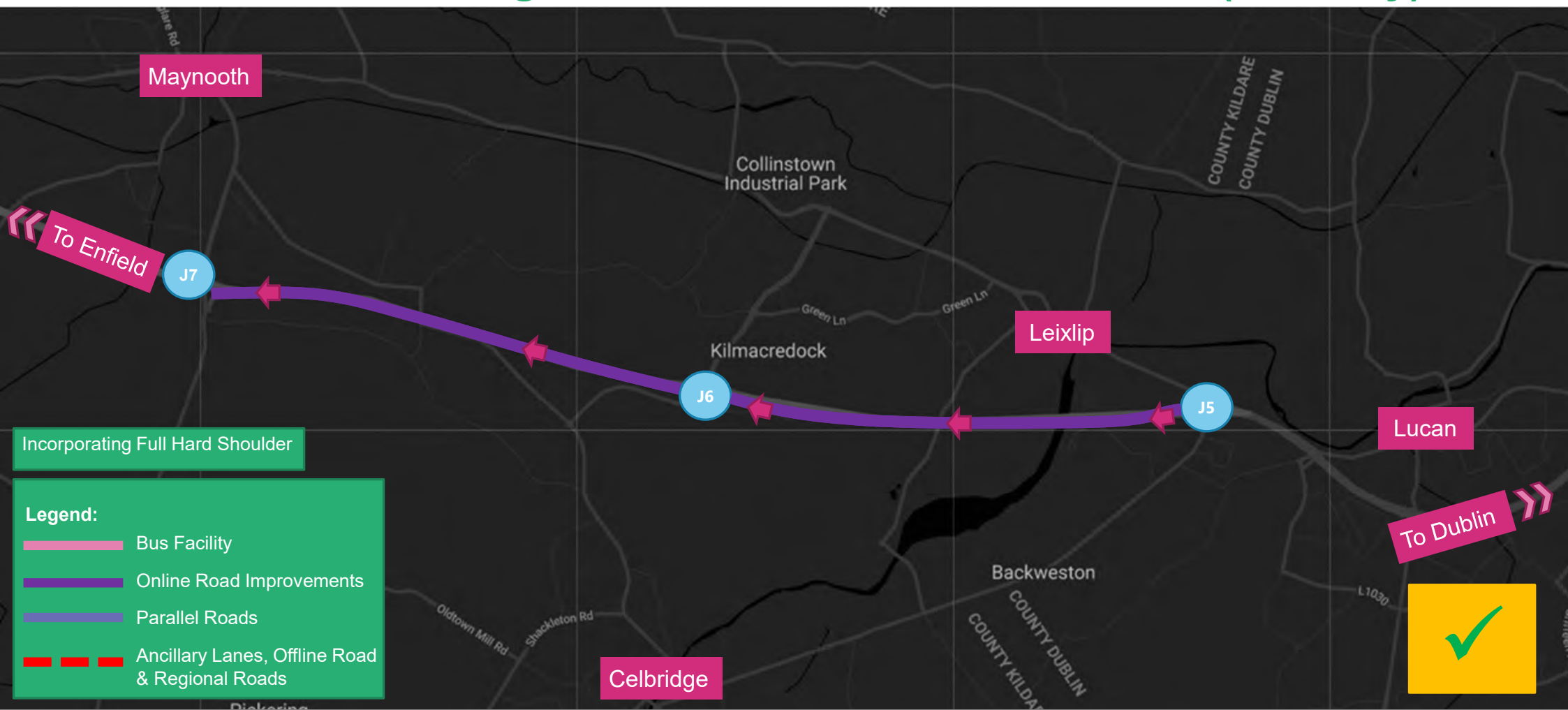


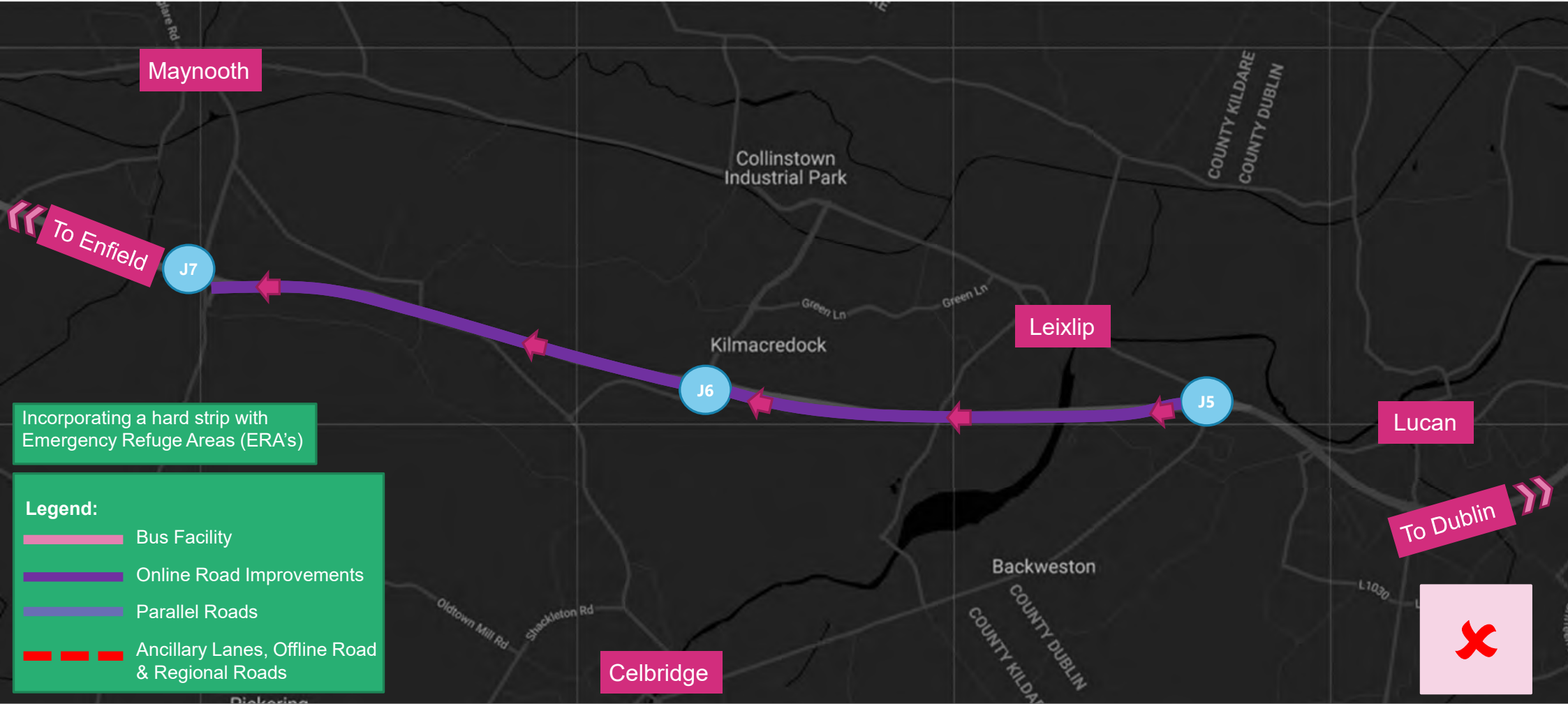
RD4.1 – Online Widening to 3 Lanes from J5 to J7 /or J6* (WB only)



*The exact extent of the intervention will be determined at a later stage, based on assessment results

Road Based Elements

RD4.2 – Online Widening to 3 Lanes from J5 to J7/or J6* (WB only)



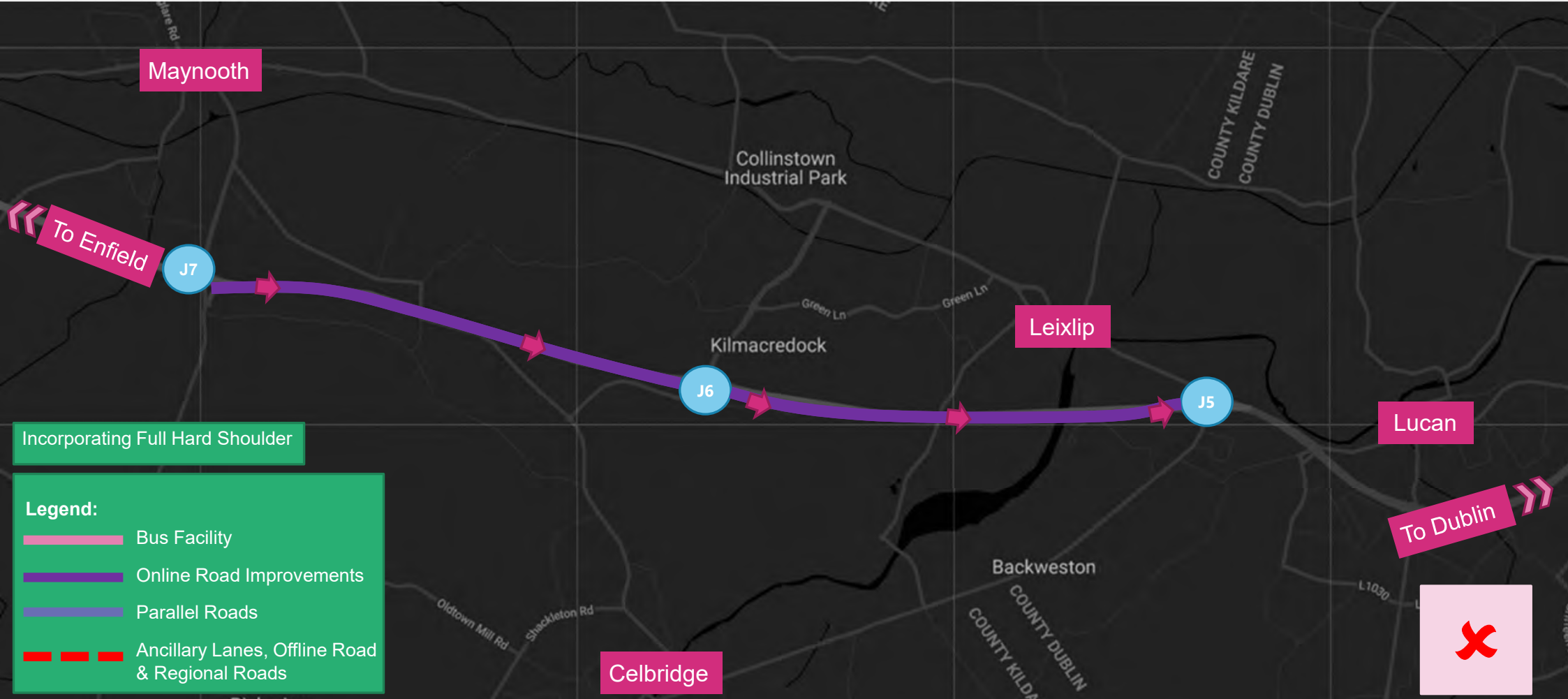
Incorporating a hard strip with Emergency Refuge Areas (ERA's)

Legend:

- Bus Facility
- Online Road Improvements
- Parallel Roads
- Ancillary Lanes, Offline Road & Regional Roads

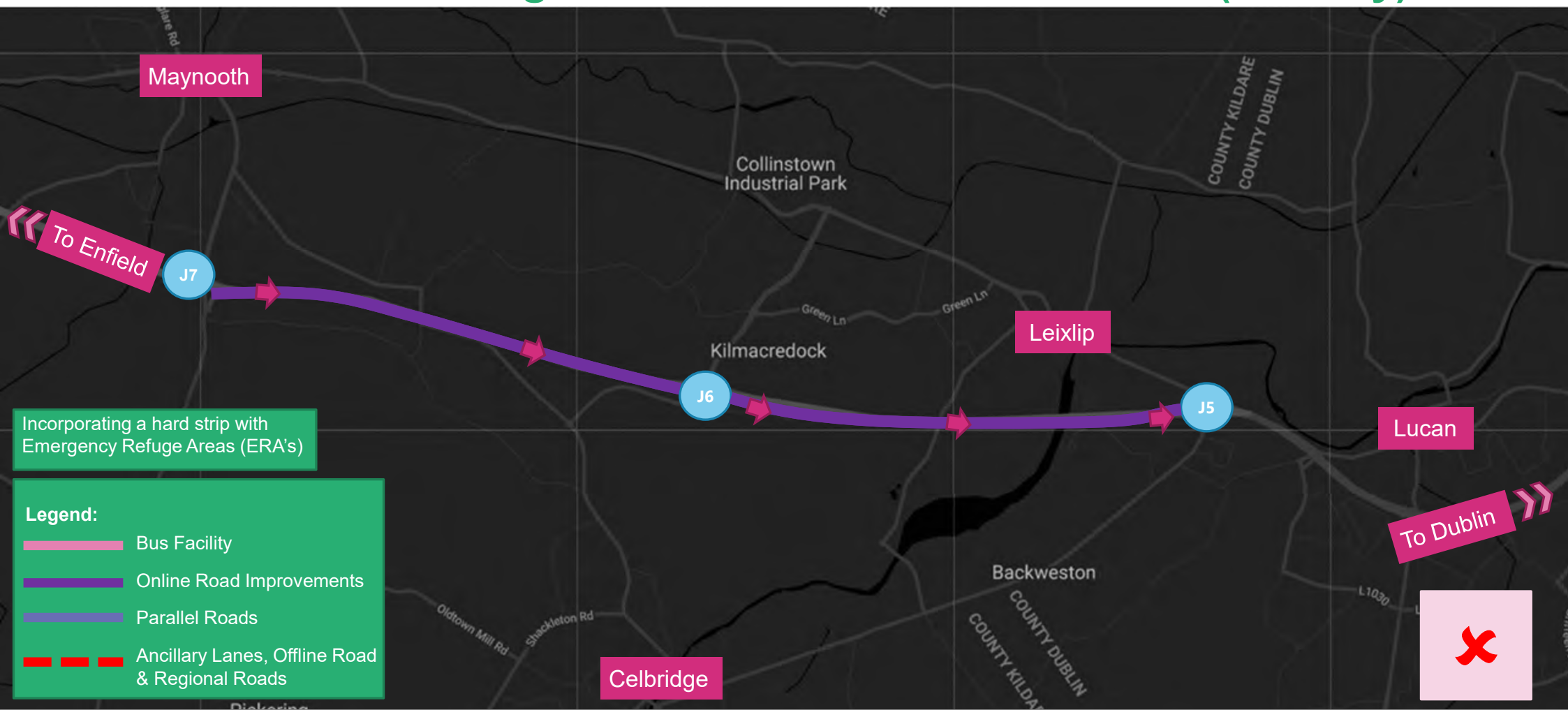
*The exact extent of the intervention will be determined at a later stage, based on assessment results

RD4.3 – Online Widening to 3 Lanes from J5 to J7 /or J6* (Eastbound only)



*The exact extent of the intervention will be determined at a later stage, based on assessment results

RD4.4 – Online Widening to 3 Lanes from J5 to J7/or J6* (EB only)

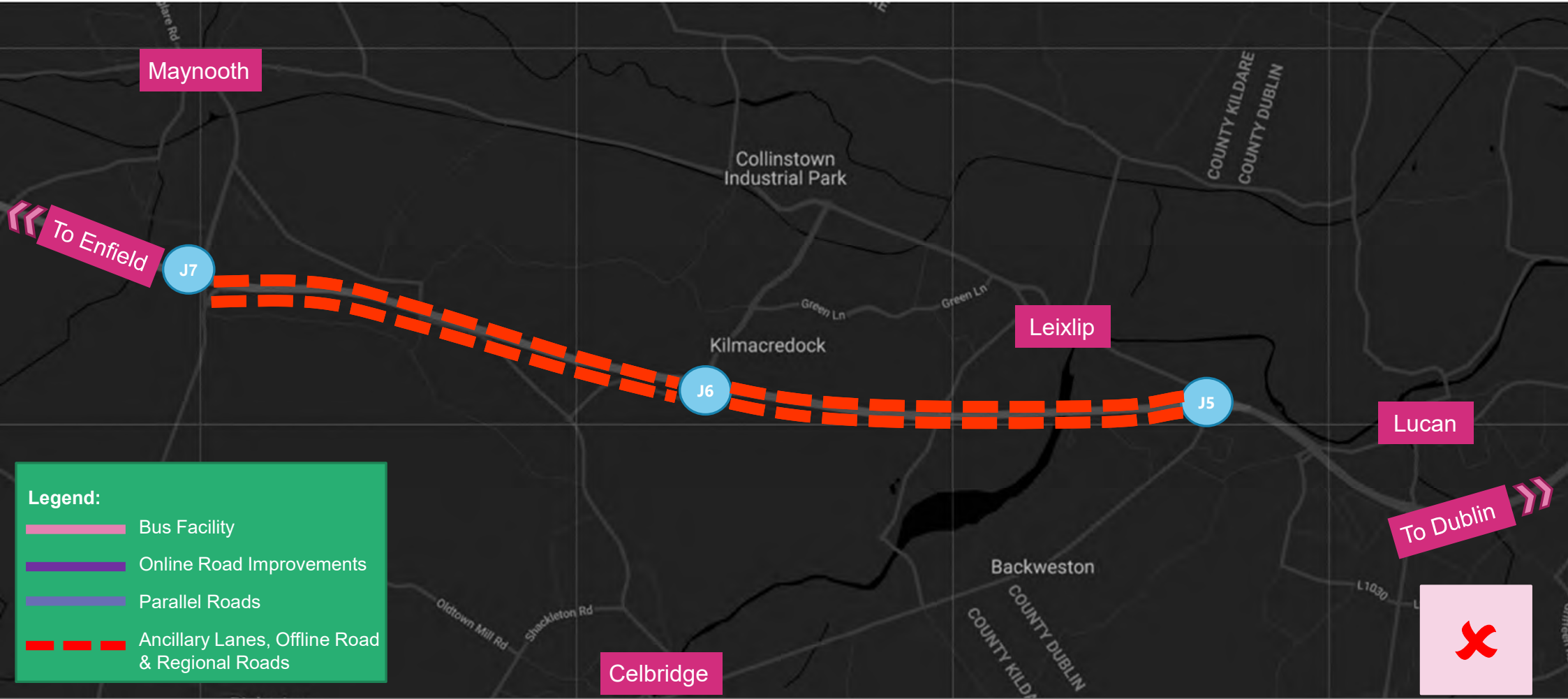


*The exact extent of the intervention will be determined at a later stage, based on assessment results

RD5.1 – Parallel Roads (incl. Parallel exist. roads**) from J5 to J7/or J6*

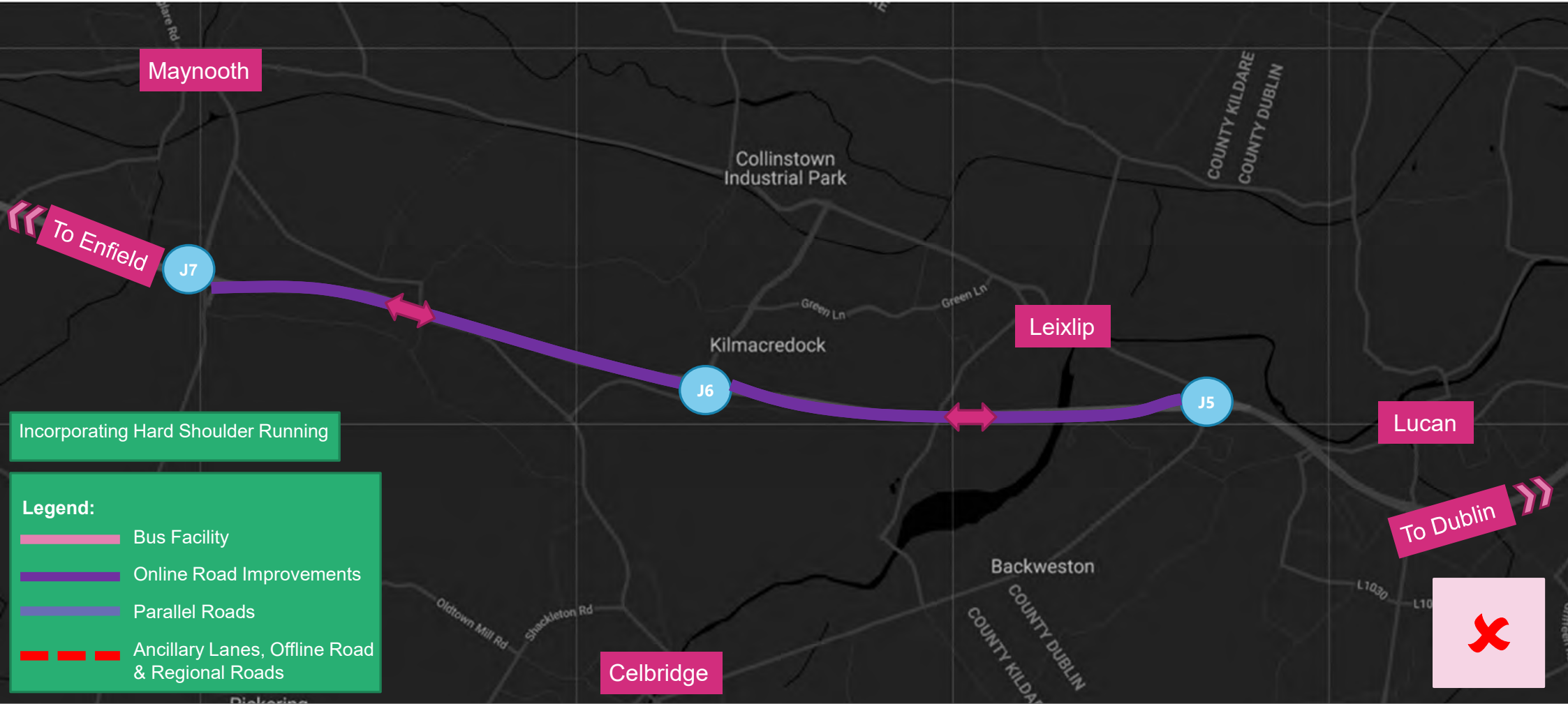


RD6.1 – Ancillary Lanes from J5 to J7/or J6*



*The exact extent of the intervention will be determined at a later stage, based on assessment results

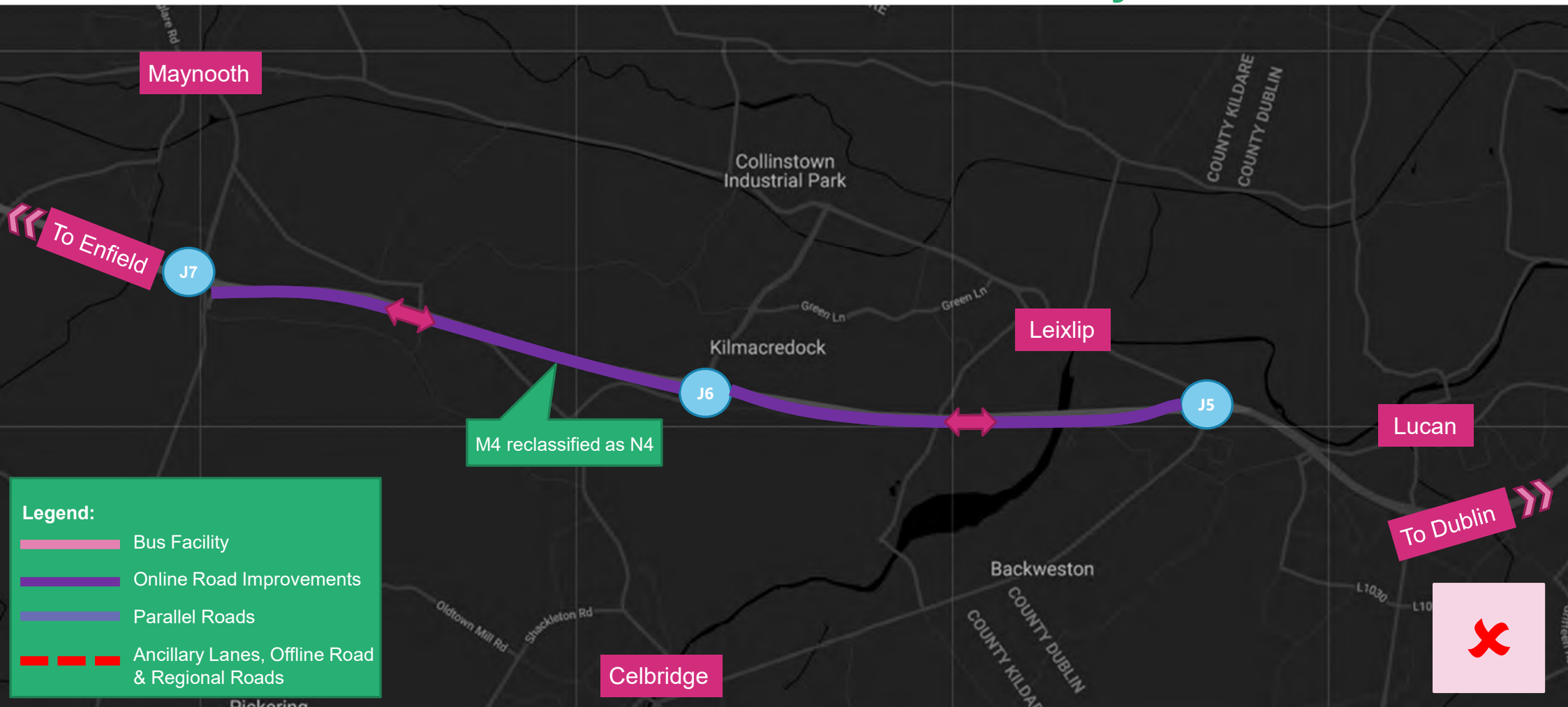
RD7.1 – SMART Motorway using Hard Shoulder Running



*The exact extent of the intervention will be determined at a later stage, based on assessment results

Road Based Elements

RD8.1 – Reclassification of Road to National Primary*

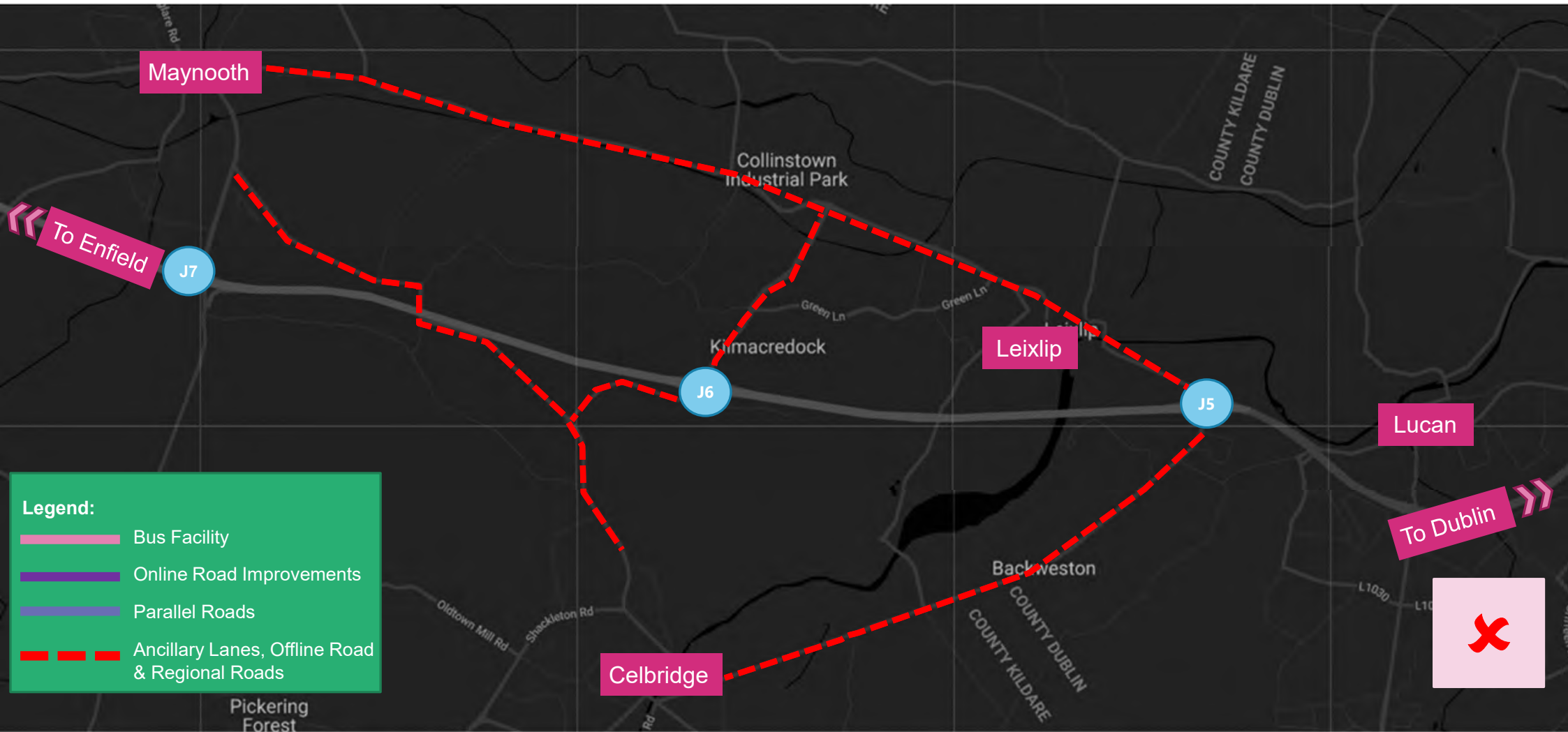


*The exact extent of the intervention will be determined at a later stage, based on assessment results

RD9.1 – Upgrade of Regional Rd (encourage local traffic on/off at J5)



RD9.2 – Upgrade of Regional Rd (encourage local traffic on/off by J6)



Road Based Elements



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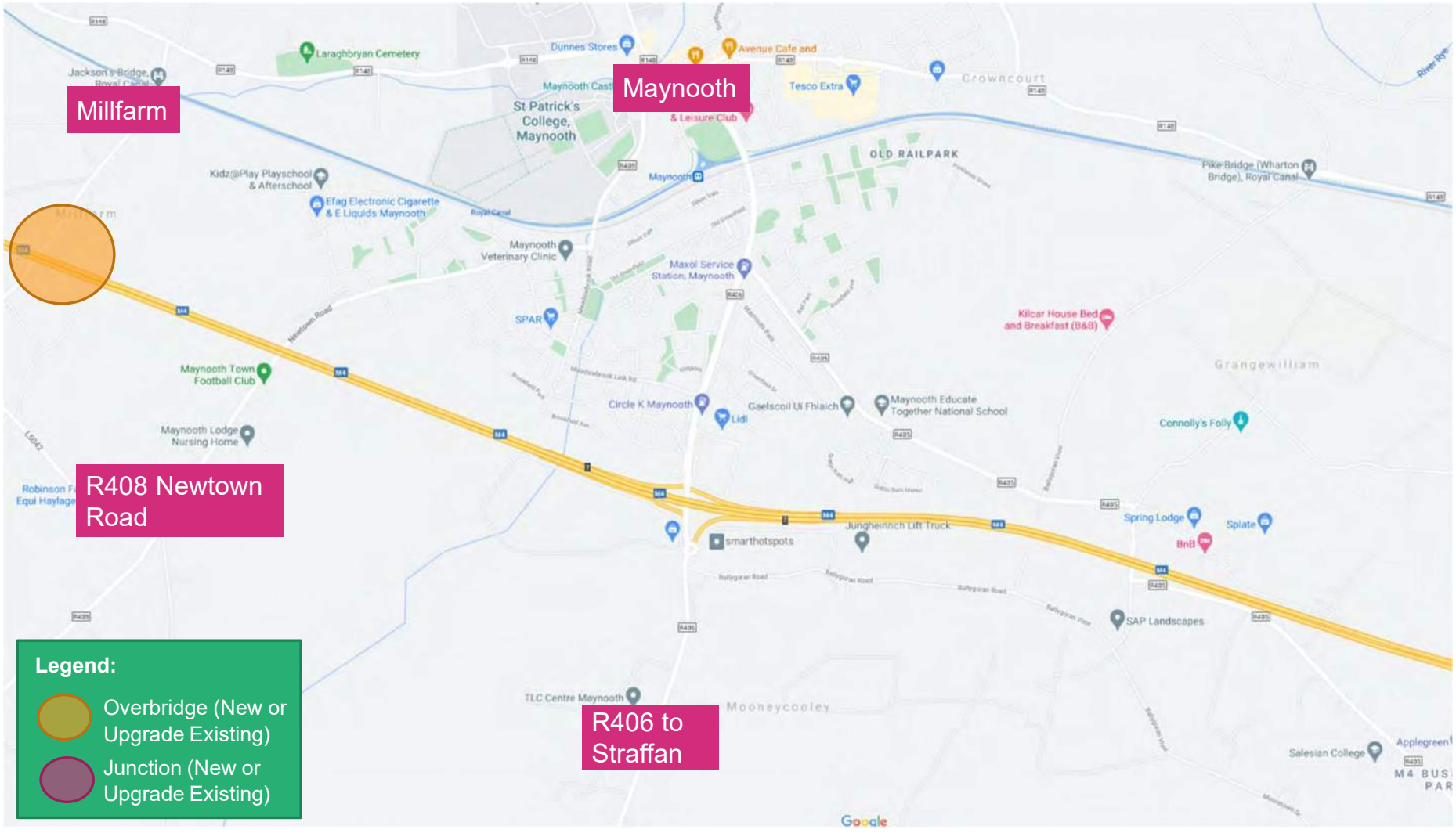


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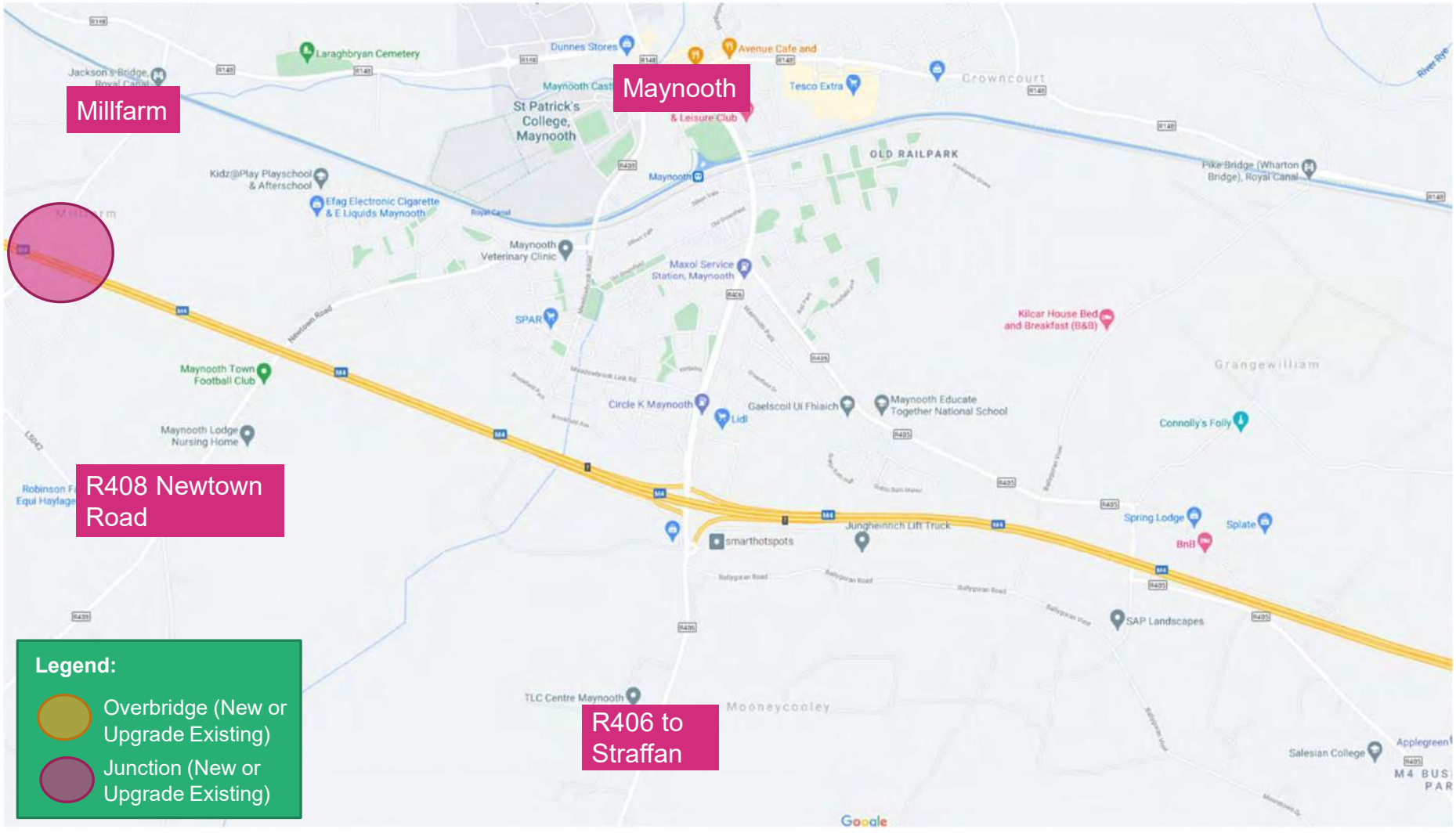
Junctions / Bridges

JB1.1 – Millfarm – Upgrade Overbridge

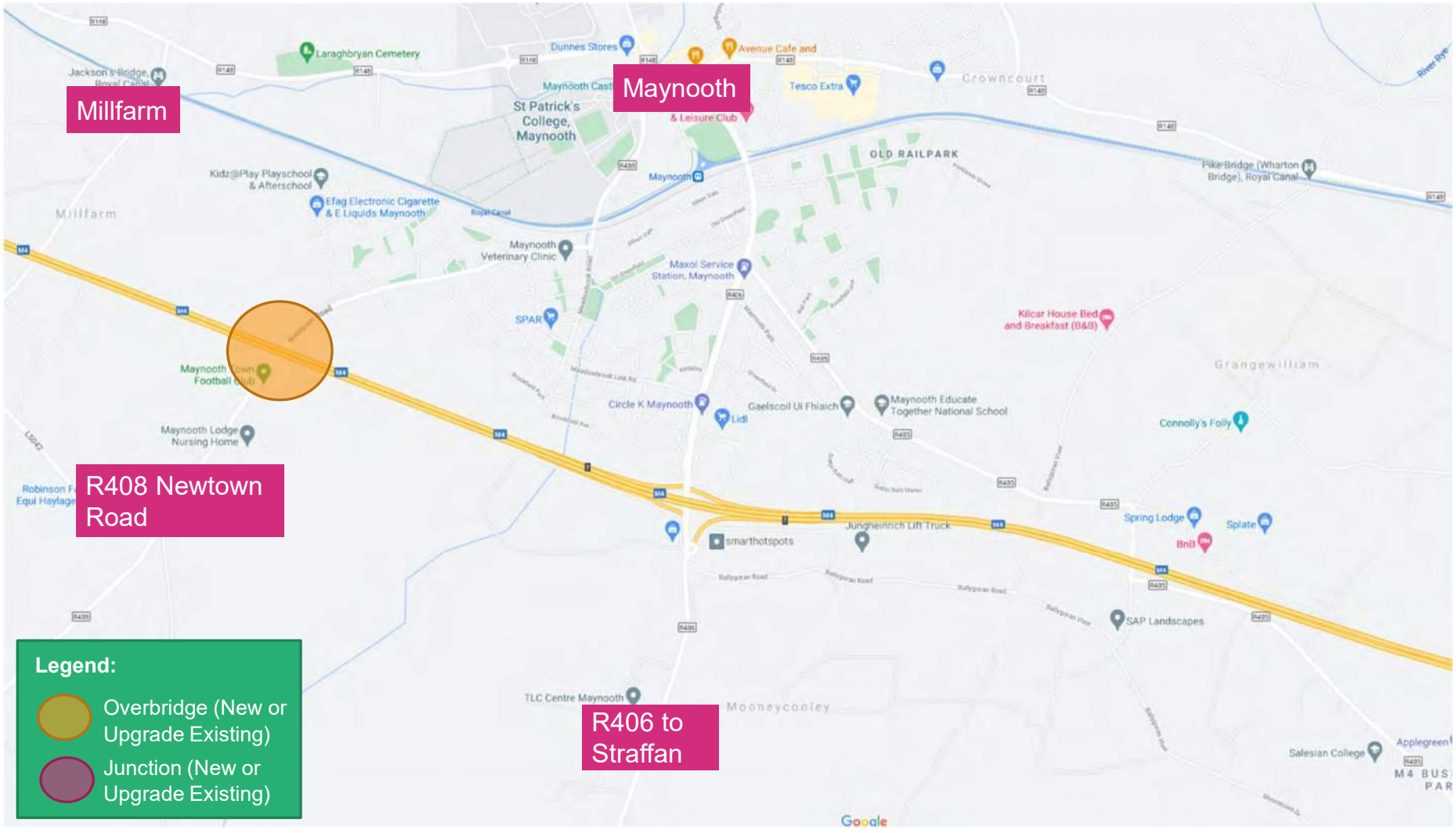


Junctions / Bridges Based Elements

JB1.2 – Millfarm - Provide Junction

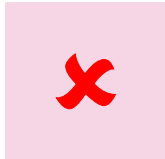
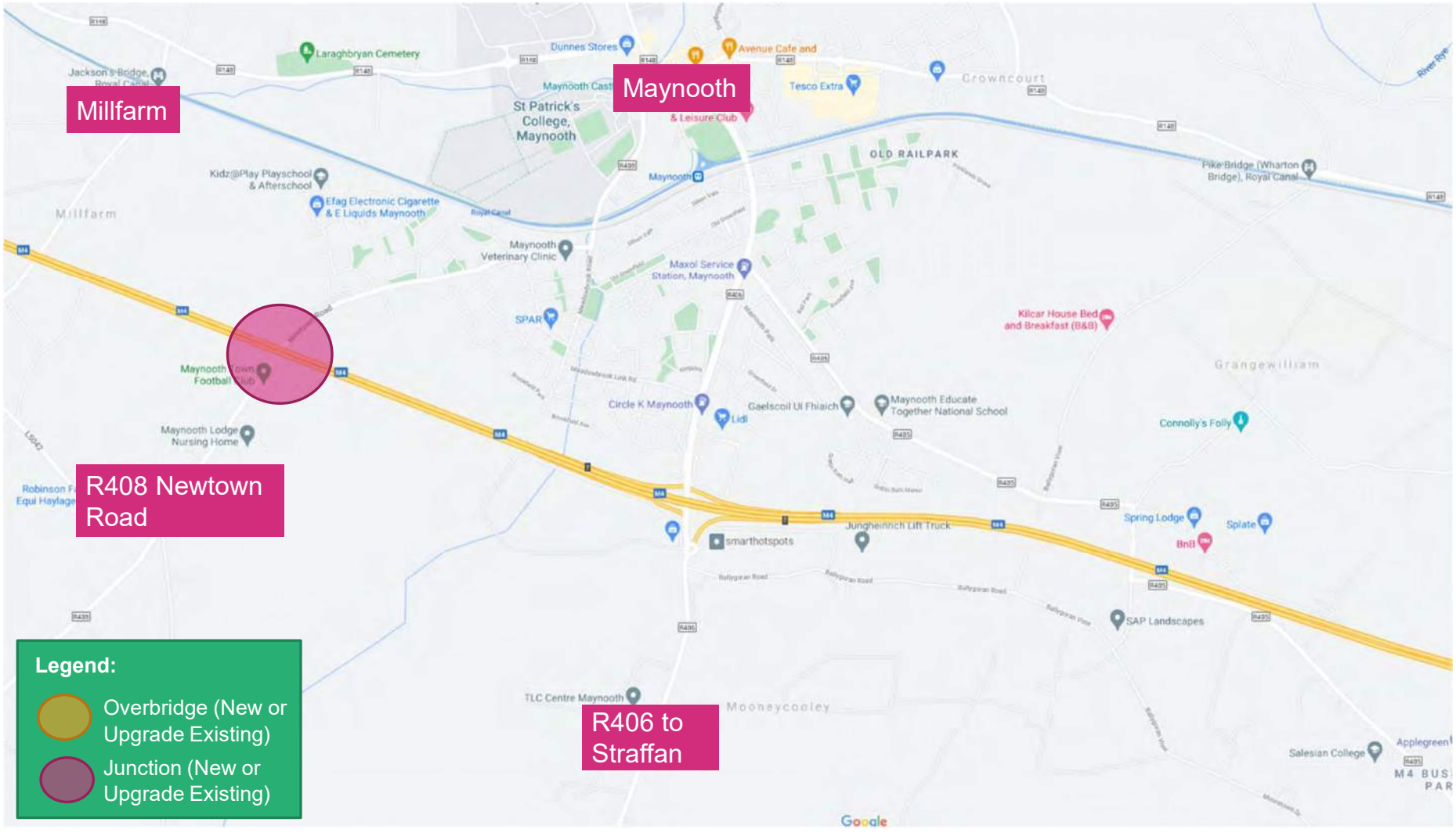


JB2.1 – Newtown – Upgrade Overbridge



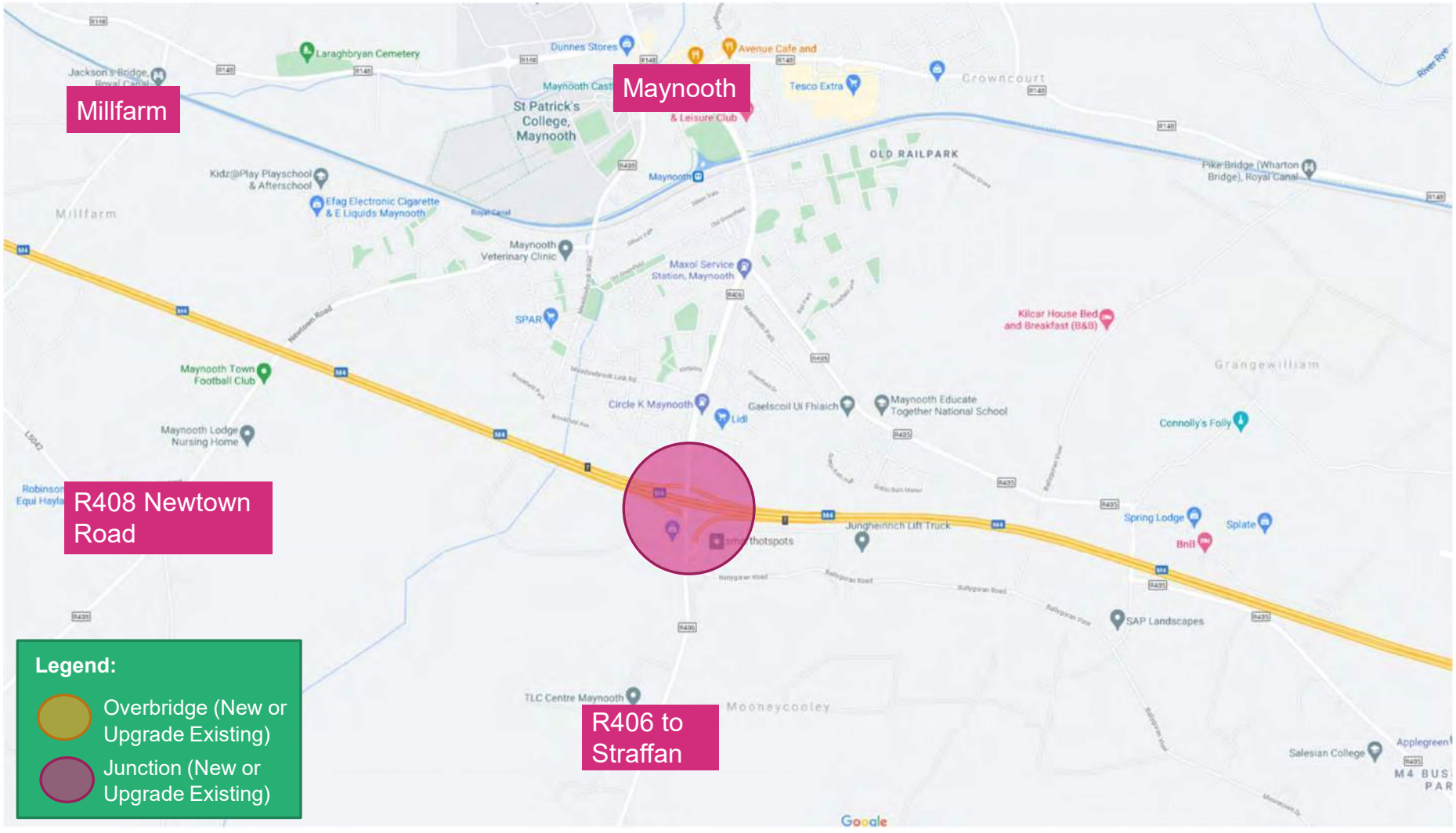
Junctions / Bridges Based Elements

JB2.2 – Newtown – Provide Junction



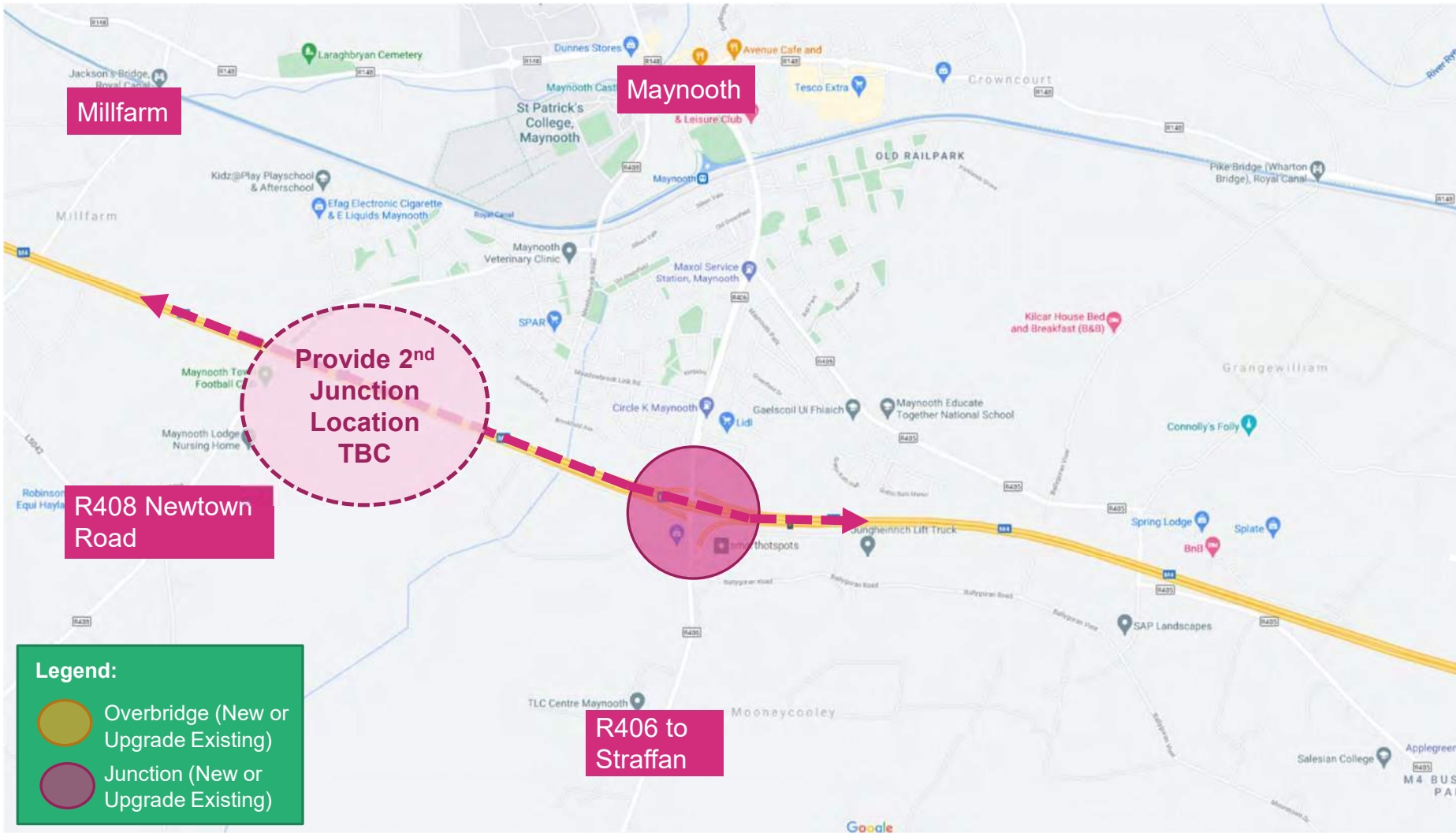
Junctions / Bridges Based Elements

JB3.1 – J7 – Upgrade Junction



Junctions / Bridges Based Elements

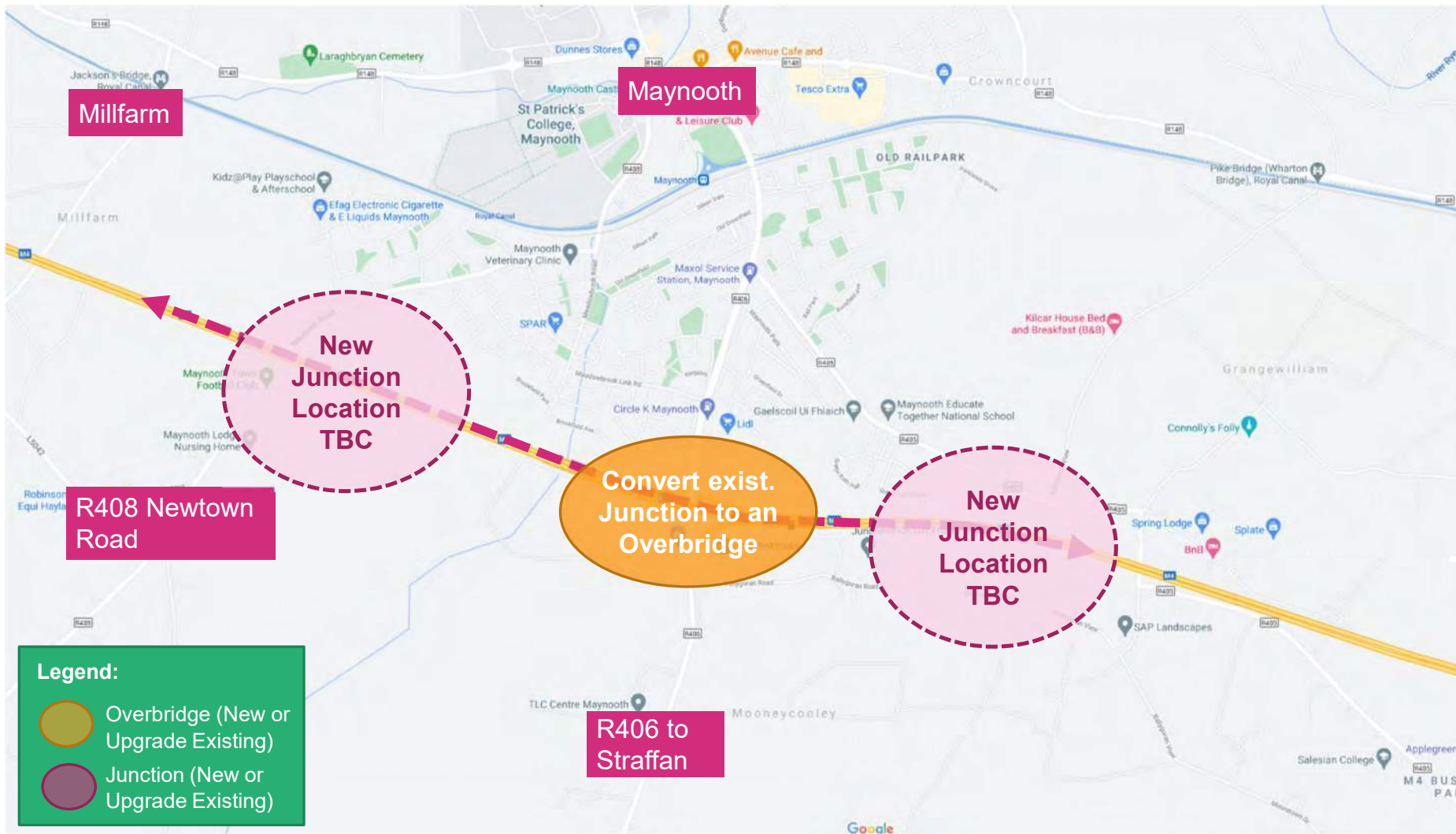
JB3.2 – J7 – Upgrade Existing Junction & Provide 2nd Junction



Junctions / Bridges Based Elements

ARUP

JB3.3 – J7 - Provide 2 New Junctions & Convert Existing to Overbridge

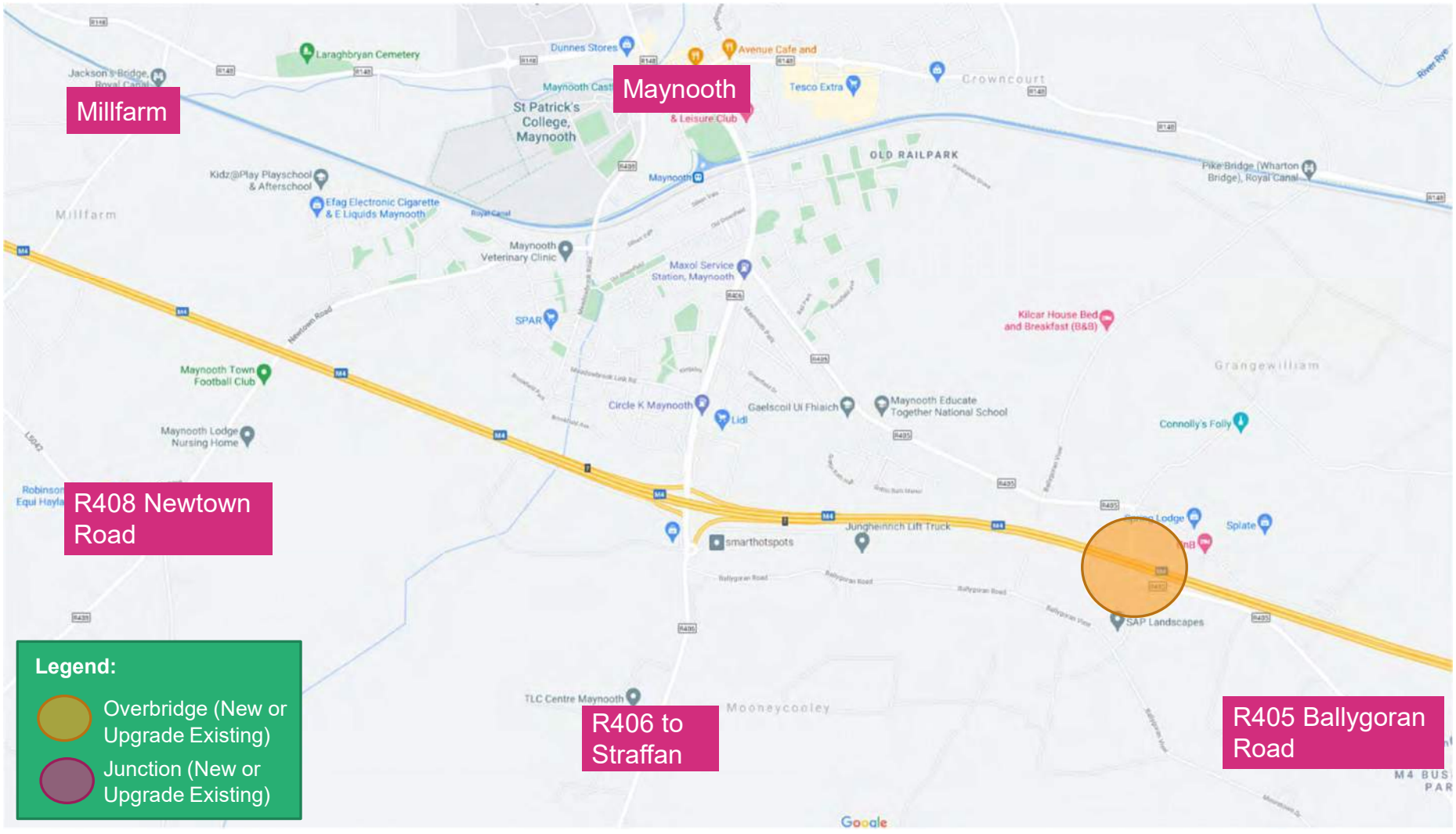


JB3.4 – J7 – Provide 1 New Junction & Convert Existing to Overbridge



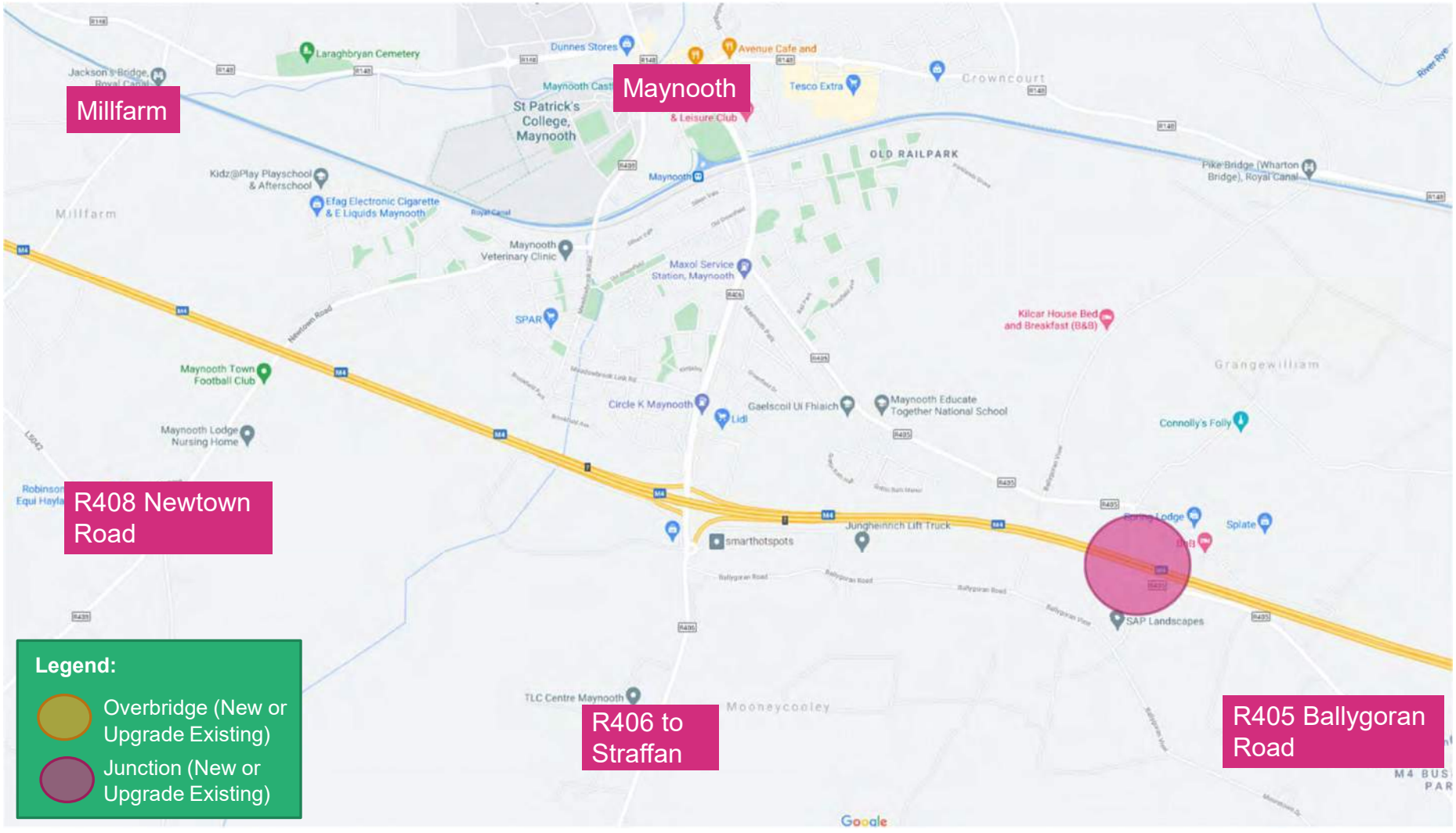
Junctions / Bridges Based Elements

JB4.1 – R405 Ballygoran – Upgrade Overbridge



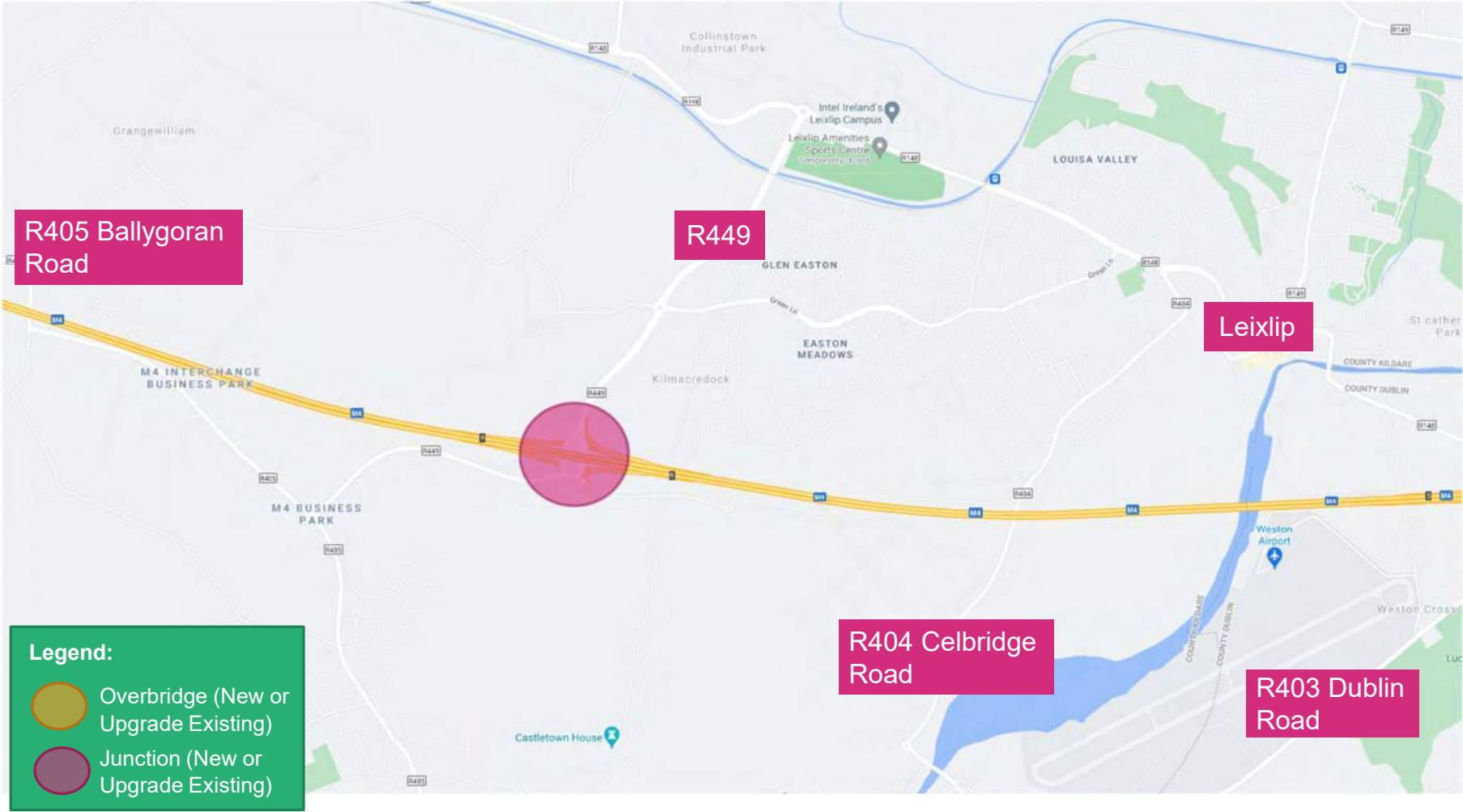
Junctions / Bridges Based Elements

JB4.2 – R405 Ballygoran - Provide Junction



Junctions / Bridges Based Elements

JB5.1 – Junction 6 – Upgrade Junction

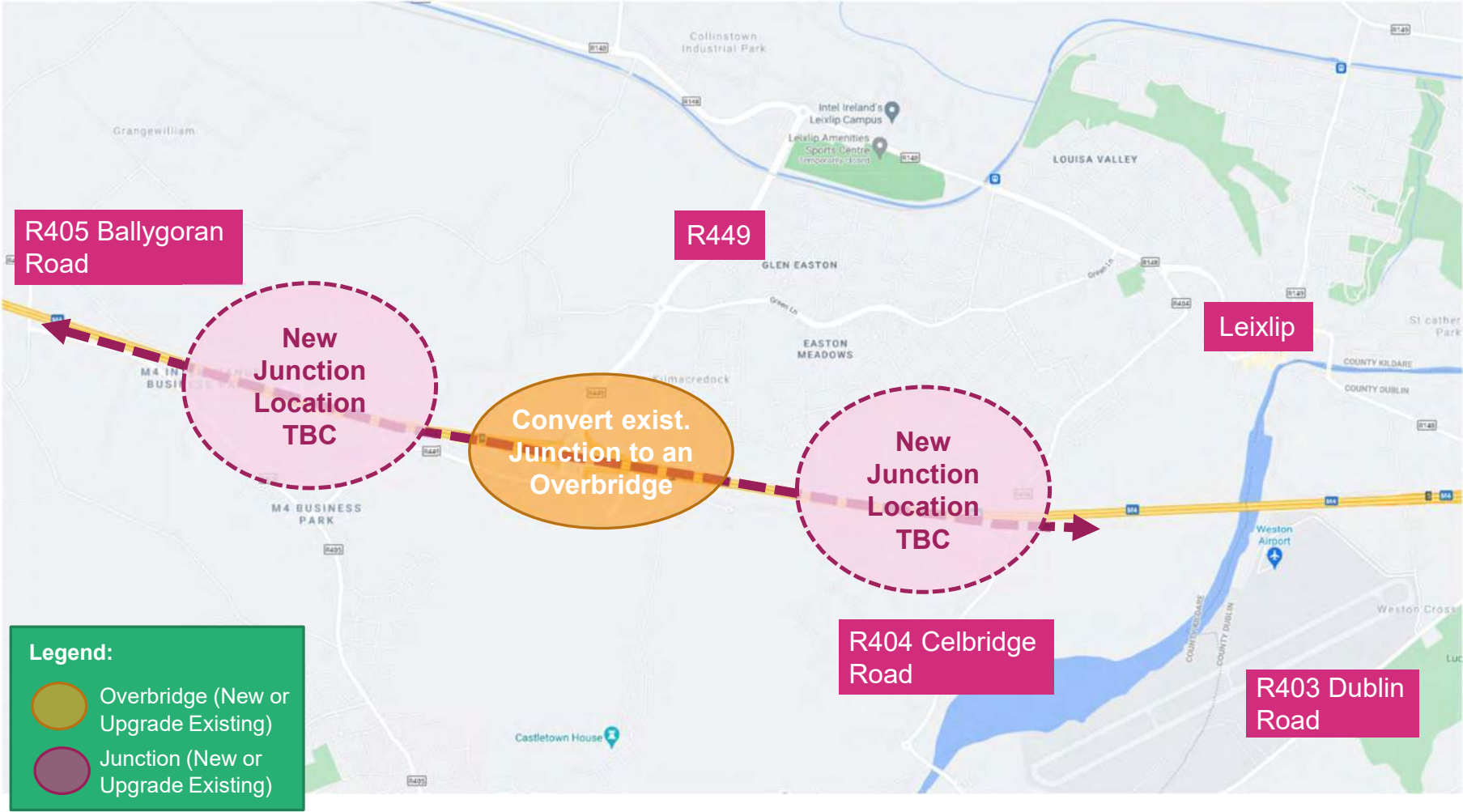


Junctions / Bridges Based Elements

JB5.2 – Junction 6 - Upgrade Existing Junction & Provide 2nd Junction



JB5.3 – J6 - Provide 2 New Junctions & Convert Existing to Overbridge

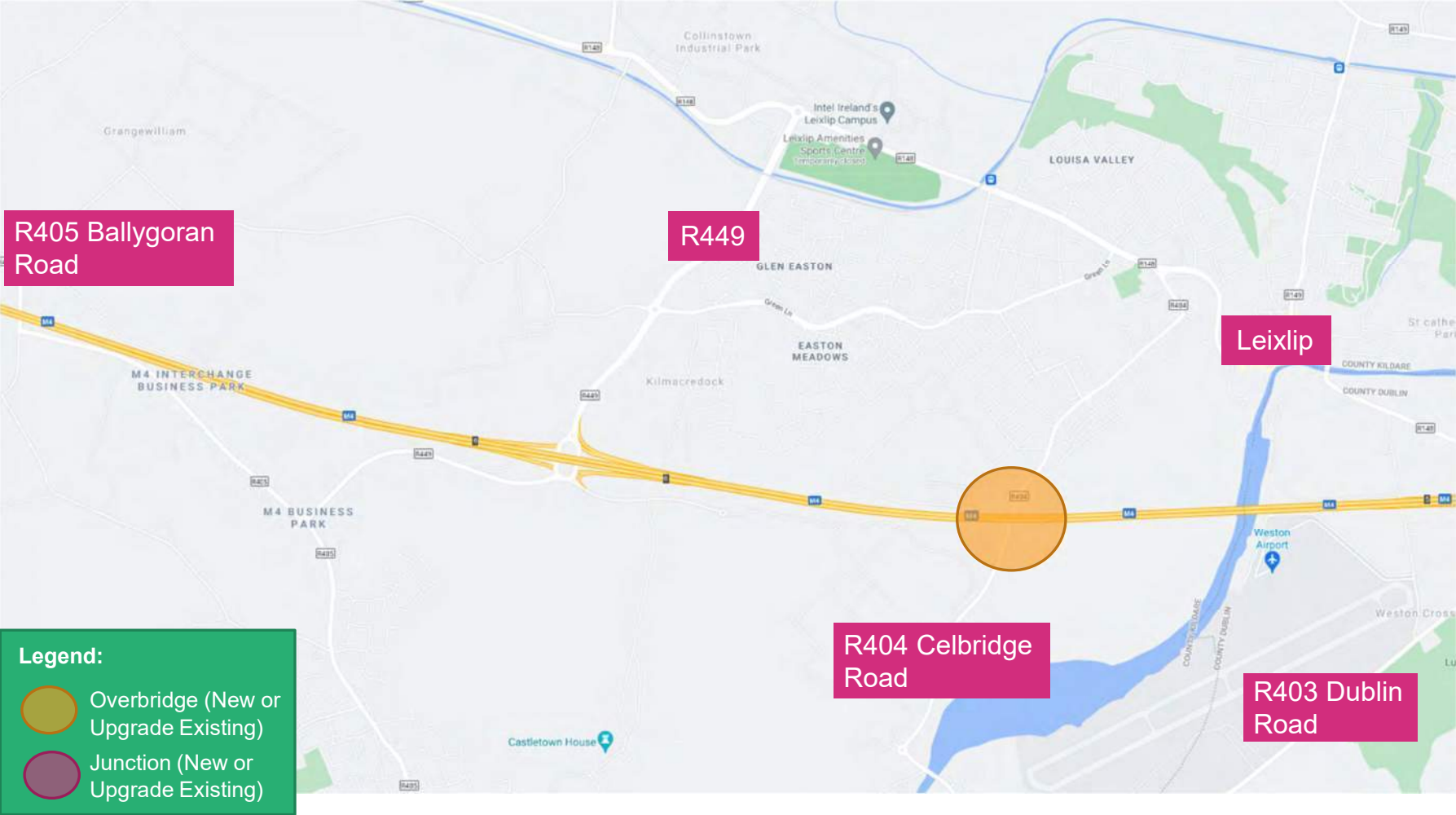


Junctions / Bridges Based Elements

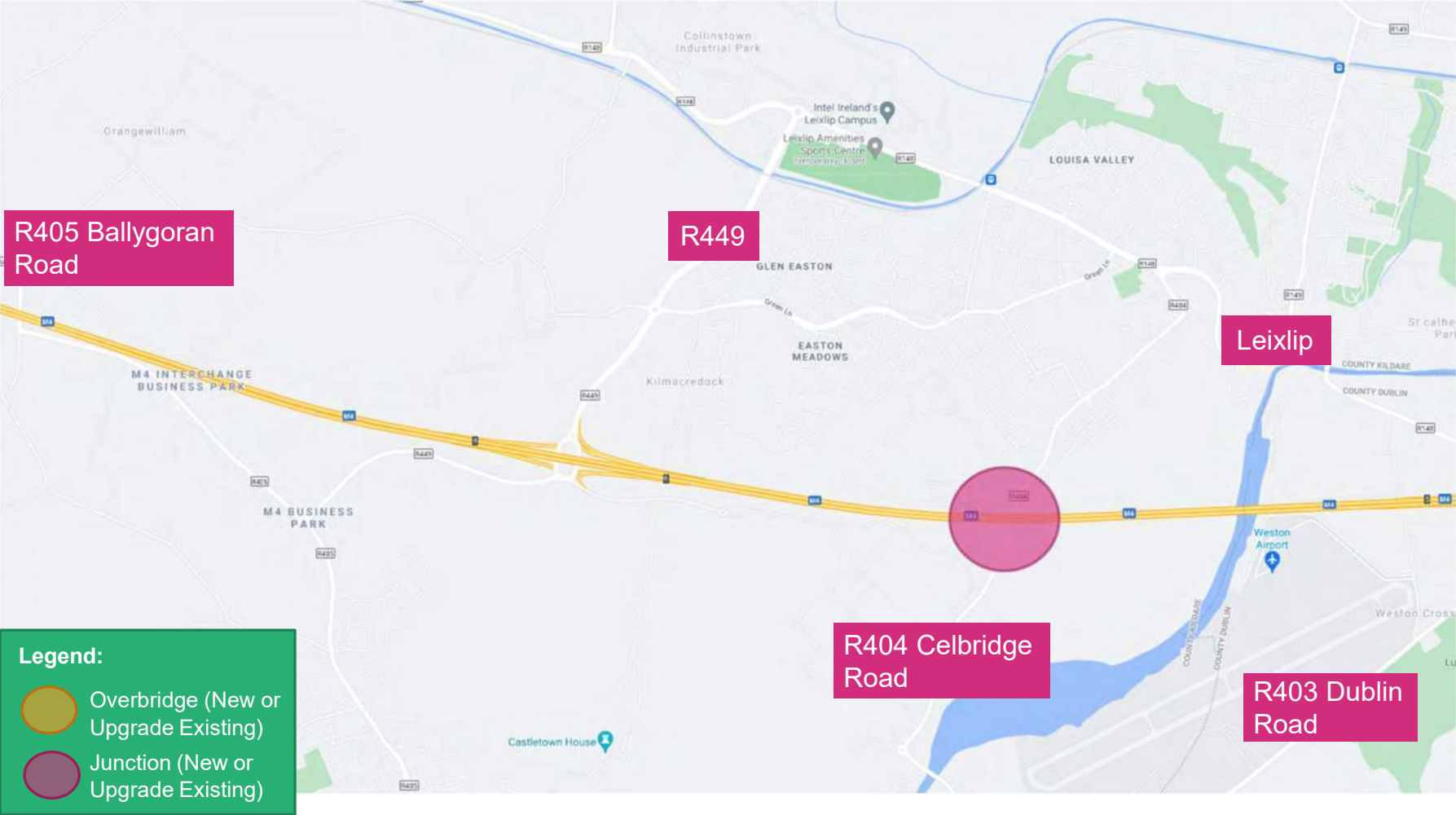
JB5.4 – J6 – Provide 1 New Junction & Convert Existing to Overbridge



JB6.1 – R404 – Upgrade Overbridge



JB6.2 – R404 - Provide Junction



JB7.1 – J5 – Upgrade Junction



Junctions / Bridges Based Elements

JB7.2 – J5 – Upgrade Existing Junction & Provide 2nd Junction



JB7.3 – J5 - Provide 2 New Junctions & Convert Existing to Overbridge



JB7.4 – J5 - Provide 1 New Junction & Convert Existing to Overbridge



Junctions / Bridges Based Elements

Stage 1 – Sift 1 on Elements

Elements:

- Upgrade to 4 lanes is not included as this is inconsistent with the current and proposed transport network (N4 & M50) and unsustainable growth
- Reclassifying the motorway to dual carriageway has limited advantages. It would only be considered in the context of bus options (see below)
- SMART motorway (ruled out in Stage 1 - Sift 1) included for multiple variations such as:
 - Peak time Bus Facility and Off-peak Car Lane
 - Peak time Bus Facility and Off-peak Hard Shoulder

Bus Elements

- All bus facilities are assumed to be full-time

Bus Facility currently:

- Could be dedicated bus facilities on the motorway (yet to be delivered in Ireland) or
- The motorway is reclassified as a dual carriageway for the purpose of adding bus facilities.



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- Provide the infrastructure to support an improved balance of transport modes
- Support greater road based user integration and connectivity with all other transport modes

- Facilitate an increase in modal shift from private car to public transport and walking/cycling thus supporting a transition towards low carbon and climate resilience

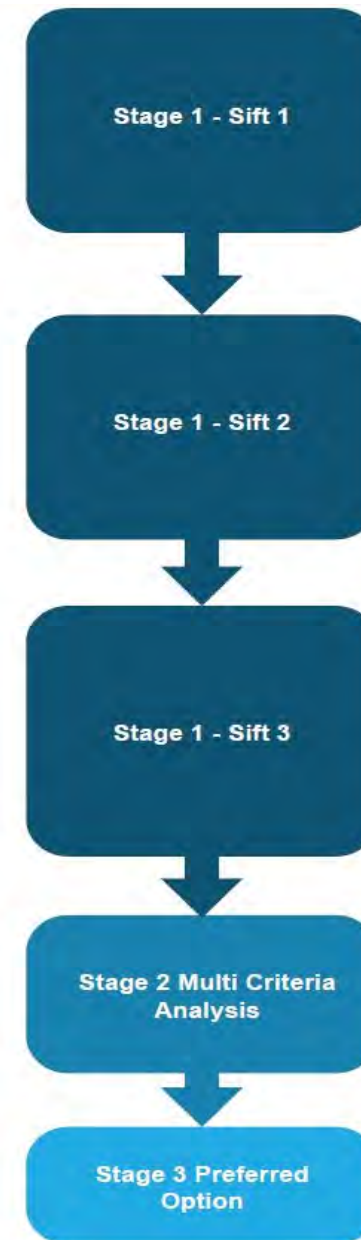
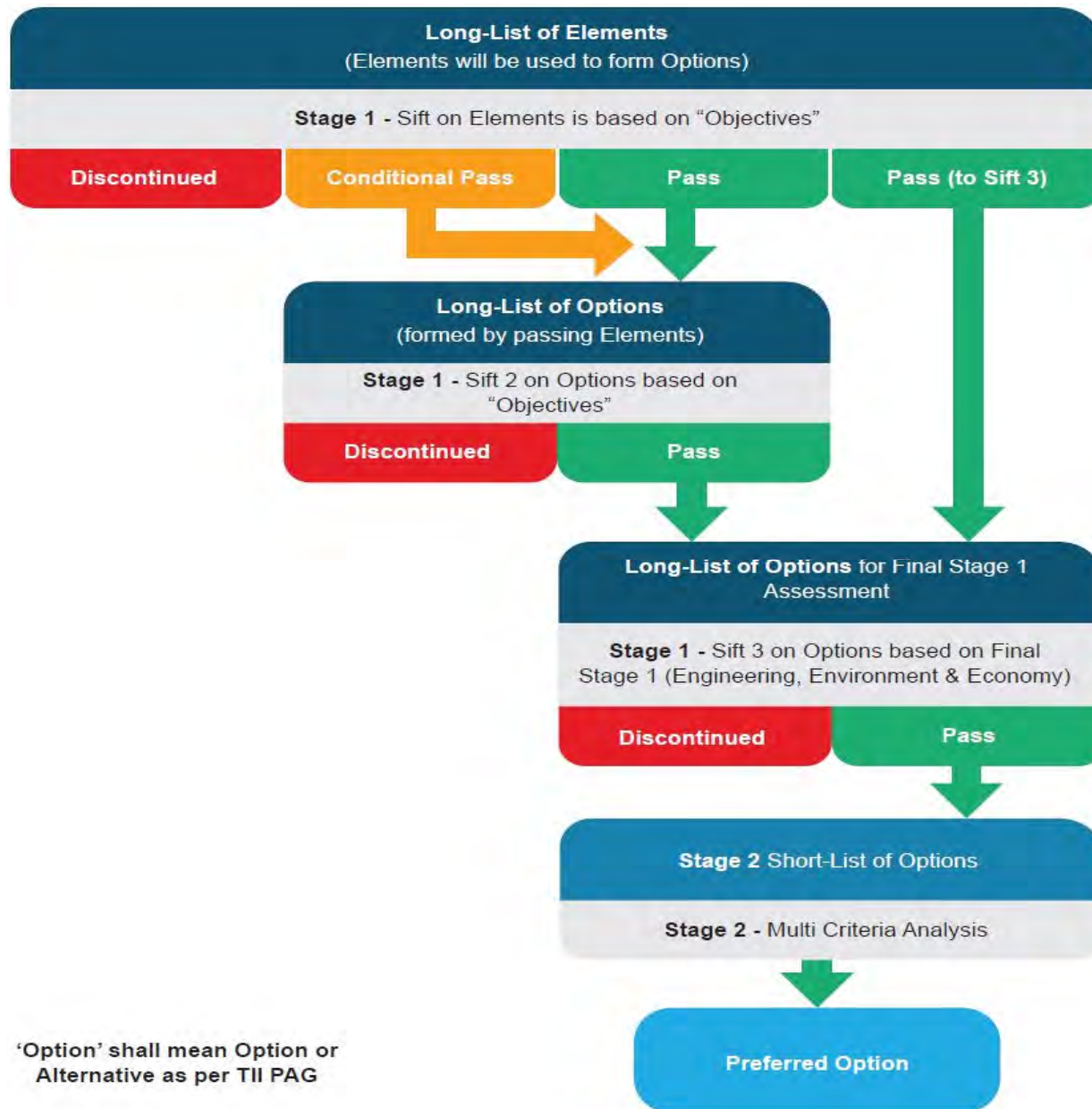
- Provide a more reliable and resilient transport solution
- Manage congestion on the M4 corridor
- Provide the infrastructure to enable transport solutions to move more people more efficiently
- Support the protection of the economic prospects of Maynooth, Leixlip, Celbridge, Kilcock, Enfield and their rural hinterland
- Facilitate effective strategic traffic movement, including from regional centres of Athlone and Sligo
- Facilitate effective freight movement



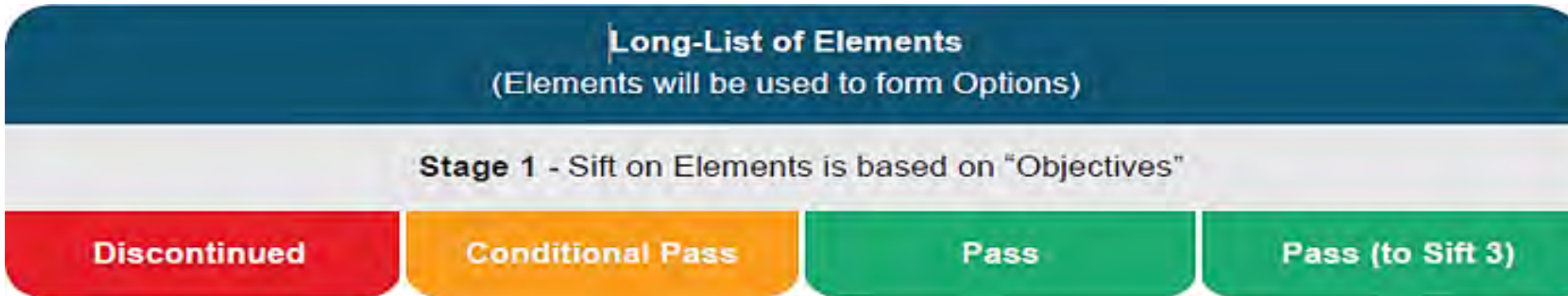
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- Provide improved accessibility to the GDA public transport network from regions outside of the GDA
- Support improved connectivity for all road users to public transport
- Enable the successful creation of place making and assist in the generation of vibrant communities

- Improve infrastructure in, across and adjacent to the M4/N4 corridor which may form barriers to physical activity and in particular linkage between key local trip attractors including education, work, residential, leisure and natural environment.
- Support the provision for cycle parking and infrastructure at key public transport nodes and destinations
- Support the creation of a healthy environment conducive to active travel



'Option' shall mean Option or Alternative as per TII PAG



Outcome	Description
Pass (to Sift 3)	These are passed to Sift 3 when sufficient design development and detail will be available to accurately appraise.
Pass	These will typically be the base of any "core" Option i.e. Option on their own and/or combined with another Option
Conditional Pass	These are considered insufficient on their own to be a "core "Option and must be joined to be sufficient
Discontinued	These are discontinued typically either (a) as they fail to meet primary objective or (b) there is another similar element/Option but it provides greater benefits or alignment with the objective

"Option" shall mean Options or Alternatives in the context of TII PAG

Stage 1 Sift 1 (Elements)

Number	Element Number	Elements (to eventually form an Option) Description	Category	Sift 1	Comments
1	B1.1	Bus facility added from J5 to J7 /or J6* (Eastbound only)	Bus Based Elements	Conditional Pass	This element aligns with the majority of the Project Objectives. However, the GDA Transport Strategy states that (1) as far as practicable, continuous priority for bus movement on the portions of the Core Bus Network within the Metropolitan Area (2) and enabling the bus to provide a faster alternative to car traffic along these routes. As the westbound Core Bus Network services would be impacted by congestion and thus not enabling the buses to provide a faster alternative to car traffic on balance. The Conditions applied to this Option is that it must consider Westbound bus services and as such, this element may be taken forward under B2.1, B3.1 or as part of another multi-element Option.
2	B2.1	Bus facility added from J5 to J7 /or J6* (Westbound only)	Bus Based Elements	Discontinued	In general, an eastbound bus facility in this context would have greater potential commuter benefits and ability to promote a modal shift in the first instance in comparison to a westbound only service. Therefore an element such as B1.1 would be of similar (cost/scale/purpose) but it provides greater benefits or alignment with the Project Objectives.
3	B3.1	Bus facility added from J5 to J7/or J6* (both directions)	Bus Based Elements	Pass	Aligns with the Project Objectives, in particular by supporting modal shift, reducing congestion (via modal shift to buses) and supports addressing the local issues which would benefit the strategic corridor.
4	B4.1	Bus facility added from J5 to J7 /or J6* (EB Bus + WB extra lane)	Bus Based Elements	Pass	Aligns with the Project Objectives, in particular by supporting modal shift, reducing congestion (via modal shift to buses) and supports addressing the local issues which would benefit the strategic corridor. In addition, it provides extra capacity westbound which may provide reduced pm peak congestion and support more efficient strategic traffic movement.
5	B5.1	Bus facility added from J5 to J7 /or J6* (WB Bus + EB extra lane)	Bus Based Elements	Discontinued	This element may result in increased congestion with the provision of an additional lane eastbound to 3 lanes, with only 2 lanes westbound. This would impact on strategic traffic. Furthermore, as highlighted already (B2.1), a westbound only bus service is not the optimal when compared with other alternative elements.
6	B6.1	Enhanced Bus Infrastructure	Bus Based Elements	Pass (to Sift 3)	This element would include enhancements to the existing bus infrastructure. This would apply to all Options in Sift 3 and the details would be determined on a case by case basis to best serve each Option. As a result, this element is Pass (to Sift 3) and will be considered at that stage on all applicable Options.
7	PR1.1	Strategic PR - Combined Rail and Bus Based Park and Ride (Enfield)	Park and Ride Based Elements	Discontinued	This is not part of DART+ West enhancement and not part of the NTA Park & Ride Development Office GDA Park & Ride (P&R) Strategy. This element may be more appropriate as part of a local mobility hub or local P&R.
8	PR1.2	Strategic PR - Bus Based Park and Ride (Tollington Point)	Park and Ride Based Elements	Discontinued	This is not part of part of DART+ West enhancement and not part of NTA Park & Ride Development Office GDA Park & Ride (P&R) Strategy. Significant infrastructure would be required at a significant capital cost. Additionally, it may be too far west of congestion for a Strategic Park and Ride, given its location it is not suitable for a local mobility hub or local P&R.
9	PR1.3	Strategic PR - Combined Rail and Bus Based Park and Ride (Kilcock)	Park and Ride Based Elements	Discontinued	This is not part of DART+ West enhancement and not part of the NTA Park & Ride Development Office GDA Park & Ride (P&R) Strategy. This element may be more appropriate as part of a local mobility hub or local P&R.
10	PR1.4	Strategic PR - Combined Rail and Bus Based Park and Ride (West Maynooth)	Park and Ride Based Elements	Pass (to Sift 3)	This element on its own does not form a stand alone Option that can sufficiently address the Project Objectives. This element will be considered in combination with other elements(s) to form an Option. Furthermore, based on its design/purpose and GDA Transport Strategy, one of these elements shall include measures for bus priority.
11	PR1.5	Strategic PR - Rail Based Park and Ride (Collinstown)	Park and Ride Based Elements	Pass (to Sift 3)	This element on its own does not form a stand alone Option that can sufficiently address the Project Objectives. This element will be considered in combination with other elements(s) to form an Option. Furthermore, based on its design/purpose and GDA Transport Strategy, one of these elements shall include measures for bus priority.
12	PR1.6	Strategic PR - Bus Based Park and Ride (Junction 6)	Park and Ride Based Elements	Pass (to Sift 3)	This element on its own does not form a stand alone Option that can sufficiently address the Project Objectives. This element will be considered in combination with other elements(s) to form an Option. Furthermore, based on its design/purpose and GDA Transport Strategy, one of these elements shall include measures for bus priority.
13	PR1.7	Strategic PR - Bus Based Park and Ride (Junction 5)	Park and Ride Based Elements	Pass (to Sift 3)	This element on its own does not form a stand alone Option that can sufficiently address the Project Objectives. This element will be considered in combination with other elements(s) to form an Option. Furthermore, based on its design/purpose and GDA Transport Strategy, one of these elements shall include measures for bus priority.
14	PR1.8	Strategic PR - Bus based facilities adjacent to each junction (J7, J6 and J5)	Park and Ride Based Elements	Discontinued	A combination of PR 1.4 - 1.8, 2.1 and 3.1 are more suitable
15	PR2.1	Local Mobility Park and Ride	Park and Ride Based Elements	Pass (to Sift 3)	This element would include Local Mobility Park and Rides. This would apply to all Options in Sift 3 and the details of the Local Mobility Park and Rides would be determined on a case by case basis to best serve each Option. As a result, this element is Pass (to Sift 3) and will be considered at that stage on all applicable Options.
16	PR3.1	Local Park and Ride	Park and Ride Based Elements	Pass (to Sift 3)	This element would include Local Park and Rides. This would apply to all Options in Sift 3 and the details of the Local Park and Rides would be determined on a case by case basis to best serve each Option. As a result, this element is Pass (to Sift 3) and will be considered at that stage on all applicable Options.
17	RL1	Benefit analysis of DART+ West Programme (included as a committed project) on the M4/N4 corridor	Rail Based Elements	Pass (to Sift 3)	Benefit analysis of DART+ West Programme (included as a committed project) on the M4/N4 corridor. This will be included in the Do-Minimum from a modelling perspective.
18	RL2	Test Regional Rail Improvements	Rail Based Elements	Pass (to Sift 3)	Frequency, speed and reliability to be tested
19	AT1.1	Active Travel Enhancement at Junction 7 on the R406.	Active Travel Based Elements	Pass (to Sift 3)	Cycle / Walking Network Upgrade with potentially a new Structure(s) / Bridge Widening at Junction 7 Maynooth on the R406 to improve linkage between Maynooth and Maynooth Business Campus. This includes possible route improvements. This would apply to all Options in Sift 3 and the details of any Active Travel improvements would be determined on a case by case basis to best serve each Option. As a result, this element is Pass (to Sift 3) and will be considered at that stage on all Options.
20	AT1.2	Active Travel Enhancement on the R405 Overbridge	Active Travel Based Elements	Pass (to Sift 3)	Cycle / Walking Network Upgrade with potentially a new Structure(s) / Bridge Widening on the R405 Overbridge to improve linkage between Maynooth and Celbridge. Potential connectivity to Maynooth Business Campus also to be included. This includes possible route improvements. This would apply to all Options in Sift 3 and the details of any Active Travel improvements would be determined on a case by case basis to best serve each Option. As a result, this element is Pass (to Sift 3) and will be considered at that stage on all Options.
21	AT1.3	Active Travel Enhancement at Junction 6 on the R449	Active Travel Based Elements	Pass (to Sift 3)	Cycle / Walking Network Upgrade with potentially a new Structure(s) / Bridge Widening at Junction 6 on the R449 to improve linkage between Celbridge and West Leixlip including Intel. This includes possible route improvements. This would apply to all Options in Sift 3 and the details of any Active Travel improvements would be determined on a case by case basis to best serve each Option. As a result, this element is Pass (to Sift 3) and will be considered at that stage on all Options.
22	AT1.4	Active Travel Enhancement on the R404 Overbridge	Active Travel Based Elements	Pass (to Sift 3)	Cycle / Walking Network Upgrade with potentially a new Structures / Bridge Widening on the R404 Overbridge to improve linkage between Leixlip and Celbridge. Connectivity to the Liffey Business Campus also to be included. This includes possible route improvements. This would apply to all Options in Sift 3 and the details of any Active Travel improvements would be determined on a case by case basis to best serve each Option. As a result, this element is Pass (to Sift 3) and will be considered at that stage on all Options.
23	AT1.5	Active Travel Enhancement at Junction 5	Active Travel Based Elements	Pass (to Sift 3)	Cycle / Walking Network Upgrade + New Structures / Bridge Widening at Junction 5 Leixlip Overbridge. It will also include upgrade along the R403 from Junction 5 Leixlip to Celbridge. This includes possible route improvements. This would apply to all Options in Sift 3 and the details of any Active Travel improvements would be determined on a case by case basis to best serve each Option. As a result, this element is Pass (to Sift 3) and will be considered at that stage on all Options.
24	AT2.1	Support the provision for cycle parking and infrastructure at key public transport nodes and destinations	Active Travel Based Elements	Pass (to Sift 3)	This aligns with the Project Objectives for Physical Activity
25	DM1.1	Test transit oriented development	Demand Management Based Elements	Pass (to Sift 3)	Aligned with National Policy. Increased density around transit stops has potential to significantly increase patronage. Though effective in the mitigation of additional car trips from future developments, mixed use developments would not effect strategic trips, nor would it alter existing local traffic patterns without substantial alterations. This is outside the remit and influence of the project and addressed via Local Area Plans and County Development Plans.
26	DM1.2	Test the mix of land uses in close proximity to each other	Demand Management Based Elements	Pass (to Sift 3)	Aligned with National Policy. Providing mixed use developments may reduce trip lengths, favouring active modes. Though effective in the mitigation of additional car trips from future developments, mixed use development would not effect strategic trips, nor would it alter existing local traffic patterns without substantial alterations.
27	DM1.3	Test for Permeability	Demand Management Based Elements	Discontinued	This measure may have a marginal impact on the level of local trip making by car. Measuring likely impacts may be difficult. This overlaps with Active Travel. Overall, it would not have a significant impact on the strategic corridor.
28	DM1.4	Alternative Demand Sensitivity Analysis	Demand Management Based Elements	Pass (to Sift 3)	As a result of Pandemic increased Working From Home (WFH) is taking place and is likely to continue into the future. This is outside the remit and influence of the project and should be developed via local council plans and policy. However, based on the current proposed plans and policy, this can be tested in the transport model.
29	DM2.1	Road Tolling / Pricing	Demand Management Based Elements	Pass (to Sift 3)	Current Policy and proven effective measure in changing trip making patterns. This could include amendment to the tolling strategy of the existing toll. It would be impractical and not value for money to move the existing toll such as short distance. Alternatively, a second toll would be in close proximity to the current toll and could result in greater impacts on strategic traffic in comparisons to local traffic.
30	DM2.2	Congestion Charging	Demand Management Based Elements	Discontinued	Within the project study area, it would be practicality of enforcing a congestion charge would be difficult and would be contrary to the project objectives which aim to improve connectivity and integration within the study area.
31	DM2.3	Fuel Duty	Demand Management Based Elements	Discontinued	Not applicable as this is a national measure as opposed to one that can be applied on a project specific basis
32	DM2.4	Public Transport Fare Subsidy	Demand Management Based Elements	Discontinued	Not applicable as this is a national/regional measure as opposed to one that can be applied on a project specific basis
33	DM2.5	Increased Parking Charges / Levies	Demand Management Based Elements	Discontinued	This is outside the remit and influence of the project and should be developed via local council plans and policy.

Stage 1 Sift 1 (Elements)

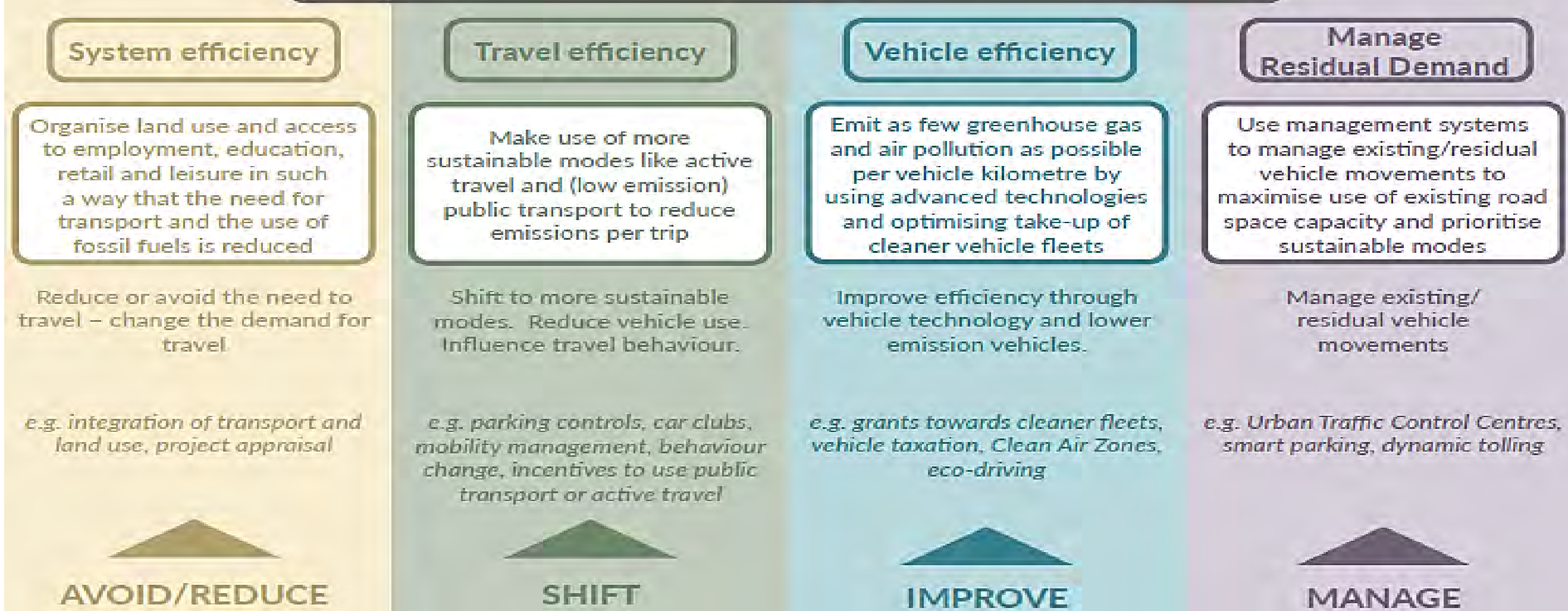
Number	Element Number	Elements (to eventually form an Option) Description	Category	Sift 1	Comments
34	DM2.6	Tax Saver Scheme	Demand Management Based Elements	Discontinued	Not applicable as this is a national measure as opposed to one that can be applied on a project specific basis.
35	DM3.1	HGV Bans	Demand Management Based Elements	Discontinued	A primary purpose of the National Road Network is to carry strategic traffic, such as HGVs, therefore this does not align with the purpose of the national road network. Furthermore, without the availability of alternative routes, HGV bans are likely to result in non-desirable trip reallocation, which may incur a higher indirect financial & safety toll.
36	DM3.2	Reduced Speed Limits	Demand Management Based Elements	Pass (to Sift 3)	Though feasible, consideration must be paid to the likely redistribution of trips and whether such a move would be desirable.
37	DM3.3	Variable Speed Limits	Demand Management Based Elements	Pass (to Sift 3)	Though feasible, consideration must be paid to the likely redistribution of trips and whether such a move would be desirable.
38	DM3.4	Ramp Metering/ Junction Access Controls Signals / Traffic Management which penalizes Short trips over Strategic trips	Demand Management Based Elements	Pass (to Sift 3)	Will provide benefits for strategic traffic and can be used to manage congestion. Will be considered at each junction and may be implemented as appropriate taking cognisance of its wider impacts.
39	DM3.5	Car free zones / Pedestrianised Streets	Demand Management Based Elements	Discontinued	Banning of vehicles may lead to redistribution onto other routes leading to a deterioration in traffic conditions. Furthermore, this will have little impact on the strategic corridor.
40	DM3.6	Incident Detection Systems	Demand Management Based Elements	Discontinued	The provision of an incident detection system is not likely to address congestion or to encourage a mode shift to alternative modes
41	DM3.7	Variable Message Signs	Demand Management Based Elements	Discontinued	The provision of a VMS system is not likely to address congestion or to encourage a mode shift to alternative modes
42	DM3.8	High Occupancy Lanes	Demand Management Based Elements	Discontinued	Case studies and high level feasibility studies suggest limited potential as a standalone measure. It would not be practicable within the study area.
43	DM3.9	New Freight Lanes	Demand Management Based Elements	Discontinued	From an economic perspective, it would be impractical to justify additional lanes for the sole purpose of freight
44	DM3.10	Freight Lane instead of a car lane	Demand Management Based Elements	Discontinued	This would fail to meet the Project Objectives of a modal shift from private car to public transport and would not be compliant with policy documents, particularly the Transport Strategy for the GDA
45	DM3.11	Freight included in Bus Facility	Demand Management Based Elements	Discontinued?	This would potentially have safety concerns with the inclusion of HGV's on the hard shoulder running bus facility
46	DM4.1	On-Street parking controls	Demand Management Based Elements	Discontinued	Removal of on-street parking may improve the movement of traffic through the area and encourage local trips to be made by alternative modes. However, this is outside the remit and influence of the project and should be developed via local council plans and policy.
47	DM4.2	Restrictive parking standards for new developments	Demand Management Based Elements	Discontinued	The effectiveness of this scheme is dependence on the prevalence of new development within Maynooth, Leixlip and Celbridge (cannot be applied to existing units). However, it would do little to mitigate existing demand. This is outside the remit and influence of the project and should be developed via local council plans and policy.
48	DM4.3	Workplace / private parking levies	Demand Management Based Elements	Discontinued	Private parking in Maynooth, Leixlip and Celbridge serves a mix of commercial and residential demands. This is outside the remit and influence of the project and should be developed via local council plans and policy.
49	DM5.1	Green Schools Programme	Demand Management Based Elements	Discontinued	Not applicable as this is a national measure as opposed to one that can be applied on a project specific basis.
50	DM5.2	Flexible Working (Post Covid Behaviours)	Demand Management Based Elements	Discontinued	Not applicable as this is a national measure as opposed to one that can be applied on a project specific basis. However, based on the current proposed plans and policy, this can be tested in the transport model. Covered in DM1.4.
51	DM5.3	Staggered School and Work Start times	Demand Management Based Elements	Discontinued	Viable measure for reducing peak hour trip demand. Potentially it is already in use but also most trips still likely to take place within the 8-9 AM modelled period. Not applicable as this is a national measure as opposed to one that can be applied on a project specific basis.
52	DM5.4	Work Place / Area wide Mobility Management Plans	Demand Management Based Elements	Discontinued	Aligned with policy and effective means to increase sustainable travel. This is outside the remit and influence of the project and should be developed via local council plans and policy. Will be addressed under DM1.4.
53	DM5.5	Residential Mobility Management Plans	Demand Management Based Elements	Discontinued	Though viable, the effectiveness is mitigated somewhat by the low quantity of sites to which these types of schemes may be applied. Furthermore, this is outside the remit and influence of the project and should be developed via local council plans and policy.
54	DM6.1	Journey Planner	Demand Management Based Elements	Discontinued	National rollout basis, rather than a project specific basis.
55	DM6.2	Real Time Passenger Information	Demand Management Based Elements	Discontinued	Real Time Passenger Information is included in the existing public transport network in the area (Dart and Bus network)
56	DM6.3	Marketing/information campaigns	Demand Management Based Elements	Discontinued	National rollout basis, rather than a project specific basis.
57	DM7.1	Interchange facilities	Demand Management Based Elements	Pass (to Sift 3)	Has the potential to improve attractiveness of public transport and overall public transport offering. A hub is already proposed at Liffey Valley as part of BusConnects.
58	DM7.2	Integrated ticketing and fares structures	Demand Management Based Elements	Pass (to Sift 3)	May be possibility to be implement as part of Dart + and BusConnects. Possible consideration of a combined toll and P&R bus and rail with integrated fair. This may be outside the remit of the project but further consideration and discussion relevant stakeholders will be undertaken.
59	DM7.3	Bicycle hire / sharing scheme	Demand Management Based Elements	Discontinued	Part of a broader solution, outside the remit of this Project. This should be progressed by Local Authority active travel team.
60	DM7.4	Car pooling	Demand Management Based Elements	Discontinued	This is outside the remit and influence of the project
61	DM7.5	Car sharing (e.g. Go Car)	Demand Management Based Elements	Discontinued	The high levels of existing car ownership, makes the uptake of car sharing unlikely. Additionally, trips will still be made by car. Furthermore, this is outside the remit and influence of the project.
62	DM8.1	Public realm and Urban Design	Demand Management Based Elements	Pass (to Sift 3)	Part of a broader solution. As such this is not a standalone Option, but improved public realm and placemaking would be considered in the emerging preferred design.
63	DM9.1	Test existing orbital routes for potential redistribution from M4/N4 corridor	Demand Management Based Elements	Pass (to Sift 3)	Test existing orbital routes for potential redistribution from M4/N4 corridor. The results will be documented.
64	RD1.1	Offline to the North	Road Based Elements	Discontinued	The existing M4/N4 serves the same function as this road based element to the north. This element would result in environmental impacts and significant capital cost, without significant benefits. For these reasons, this element is discontinued.
65	RD2.1	Offline to the South	Road Based Elements	Discontinued	The existing M4/N4 serves the same function as this road based element to the south. This element would result in environmental impacts and significant capital cost, without significant benefits. For these reasons, this element is discontinued.
66	RD3.1	Online Widening to 3 Lanes from J5 to J7/or J6* (Both Directions). Incorporating a full hard shoulder width.	Road Based Elements	Conditional Pass	This partially aligns with the Project Objectives. To align with the Project Objectives and in accordance with GDA Transport Strategy: (1) as far as practicable, continuous priority for bus movement on the portions of the Core Bus Network within the Metropolitan Area. (2) and enabling the bus to provide a faster alternative to car traffic along these routes. Therefore, this element must be combined with an element(s) to support a modal shift and the Core Bus Network.
67	RD3.2	Online Widening to 3 Lanes from J5 to J7/or J6* (Both Directions). Incorporating a hard strip with Emergency Refuge Areas (ERA's).	Road Based Elements	Discontinued	Discontinued due to safety (not in current standards) and due to the relative availability of space for standard hard shoulder (i.e not built up area). Other elements provide greater benefits or alignment with the Project Objectives.
68	RD4.1	Online Upgrade to 3 Lanes from Junction 5 to Junction 7 (Westbound Only). Incorporating a full hard shoulder width.	Road Based Elements	Conditional Pass	This partially aligns with the Project Objectives. To align with the Project Objectives and in accordance with GDA Transport Strategy: (1) as far as practicable, continuous priority for bus movement on the portions of the Core Bus Network within the Metropolitan Area. (2) and enabling the bus to provide a faster alternative to car traffic along these routes. Therefore, this element must be combined with an element(s) to support a modal shift and the Core Bus Network.
69	RD4.2	Online Widening to 3 Lanes from J5 to J7/or J6* (Westbound only). Incorporating a hard strip with Emergency Refuge Areas (ERA's).	Road Based Elements	Discontinued	Discontinued due to safety (not in current standards) and due to the relative availability of space for standard hard shoulder (i.e not built up area). Other elements provide greater benefits or alignment with the Project Objectives.
70	RD4.3	Online Widening to 3 Lanes from J5 to J7 /or J6* (Eastbound only) Incorporating a full hard shoulder width.	Road Based Elements	Discontinued	Widening in the eastbound direction only would induce an unbalanced demand and create congestion. It would bring traffic towards a key trip attractor (the Greater Dublin Area) and toward existing congestion, without an equal facility to take traffic away from the Greater Dublin Area and ease congestion. Therefore, this element is discontinued.
71	RD4.4	Online Widening to 3 Lanes from J5 to J7 /or J6* (Eastbound only). Incorporating a hard strip with Emergency Refuge Areas (ERA's).	Road Based Elements	Discontinued	Discontinued due to safety (not in current standards) and due to the relative availability of space for standard hard shoulder (i.e not built up area). Other elements provide greater benefits or alignment with the Project Objectives.
72	RD5.1	Parallel Roads (including parallel existing roads**) from J5 to J7/or J6*	Road Based Elements	Conditional Pass	This partially aligns with the Project Objectives. To align with the Project Objectives, this element must be combined with an element(s) to support a modal shift and the Core Bus Network.
73	RD6.1	Auxiliary Lanes from J5 to J7/or J6*	Road Based Elements	Discontinued	Auxiliary Lanes from J5 to J7/or J6 would effectively constitute additional lanes (widening), which is covered under and taken forward under RD3.1.
74	RD 7.1	Smart motorway - 2 existing lanes in both directions with use of the hard shoulder as an additional lane for vehicular traffic (or BPM) as Dynamic or ALR system	Road Based Elements	Discontinued	No standard currently exists for SMART motorways which are typically used in land constrained urban areas when there are few other Options available. Not taken forward on safety grounds.
75	RD 8.1	Re classification of road to National Primary route to include segregated active travel	Road Based Elements	Discontinued	Reclassification of the motorway to dual carriageway would have very few advantages. This would only be considered in the context of buses. This corridor already contains a strategic east west active travel route along the Grand Canal. Furthermore, at the eastern end of the study area, towns can link into the N4 cycle tracks.
76	RD 9.1	Upgrade of regional roads with traffic coming off at/by J5	Road Based Elements	Discontinued	This would not take significant traffic (to be impactful) from Celbridge/Leixlip off the M4 as the regional road is a good standard and would not justify a major upgrade. Additionally, it would result in routing Maynooth bound traffic through Leixlip.
77	RD 9.2	Upgrade of regional roads with traffic coming off at/by J6	Road Based Elements	Discontinued	This would not take significant traffic (to be impactful) from Celbridge/Leixlip off the M4 as the regional road is a good standard and would not justify a major upgrade. Additionally, it would result in routing Maynooth bound traffic onto the R148 through Leixlip, as some would be removed at J6 rather than J7.
78	JB1.1	Millfarm - Upgrade Overbridge	Junction/Bridge Based Elements	Discontinued	The I-5041 Local Road would require a significant upgrade. Additionally, it is not included in the BusConnects network or GDA National Cycle Network.
79	JB1.2	Millfarm - Provide Junction	Junction/Bridge Based Elements	Discontinued	This would be considered under JB3.2 to 3.4 as part of multiple Options.

Stage 1 Sift 1 (Elements)

Number	Element Number	Elements (to eventually form an Option) Description	Category	Sift 1	Comments
80	JB2.1	Newtown - Upgrade Overbridge	Junction/Bridge Based Elements	Discontinued	No requirement for significant upgrade as it is not on the BusConnects network, or GDA National Cycle Network and not severing major trip attractors such as a Business Campus.
81	JB2.2	Newtown - Provide Junction	Junction/Bridge Based Elements	Discontinued	This would be considered under JB3.2 to 3.4 as part of multiple Options.
82	JB3.1	J7 - Upgrade Junction	Junction/Bridge Based Elements	Conditional Pass	Given its existing condition, demand and strategic importance, junction improvements should be considered. However, standalone junction improvements would not achieve the Project Objectives.
83	JB3.2	J7 - Upgrade Existing Junction & Provide 2nd Junction	Junction/Bridge Based Elements	Conditional Pass	This element on its own does not form a standalone Option that can sufficiently address the Project Objectives. The condition on this element is that it will be considered in combination with other elements(s) to form an Option.
84	JB3.3	J7 - Provide 2 New Junctions & Convert Existing to Overbridge	Junction/Bridge Based Elements	Conditional Pass	This element on its own does not form a standalone Option that can sufficiently address the Project Objectives. The condition on this element is that it will be considered in combination with other elements(s) to form an Option.
85	JB3.4	J7 - Provide 1 New Junction & Convert Existing to Overbridge	Junction/Bridge Based Elements	Conditional Pass	This element on its own does not form a standalone Option that can sufficiently address the Project Objectives. The condition on this element is that it will be considered in combination with other elements(s) to form an Option.
86	JB4.1	R405 Ballygoran - Upgrade Overbridge	Junction/Bridge Based Elements	Conditional Pass	This overbridge is on the BusConnects network and is a potential key Active Travel connection (refer to AT 1.2).
87	JB4.2	R405 Ballygoran - Provide Junction	Junction/Bridge Based Elements	Discontinued	This would be considered under JB3.2 to 3.4 as part of multiple Options.
88	JB5.1	J6 - Upgrade Junction	Junction/Bridge Based Elements	Conditional Pass	Potentially this would have some benefits to the project and is worth investigating further. This element on its own does not form a standalone Option that can sufficiently address the Project Objectives. The condition on this element is that it will be considered in combination with other elements(s) to form an Option.
89	JB5.2	J6 - Upgrade Existing Junction & Provide 2nd Junction	Junction/Bridge Based Elements	Discontinued	The existing junction does not experience notable issues. Improvements to the existing junction (JB5.1) may be required in the future but a 2nd junction is not required in these environs.
90	JB5.3	J6 - Provide 2 New Junctions & Convert Existing to Overbridge	Junction/Bridge Based Elements	Discontinued	The existing junction does not experience notable issues. Improvements to the existing junction (JB5.1) may be required in the future but 2 new junctions are not required in these environs.
91	JB5.4	J6 - Provide 1 New Junction & Convert Existing to Overbridge	Junction/Bridge Based Elements	Discontinued	The existing junction does not experience notable issues. Improvements to the existing junction (JB5.1) may be required in the future but a new replacement junction is not required in these environs.
92	JB6.1	R404 - Upgrade Overbridge	Junction/Bridge Based Elements	Conditional Pass	This would provide an Active Travel connection and therefore would be beneficial to consider.
93	JB6.2	R404 - Provide Junction	Junction/Bridge Based Elements	Discontinued	There is insufficient space and a new junction would be too close to J6 and J5. Consideration of similar Options taken forward under JB7.2 to 7.4.
94	JB7.1	J5 - Upgrade Overbridge	Junction/Bridge Based Elements	Conditional Pass	Potentially this would have some benefits to the project and worth investigating further. This element on its own does not form a stand alone Option that can sufficiently address the Project Objectives. The condition on this element is that it will be considered in combination with other elements(s) to form an Option.
95	JB7.2	J5 - Upgrade Existing Junction & Provide 2nd Junction	Junction/Bridge Based Elements	Discontinued	There is insufficient space to retain and improve the existing junction and provide a new 2nd junction
96	JB7.3	J5 - Provide 2 New Junctions & Convert Existing to Overbridge	Junction/Bridge Based Elements	Discontinued	There is insufficient space to provide 2 new junctions
97	JB7.4	J5 - Provide 1 New Junction & Convert Existing to Overbridge	Junction/Bridge Based Elements	Conditional Pass	The minimum weaving distance is not provided between J5 and J4a. Converting the existing junction to an overbridge may provide active travel benefits. A new junction, potentially further west would improve the weaving issues.

GDA Transport Strategy Quote "In order to ensure an efficient, reliable and effective bus system, it is intended, as part of the Strategy, to develop the Core Bus network to achieve, as far as practicable, continuous priority for bus movement on the portions of the Core Bus Network within the Metropolitan Area. This will mean enhanced Bus facility provision on these corridors, removing current delays on the bus network in the relevant locations and enabling the bus to provide a faster alternative to car traffic along these routes, making bus transport a more attractive alternative for road users. It will also make the overall bus system more efficient, as faster bus journeys means that more people can be moved with the same level of vehicle and driver resources.

Demand Management Toolkit



Column	Title	Description
C	Type of Measure	This relates to the Demand Management Toolkit (see image) and different types of DM measure. Avoid - Shift - Improve - Manage
D	Potential Application	Provides a description of the measure and how it can be applied
E	Engineering Feasibility	High = Very Feasible. Low = Not Feasible / Difficult to implement
F	Affordability	High = Very Affordable. Low = Not Affordable
G	Public Acceptability	High = Very Acceptable. Low = Not Acceptable
H	Aligned with Project Objectives	Does the measure and expected impact align with the project objectives and Vision
I	Can it be Modelled?	Is it possible to model the measure with existing tools
J	Model Methodology	How the measure can be modelled / Assessed using existing modelling tools
K	Brought Forward	Should the measure be brought forward for further assessment
L	General Comment	Provides a description on likely effectiveness of the measure and other considerations

No.	Measure	Type of Measure	Potential Application	Brought Forward	Reason Brought Forward	Brought Forward for Modelling	Model Methodology	General Comment	
		(A-S-I-M)							
Land Use Measures									
DM1.1	Test transit oriented development	A & S	consideration on preferred option	LAPs for Maynooth, Leixlip and Celbridge. Designed to correlate future developments with existing PT routes and services.	Yes	Aligned with National Policy. Increased density around transit stops has potential to significantly increase patronage. Though effective in the mitigation of additional car trips from future developments, mixed use developments would not effect strategic trips, nor would it alter existing local traffic patterns without substantial alterations. This is outside the remit and influence of the project and addressed via Local Area Plans and County Development Plans.	Yes/No	N/A	Significant PT already in the study area, however modal shift has not materialised. Existing PT will be further enhanced (speed, frequency and reliability) through the Dart + West and BusConnects projects.
DM1.2	Test the mix of land uses in close proximity to each other	A	consideration on preferred option	A long term strategic development plan, introduced in Maynooth, Leixlip and Celbridge, designed to minimize the distance between residential, commercial and employment zones. This would act to reduce the overall use of non active modes.	Yes	Aligned with National Policy. Providing mixed use developments may reduce trip lengths, favouring active modes. Though effective in the mitigation of additional car trips from future developments, mixed use development would not effect strategic trips, nor would it alter existing local traffic patterns without substantial alterations.	Yes/No	N/A	Though effective in the mitigation of additional car trips from future developments, mixed use development would not effect strategic trips, nor would it alter existing local traffic patterns without substantial alterations
DM1.3	Test for Permeability	S		Improved accessibility for pedestrians and cyclists throughout Maynooth, Leixlip and Celbridge	No	This measure may have a marginal impact on the level of local trip making by car. Measuring likely impacts may be difficult. This overlaps with Active Travel. Overall, it would not have a significant impact on the strategic corridor.	No	N/A	This measure may have a marginal impact on the level of local trip making by car. Measuring likely impacts may be difficult. This overlaps with Active Travel. Overall, it would not have a significant impact.
DM1.4	Alternative Demand Sensitivity Analysis	A	test on preferred option only	Strategy and list of measures developed to encourage people to work locally (eg. in remote working Hubs, etc) or work from Home	Yes	As a result of Pandemic increased Working From Home (WFH) is taking place and is likely to continue into the future. This is outside the remit and influence of the project and should be developed via local council plans and policy. However, based on the current proposed plans and policy, this can be tested in the transport model.	Yes/No	An "Alternative Demand" scenario, accounting for increased working from home, has been developed by the NTA. This will be adopted as the core demand scenario for Option testing.	Impact on travel demand will be determined using NTA/TII guidance
Fiscal Measures									
DM2.1	Road Tolling / Pricing	M	Take into Stage 2 MCA - 1 Tolling 2 Pricing 3. congestion	The introduction of tolls on the more congested section(s) of the M4 could significantly reduce trips on these sections in addition to providing a revenue source	Yes	Current Policy and proven effective measure in changing trip making patterns. This could include amendment to the tolling strategy of the existing toll. It would be impractical and not value for money to move the existing toll such as short distance. Alternatively, a second toll would be in close proximity to the current toll and could result in greater impacts on strategic traffic in comparisons to local traffic.	Yes/No	Road toll can be applied on a link by link basis	The introduction of tolls along the M4 may result in increased traffic on less suitable, regional roads which cannot cater for the traffic safety. Should we combine a toll with an adjacent P&R bus and rail at the Dart West + at Maynooth
DM2.2	Congestion Charging	M		The introduction of congestion charges within Maynooth, Leixlip and Celbridge could significantly reduce local trips in addition to providing a revenue source	No	Within the project study area, it would be practicality of enforcing a congestion charge would be difficult and would be contrary to the project objectives which aim to improve connectivity and integration within the study area.	No	N/A	The practicality of enforcing a congestion charge would be difficult and would be contrary to the project objectives which aim to improve connectivity and integration within the study region. It would also likely result in significant public resistance.
DM2.3	Fuel Duty			N/A as national measure as opposed to one that can be applied on a project specific basis	No	Not applicable as this is a national measure as opposed to one that can be applied on a project specific basis	No	N/A	N/A as national measure as opposed to one that can be applied on a project specific basis
DM2.4	Public Transport Fare Subsidy	S		A subsidy to be introduced on routes passing through and into Maynooth, Leixlip and Celbridge. This would act to increase uptake of public transport Options and thus relieve the road network.	No	Not applicable as this is a national/regional measure as opposed to one that can be applied on a project specific basis	No	N/A	The practicalities of implementing such a scheme would be difficult
DM2.5	Increased Parking Charges / Levies	M		Increase parking charges in Maynooth, Leixlip and Celbridge centre in an effort to limit trips into the towns by car. This could be applied to promote alternative modes for shorter, internal trips in Maynooth, Leixlip and Celbridge.	No	This is outside the remit and influence of the project and should be developed via local council plans and policy.	No	N/A	Modelling may need to be target based as behaviour modelling suggests people will park in adjacent zones (with no charge).
DM2.6	Tax Saver Scheme			-	No	Not applicable as this is a national measure as opposed to one that can be applied on a project specific basis.	No	N/A	N/A as national measure as opposed to one that can be applied on a project specific basis. And also is in place and would be accounted for in existing mode choices
Traffic Demand Management									
DM3.1	HGV Bans	M		This would involve the full or partial banning of HGV's	No	A primary purpose of the National Road Network is to carry strategic traffic, such as HGVs, therefore this does not align with the purpose of the national road network. Furthermore, without the availability of alternative routes, HGV bans are likely to result in non-desirable trip reallocation, which may incur a higher indirect financial & safety toll.	No	N/A	Without the availability of alternative routes, HGV bans are likely to result in non-desirable trip reallocation, which may incur a higher indirect financial & Safety toll. It would also likely result in significant resistance from those involved in the HGV haulage sector.
DM3.2	Reduced Speed Limits	M	consideration on preferred option	The reduction of speed limits along the M4/N4	Yes	Though feasible, consideration must be paid to the likely redistribution of trips and whether such a move would be desirable.	Yes/No	Speed limit restrictions can be readily applied within existing methodology's	Though feasible, consideration must be paid to the likely redistribution of trips and whether such a move would be desirable. In addition, would likely result in increased congestion on the M4/N4.
DM3.3	Variable Speed Limits	M	consideration on preferred option	Variable speed Limits can be applied to enact restrictions at peak times, primarily in the AM and PM peak hours	Yes	Though feasible, consideration must be paid to the likely redistribution of trips and whether such a move would be desirable.	Yes/No	Speed limit restrictions can be readily applied within existing methodology's, with speed limits able to be altered between the existing AM, IP and PM periods.	Though feasible, consideration must be paid to the likely redistribution of trips and whether such a move would be desirable. In addition, would likely result in increased congestion on the M4/N4.
DM3.4	Ramp Metering/ Junction Access Controls Signals / Traffic Management which penalizes Short trips over Strategic trips	M	Take into Stage 2 MCA -	Alterations and introduction of signals aimed at penalising more local trips and improving journey times for strategic movements	Yes	Will provide benefits for strategic traffic and can be used to manage congestion. Will be considered at each junction and may be implemented as appropriate taking cognisance of its wider impacts.	Yes	Addition of signals at on-ramps. Alterations to infrastructure can be coded into the ERM/LAM. Assumptions on mode shift and trip reduction would have to be made and applied to matrices	The introduction of priority signals would potentially act to improve flow along the M4/N4. However in order to be effective, all junctions within the study area would require consideration, in order to avoid the use of the regional/local road network between strategic junctions. Significant infrastructure/technology required, and the benefits may be limited given the associated costs.
DM3.5	Car free zones / Pedestrianised Streets	S		The banning of all vehicles on certain streets within Maynooth, Leixlip and Celbridge	No	Banning of vehicles may lead to redistribution onto other routes leading to a deterioration in traffic conditions. Furthermore, this will have little impact on the strategic corridor.	No	N/A	Banning of vehicles may lead to redistribution onto other routes leading to a deterioration in traffic conditions
DM3.6	Incident Detection Systems	M		IDS's can be introduced at key locations on the M4 and in Maynooth, Leixlip and Celbridge	No	The provision of an incident detection system is not likely to address congestion or to encourage a mode shift to alternative modes	No	N/A	The provision of an incident detection system is not likely to address congestion or to encourage a mode shift to alternative modes
DM3.7	Variable Message Signs	M		Signage informing road users of traffic conditions, positioned on the M4	No	The provision of a VMS system is not likely to address congestion or to encourage a mode shift to alternative modes	No	N/A	The provision of an incident detection system is not likely to address congestion or to encourage a mode shift to alternative modes
DM3.8	High Occupancy Lanes	M		A particular lane would only be available to vehicles which have a minimum number of occupants. ITS would be required to monitor compliance and enable enforcement.	No	Case studies and high level feasibility studies suggest limited potential as a standalone measure. It would not be practicable within the study area.	No	N/A	Case studies and high level feasibility studies suggest limited potential as a standalone measure. It would not be practicable within the study area.
DM3.9	New Freight Lanes	M		Additional lanes would be provided for the sole purpose of freight	No	From an economic perspective, it would be impractical to justify additional lanes for the sole purpose of freight	No	N/A	This would provide benefits to HGV's but may lead to a net increase in congestion at current levels of HGV activity as the freight lanes would operate significantly below capacity to the detriment of other users on the road network. Additionally, from an economic perspective, it would be difficult to justify additional lanes for the sole purpose of freight.
DM3.10	Freight Lane instead of a car lane	M		A traffic lane would be converted to a freight lane, for the sole purpose of freight	No	This would fail to meet the Project Objectives of a modal shift from private car to public transport and would not be compliant with policy documents, particularly the Transport Strategy for the GDA	No	N/A	This would provide benefits to HGV's but may lead to a net increase in congestion at current levels of HGV activity as the freight lanes would operate significantly below capacity to the detriment of other users on the road network. Additionally, it would fail to meet the Project Objectives of a modal shift from private car to public transport and would not be compliant with policy documents, particularly the Transport Strategy for the GDA.
DM3.11	Freight included in Bus Facility	M		Freight would utilise the hard shoulder running bus facility	No	This would potentially have safety concerns with the inclusion of HGV's on the hard shoulder running bus facility	No	N/A	This would potentially have safety issues with the inclusion of HGV's on the hard shoulder running bus facility
Parking Management									
DM4.1	On-Street parking controls	S & M		Restriction on parking along certain roads in Maynooth, Leixlip and Celbridge	No	Removal of on-street parking may improve the movement of traffic through the area and encourage local trips to be made by alternative modes. However, this is outside the remit and influence of the project and should be developed via local council plans and policy.	No	N/A	Removal of on-street parking, could help improve the movement of traffic through the area and encourage local trips to be made by alternative modes. Removal would likely face significant local opposition.
DM4.2	Restrictive parking standards for new developments	A		Parking obligations within new developments within Maynooth, Leixlip and Celbridge can be restricted in order to minimize the introduction of further demand for travel by car	No	The effectiveness of this scheme is dependence on the prevalence of new development within Maynooth, Leixlip and Celbridge (cannot be applied to existing units). However, it would do little to mitigate existing demand. This is outside the remit and influence of the project and should be developed via local council plans and policy.	No	N/A	The effectiveness of this scheme is dependence on the prevalence of new development within Maynooth, Leixlip and Celbridge (cannot be applied to existing units). However, it would do little to mitigate existing demand.
DM4.3	Workplace / private parking levies	S		Parking levies to be introduced across the study area or in specific locations	No	Private parking in Maynooth, Leixlip and Celbridge serves a mix of commercial and residential demands. This is outside the remit and influence of the project and should be developed via local council plans and policy.	No	N/A	Likely to encounter significant opposition. Private parking in Maynooth, Leixlip and Celbridge serves a mix of commercial and residential demands.
Behavioural Change Programs									
DMS.1	Green Schools Programme			N/A as already in place nationally	N/A	Not applicable as this is a national measure as opposed to one that can be applied on a project specific basis.	N/A	N/A	N/A

DMS.2	Flexible Working (Post Covid Behaviours)	A		The encouragement of flexible working pattern within Maynooth, Leixlip and Celbridge and the surrounding areas to avoid peak hour trips	No	Not applicable as this is a national measure as opposed to one that can be applied on a project specific basis. However, based on the current proposed plans and policy, this can be tested in the transport model. Covered in DM1.4.	No	N/A	Need to determine which trips to target in the model and by how much. Review NTA / TII latest guidance.
DMS.3	Staggered School and Work Start times	M		The encouragement of staggered patterns within Maynooth, Leixlip and Celbridge and the surrounding area. To spread out the peak period.	No	Viable measure for reducing peak hour trip demand. Potentially it is already in use but also most trips still likely to take place within the 8-9 AM modelled period. Not applicable as this is a national measure as opposed to one that can be applied on a project specific basis.	No	N/A	Viable. Potentially it is already in use. Also most trips still likely to take place within the 8-9 AM modelled period.
DMS.4	Work Place / Area wide Mobility Management Plans	M		Work Place MMP is an on-going strategy that facilitates, promotes, and encourages sustainable, active, and healthy modes of travel and helps reduce single-occupancy car use for journeys to and from a workplace. Area based MMPs cover a particular set of sites in an area that can be linked in order to increase the effectiveness of individual Mobility Management Plans	No	Aligned with policy and effective means to increase sustainable travel. This is outside the remit and influence of the project and should be developed via local council plans and policy. Will be addressed under DM1.4.	No	N/A	Impact on travel demand will be determined using NTA/TII guidance
DMS.5	Residential Mobility Management Plans	A		An on-going strategy that facilitates, promotes, and encourages sustainable, active, and healthy modes of travel and helps reduce single-occupancy car use for journeys to and from large residential sites	No	Though viable, the effectiveness is mitigated somewhat by the low quantity of sites to which these types of schemes may be applied. Furthermore, this is outside the remit and influence of the project and should be developed via local council plans and policy.	No	No	Though viable, the effectiveness is mitigated somewhat by the low quantity of sites to which these types of schemes might be applied
Information Awareness									
DM6.1	Journey Planner	S		Provides service information, directions, and time estimates for taking a journey on all licenced public transport providers across Ireland	No	National rollout basis, rather than a project specific basis.	No	N/A	National rollout basis, rather than a project specific basis.
DM6.2	Real Time Passenger Information	S		The provision of real time tracking on public transport modes servicing the area	No	Real Time Passenger Information is included in the existing public transport network in the area (Dart and Bus network)	No	N/A	RTPI included in existing PT network in the area (Dart and Bus network)
DM6.3	Marketing/information campaigns	S		Marketing Strategy to increase awareness and use of Public Transport and active travel modes	No	National rollout basis, rather than a project specific basis.	No	N/A	National rollout basis, rather than a project specific basis.
End to End Facilities and Integration Measures									
DM7.1	Interchange facilities	S	TBD	Introduction of Mobility Hub for all PT services in Maynooth, Leixlip and Celbridge	Yes	Has the potential to improve attractiveness of public transport and overall public transport offering. A hub is already proposed at Liffey Valley as part of BusConnects.	Yes	Agree what trips might be affected and by how much	Could improve attractiveness of PT and overall public transport offering. Hub proposed at Liffey Valley as part of BusConnects. A Hub in all three towns may be difficult to justify.
DM7.2	Integrated ticketing and fares structures	S	in existing model so no longer an option	Integration of public transport Options in vicinity of Maynooth, Leixlip and Celbridge	Yes	May be possibility to be implement as part of Dart + and BusConnects. Possible consideration of a combined toll and P&R bus and rail with integrated fair. This may be outside the remit of the project but further consideration and discussion relevant stakeholders will be undertaken.	No	N/A	May be implemented as part of Dart + and BusConnects
DM7.3	Bicycle hire / sharing scheme	S		Introduction of a shared cycle scheme similar to Dublin Bikes	No	Part of a broader solution, outside the remit of this Project. This should be progressed by Local Authority active travel team.	No	N/A	To be reviewed as part of Active Travel. Population densities and scale of towns may make it difficult to justify
DM7.4	Car pooling	I		Car pooling scheme could be encouraged within Maynooth, Leixlip and Celbridge. Works best when used in conjunction with toll or parking charges.	No	This is outside the remit and influence of the project	No	N/A	May be viable in sites such as Maynooth University, possibly Intel and others
DM7.5	Car sharing (e.g. Go Car)	I		Car sharing scheme could be implemented and encouraged within Maynooth, Leixlip and Celbridge. The aim would be to discourage car ownership and encourage people to use cars only for those trips that require a car.	No	The high levels of existing car ownership, makes the uptake of car sharing unlikely. Additionally, trips will still be made by car. Furthermore, this is outside the remit and influence of the project.	No	N/A	The high levels of existing car ownership, makes the uptake of car sharing unlikely. Additionally, trips will still be made by car.
Built Environment Measures									
DM8.1	Public realm and Urban Design	S	test take into Stage 2 MCA	Improved Public Realm within the town centres of Maynooth, Leixlip and Celbridge may encourage people to make trip by active modes as opposed to car	Yes	Part of a broader solution. As such this is not a standalone Option, but improved public realm and placemaking would be considered in the emerging preferred design.	No	N/A	This could be reviewed in tandem with parking rationalisation
Other									
DM9.1	Test existing orbital routes for potential redistribution from M4/N4 corridor	test existing orbital routes for	ruled out	Test existing orbital routes for potential redistribution from M4/N4 corridor	Yes	Test existing orbital routes for potential redistribution from M4/N4 corridor. The results will be documented.	Yes	Test existing orbital routes for potential redistribution from M4/N4 corridor	This could be reviewed in tandem with parking rationalisation



MAYNOOTH TO LEIXLIP PROJECT

Appendix 3.2

Stage 1 Sift 2 - Options



MAYNOOTH TO LEIXLIP PROJECT

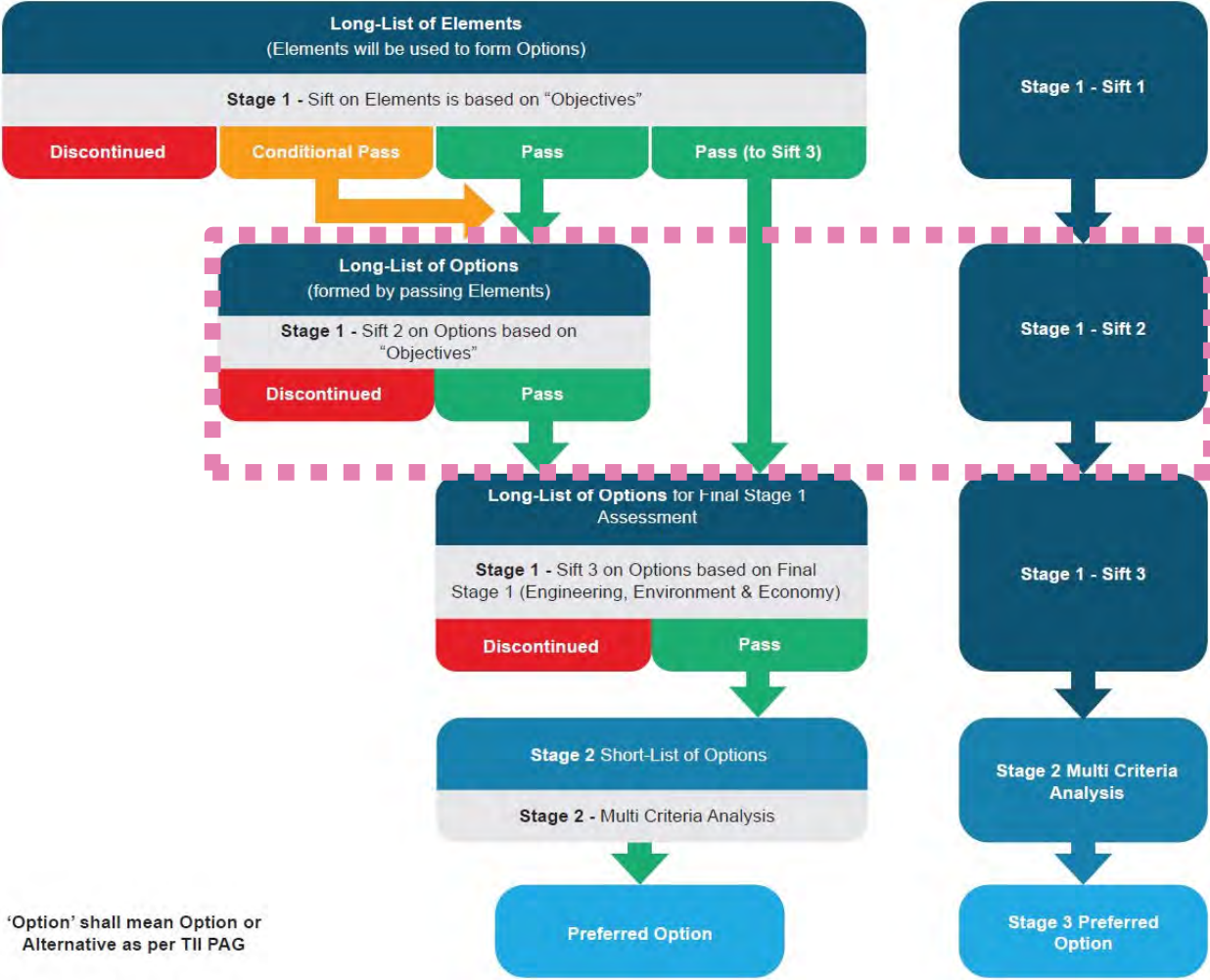


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Project Ireland
2040



Stage 1 – Sift 2 on Options

Stage 1 – Sift 2 on Options

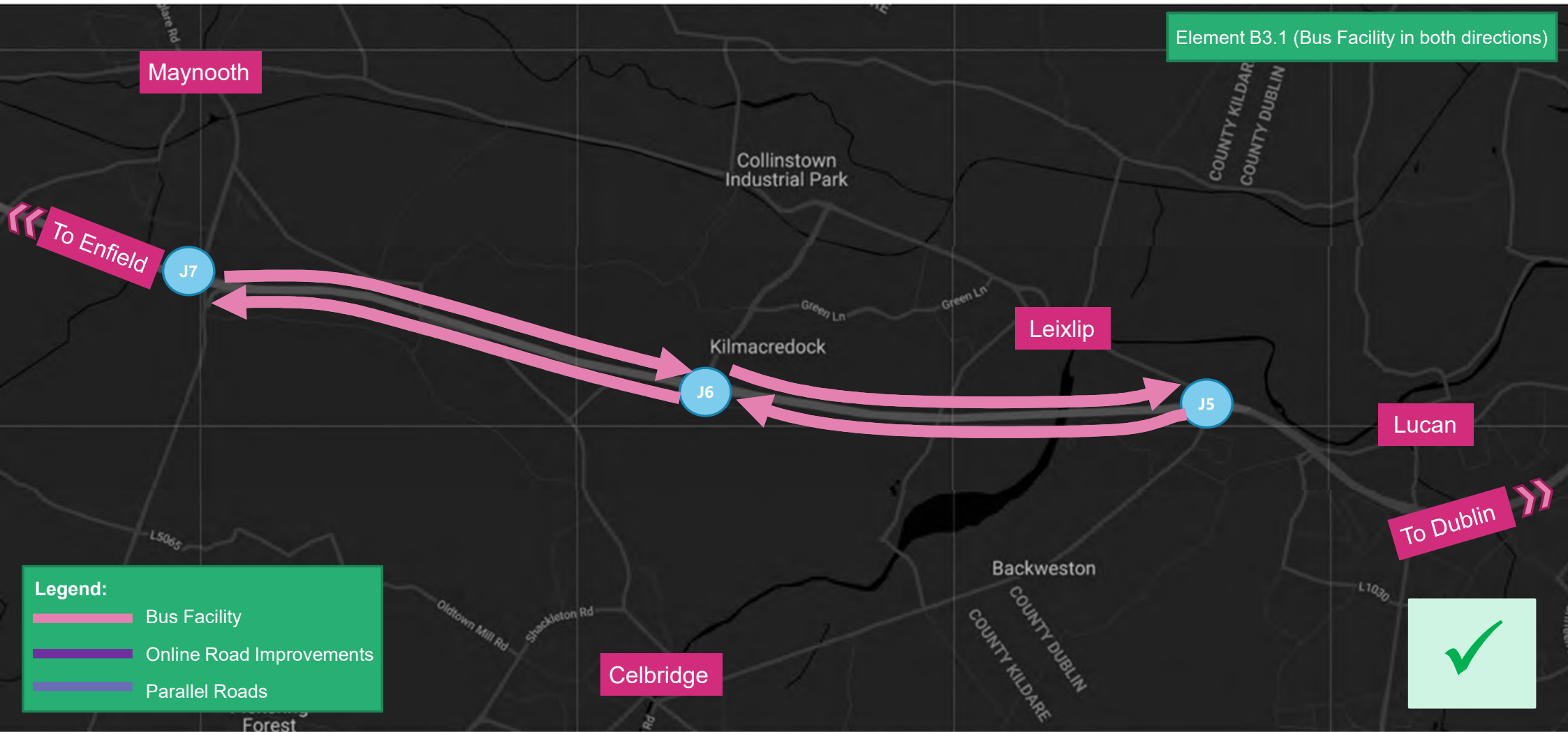


'Option' shall mean Option or Alternative as per TII PAG

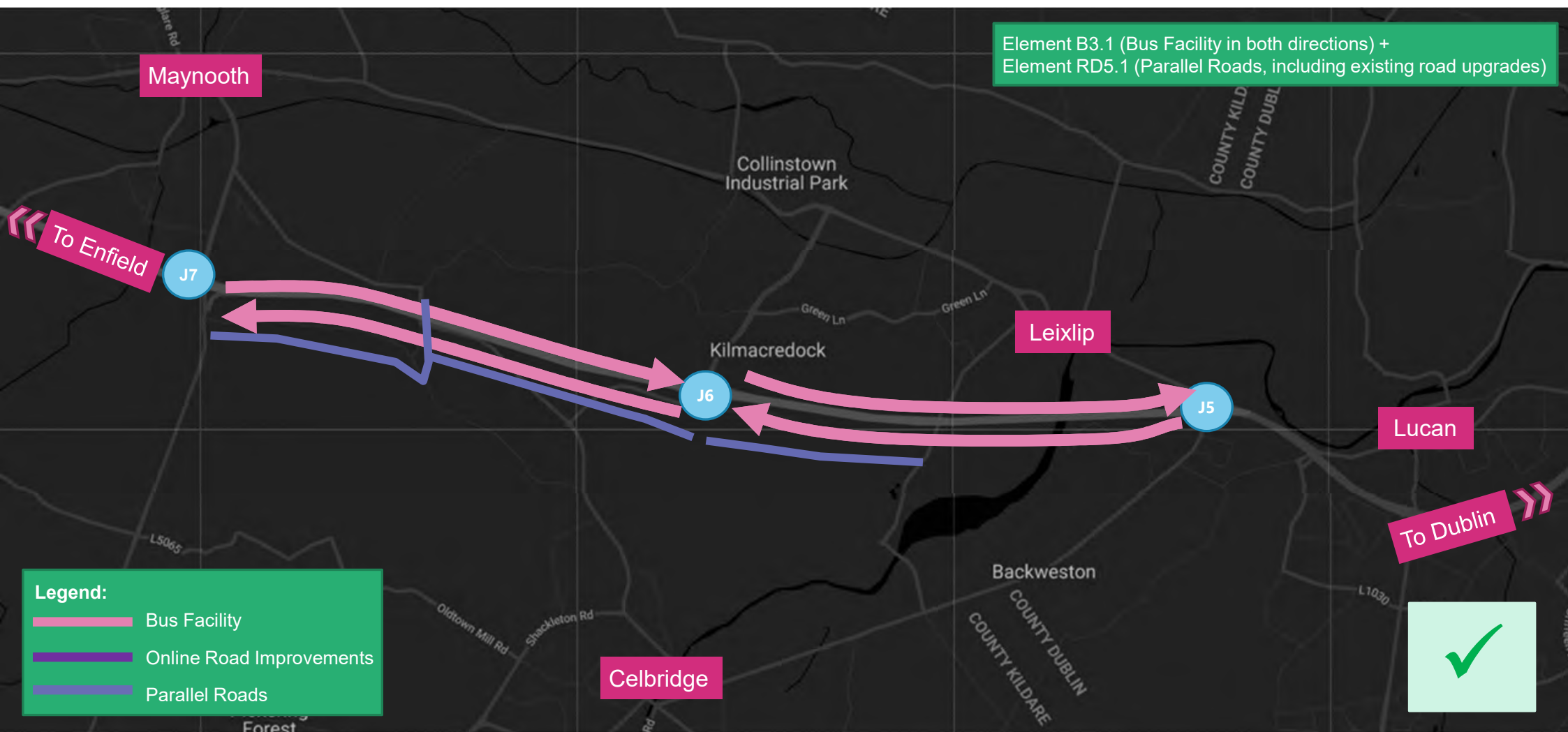


Corridor Options

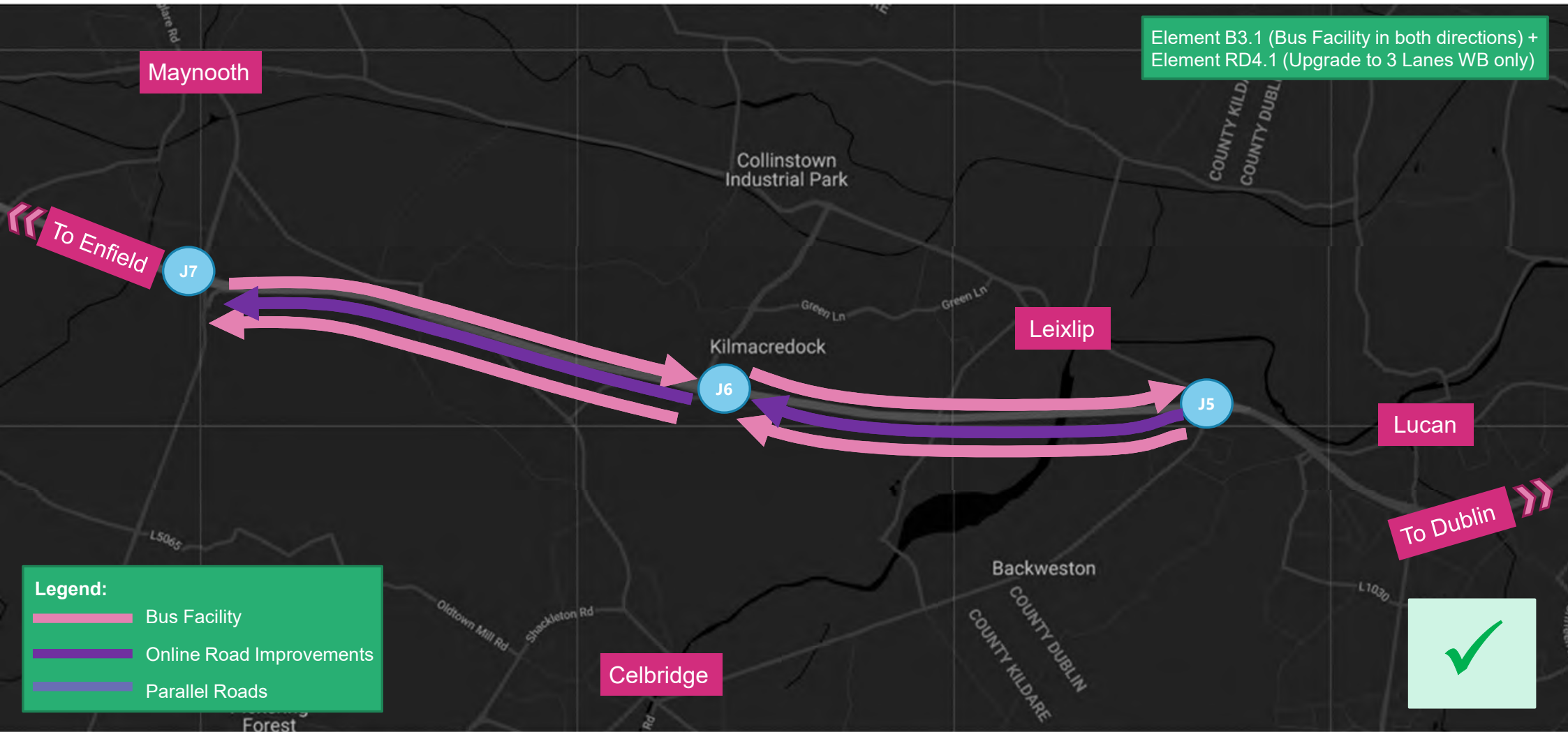
Corridor Option 1A



Corridor Option 1B



Corridor Option 2A

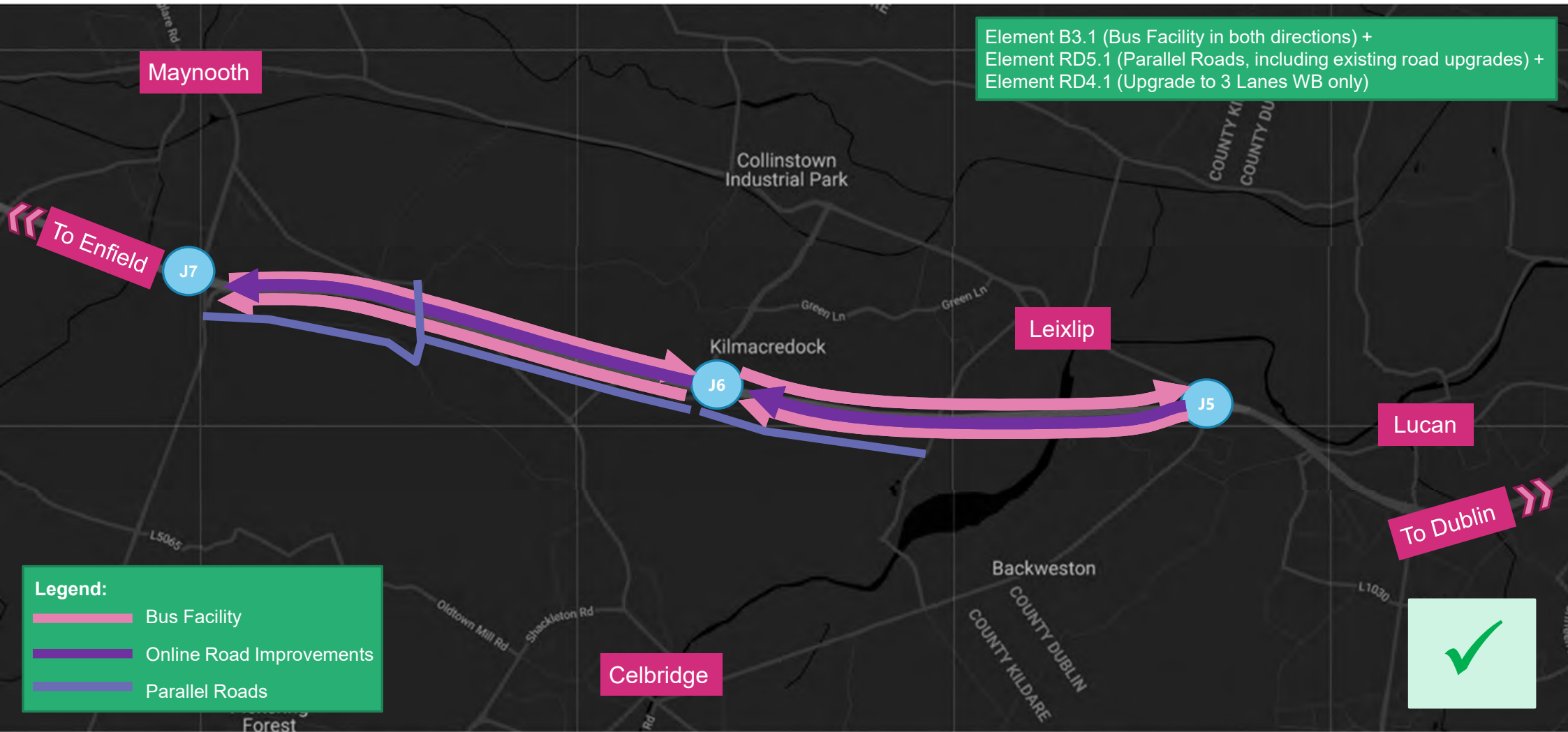


Legend:

- Bus Facility
- Online Road Improvements
- Parallel Roads

Element B3.1 (Bus Facility in both directions) +
Element RD4.1 (Upgrade to 3 Lanes WB only)

Corridor Option 2B



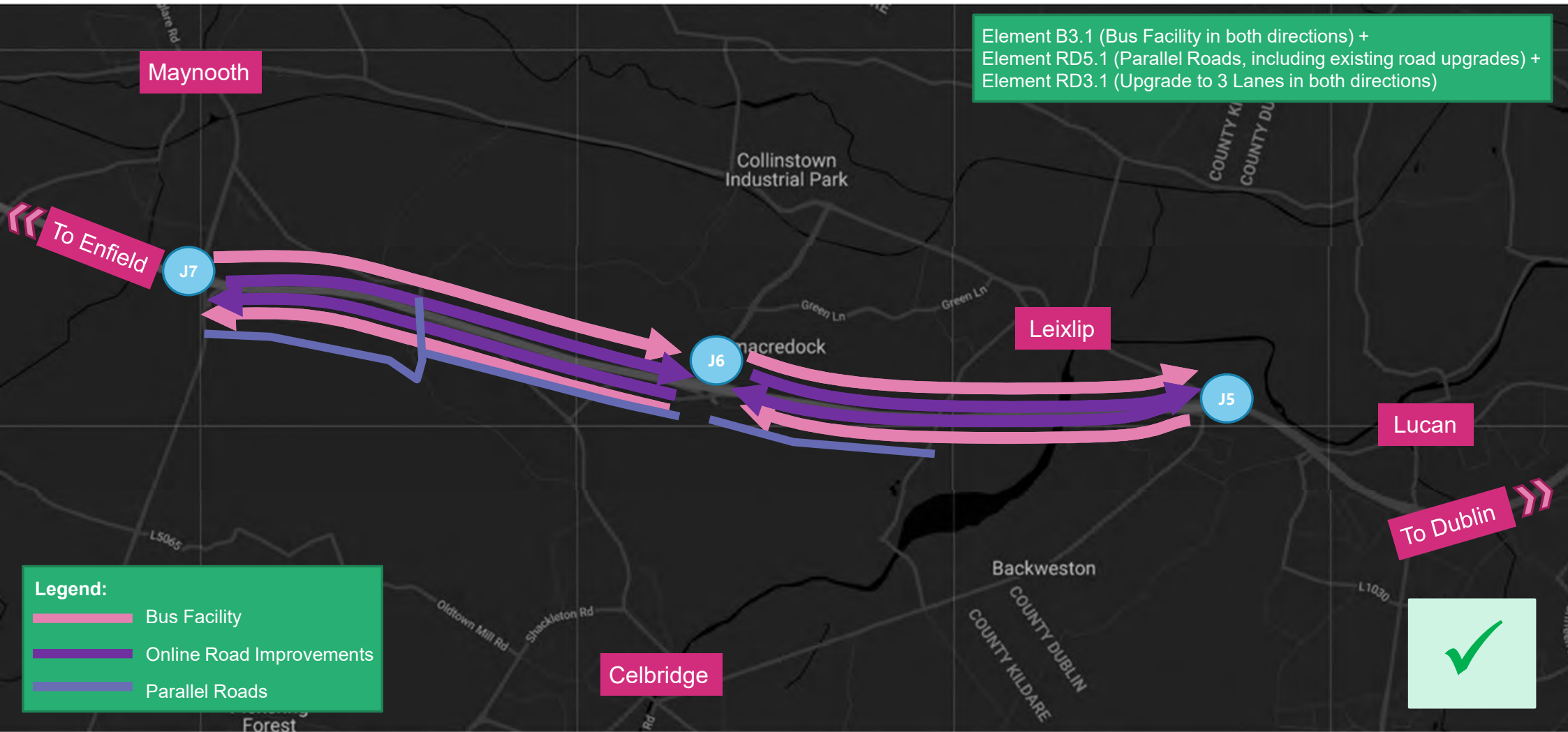
Element B3.1 (Bus Facility in both directions) +
Element RD5.1 (Parallel Roads, including existing road upgrades) +
Element RD4.1 (Upgrade to 3 Lanes WB only)

Legend:
— Bus Facility
— Online Road Improvements
— Parallel Roads

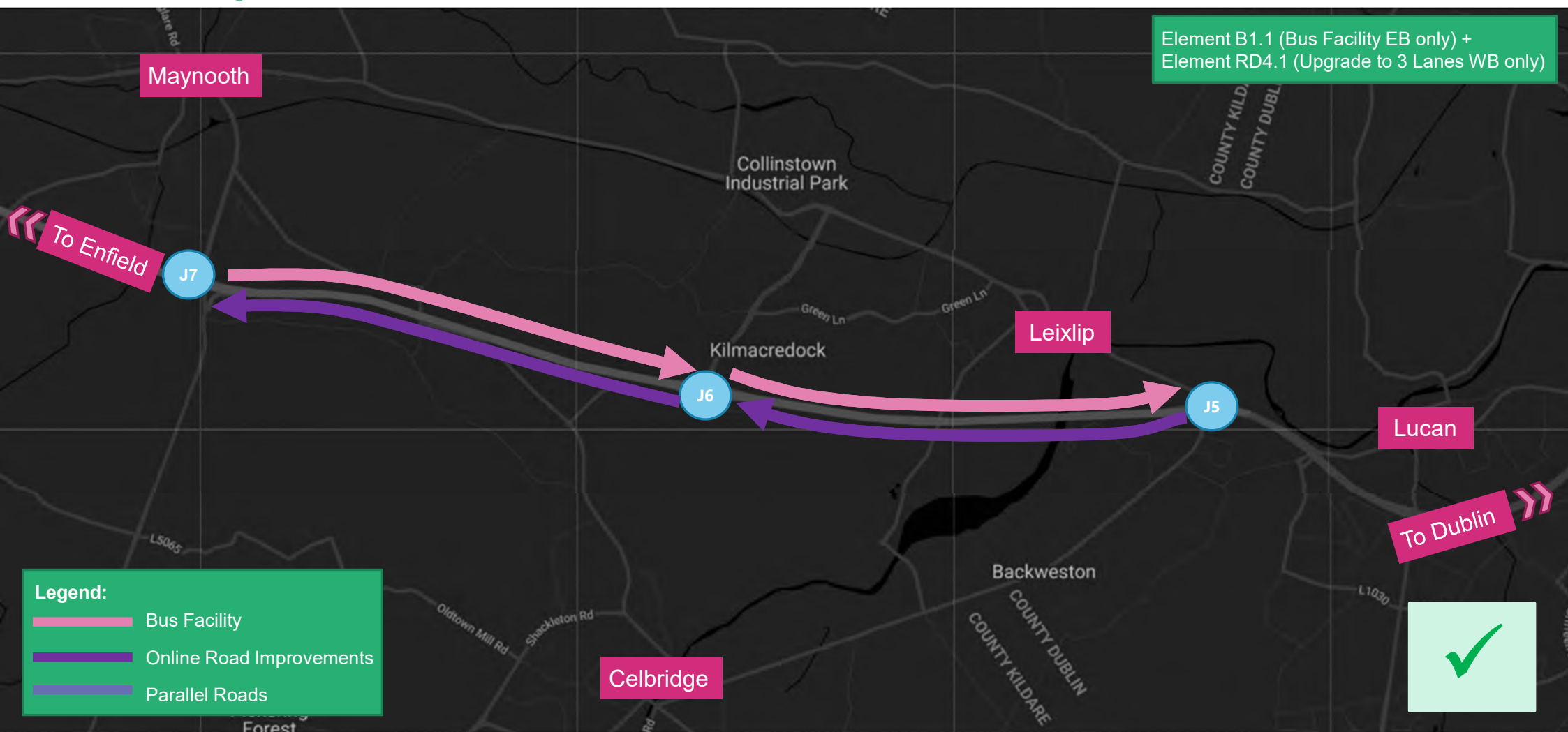
Corridor Option 3A



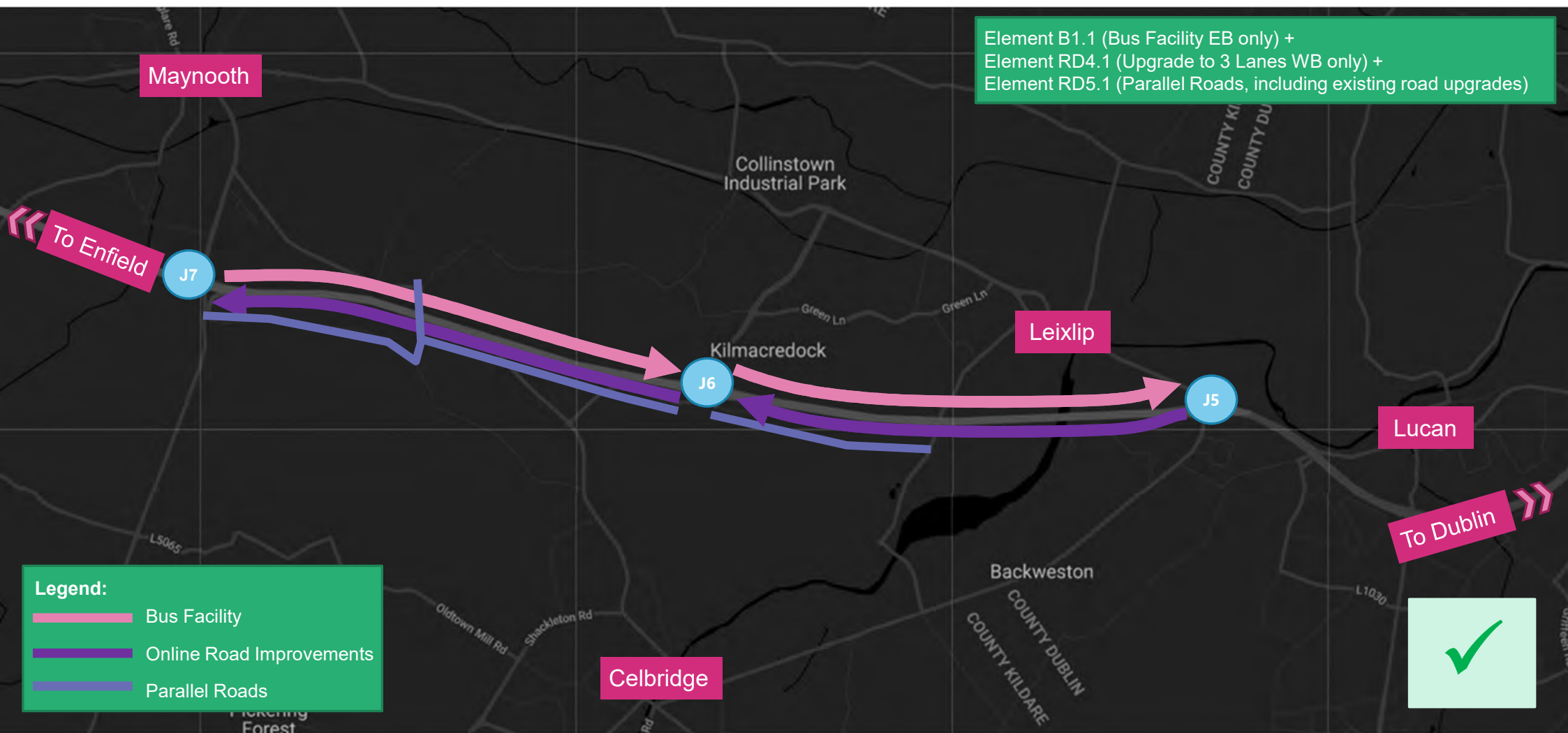
Corridor Option 3B



Corridor Option 4A

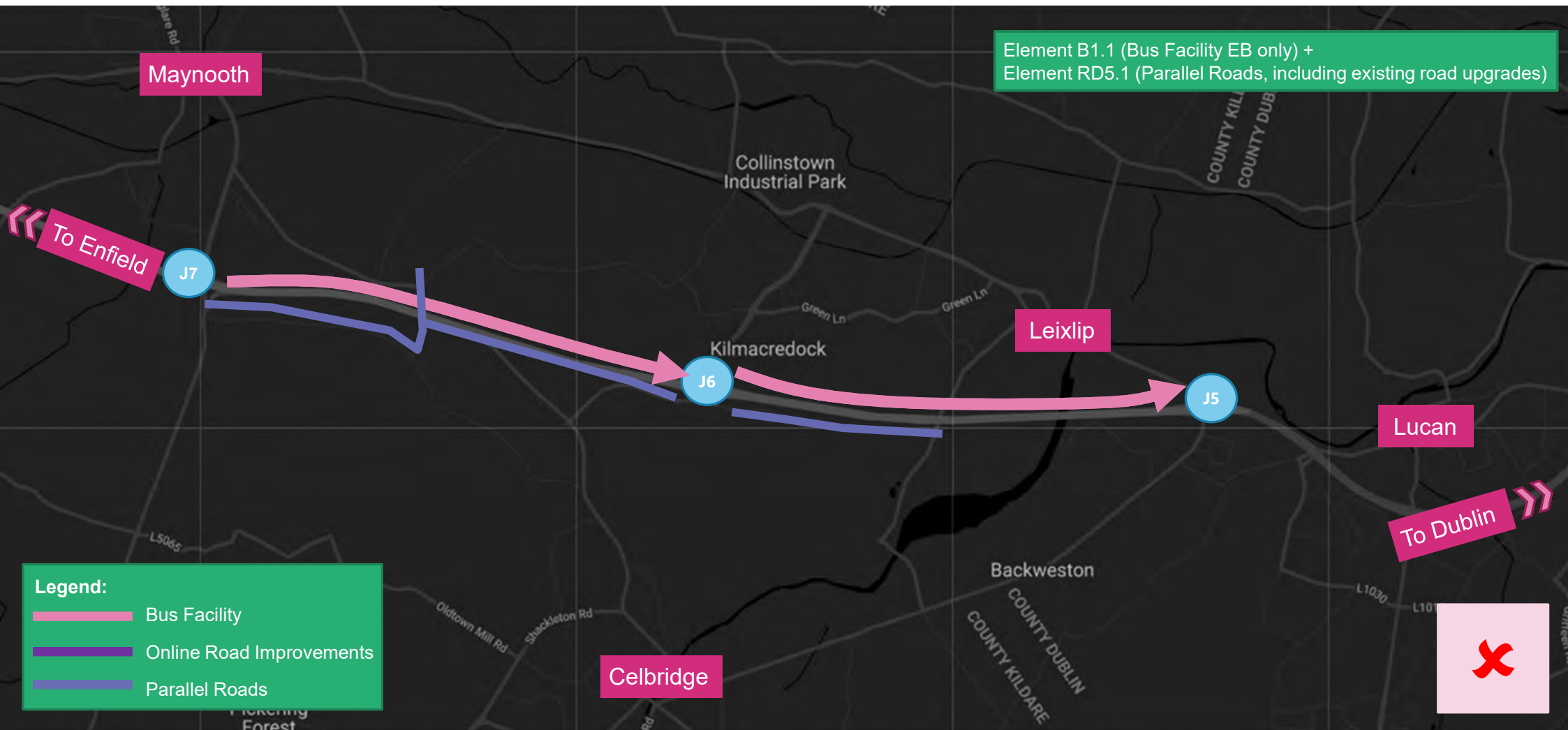


Corridor Option 4B



Corridor Option 4B

Corridor Option 5



Corridor Option 5

Junctions / Bridges Options

Stage 1 – Sift 2 (Junctions / Bridges) on Options

Junction 5:

- Given the proximity of Junction 4a and Junction 6, proposed options will include relaxation(s) from TII Standards for weaving lengths (Standard is 2km).



Junction 7:

- Due to constraints, only in options where 2 junctions are being provided at Maynooth, (either (a) upgrading the existing junction and providing 1 new junction or (b) providing 2 new junctions), will relaxations from TII Standards be considered along with an option compliant with TII Standards for weaving lengths, where possible.
- Where only 1 junction is being proposed (e.g. the existing junction converted to an overbridge and a new junction created elsewhere) relaxations will not apply.

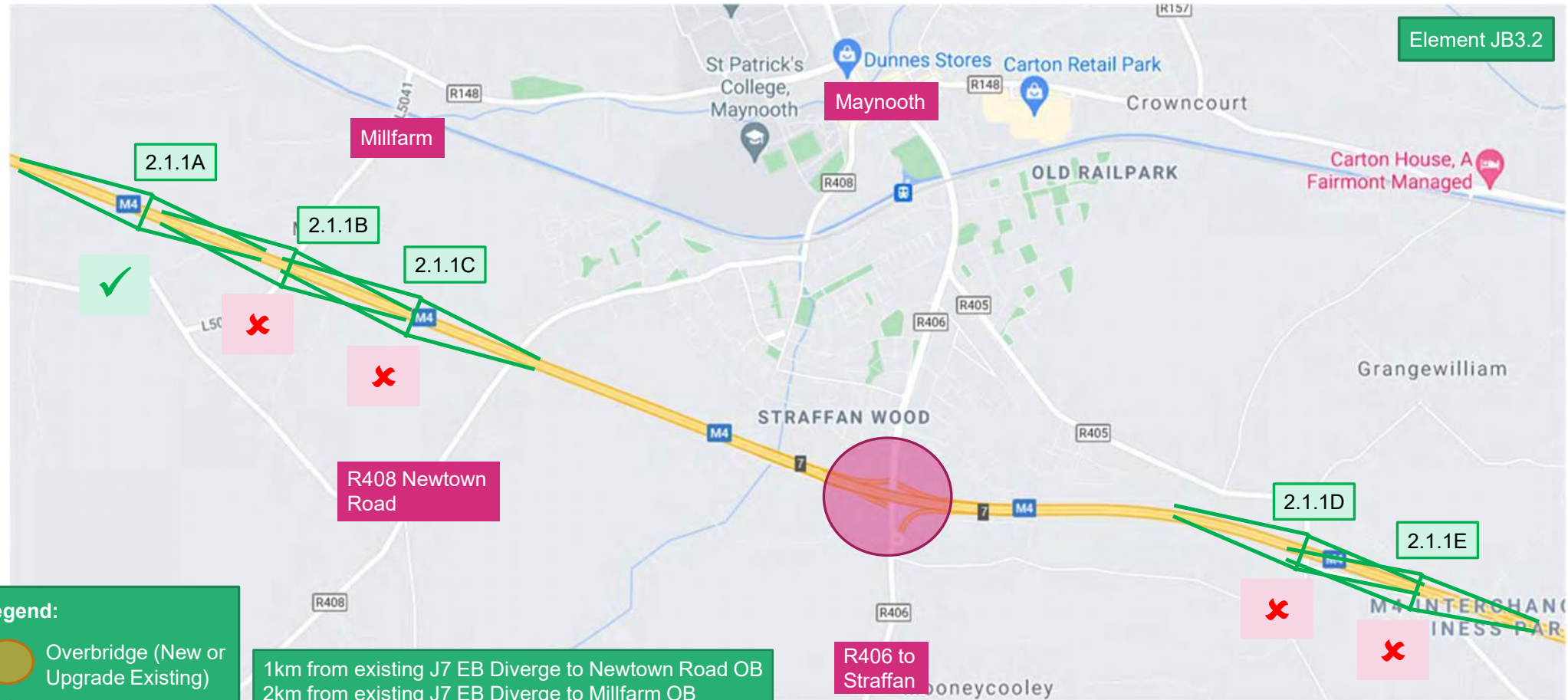
J7 – Option 1 – Upgrade Existing Junction



Legend:

-  Overbridge (New or Upgrade Existing)
-  Junction (New or Upgrade Existing)

J7 - Option 2.1.1 – Upgrade Existing Junction & Provide 2nd Junction (Standard 2km)



Element JB3.2

Legend:

- Overbridge (New or Upgrade Existing)
- Junction (New or Upgrade Existing)

- 1km from existing J7 EB Diverge to Newtown Road OB
- 2km from existing J7 EB Diverge to Millfarm OB
- 1km from existing J7 EB Merge to R405 Ballygoran OB
- 1.8km from existing J6 EB Diverge to R405 OB

J7 - Option 2.1.2 – Upgrade Existing Junction & Provide 2nd Junction (Relaxation 1km)



J7 - Option 3.1.1 - Provide 2 New Junctions & Convert Existing to Overbridge (Standard 2km)



J7 - Option 3.1.2 - Provide 2 New Junctions & Convert Existing to Overbridge (Relaxation 1km)



J7 - Option 3.2.1 - Provide 2 New Junctions & Convert Existing to Overbridge (Standard 2km)



J7 - Option 3.2.2 - Provide 2 New Junctions & Convert Existing to Overbridge (Relaxation 1km)



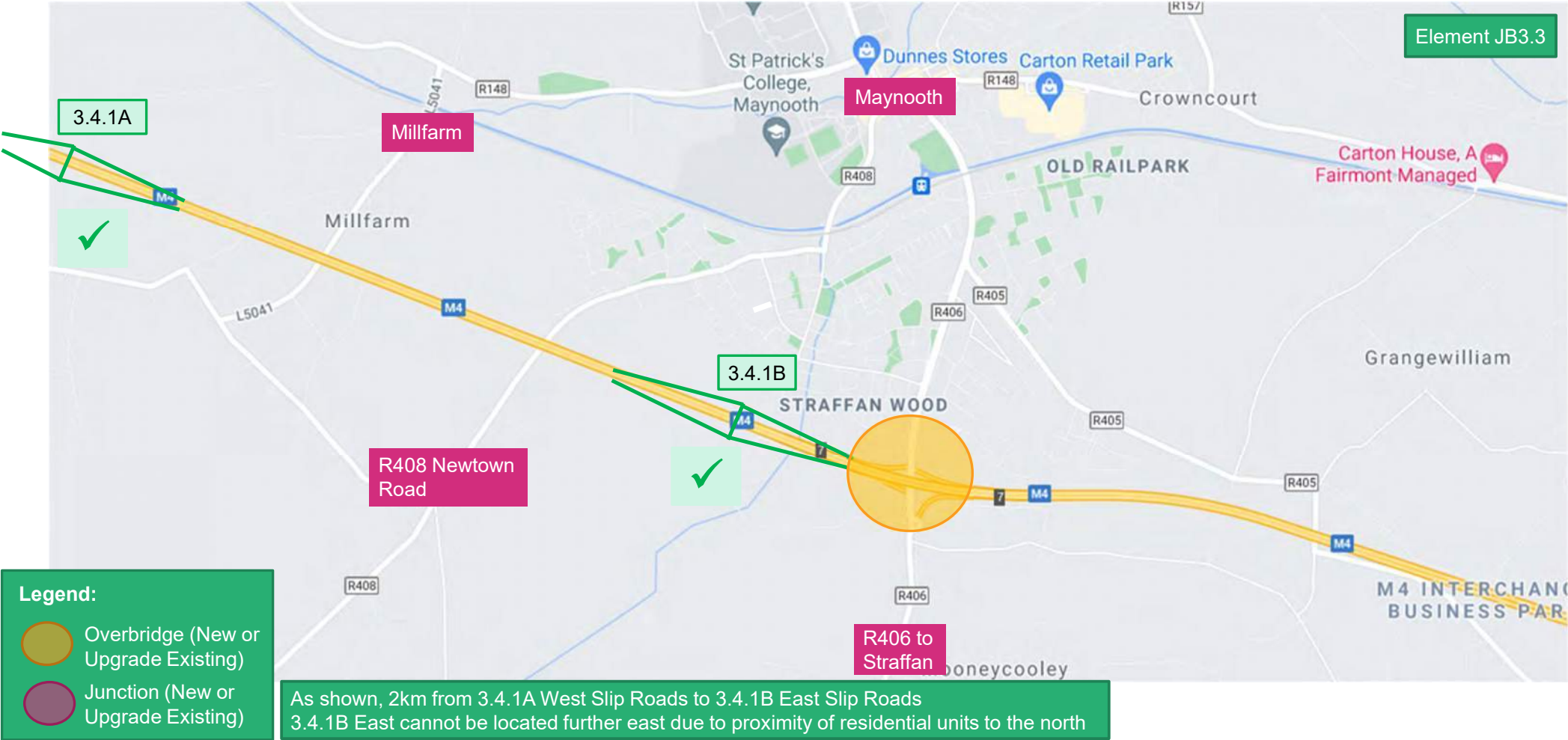
J7 - Option 3.3.1 - Provide 2 New Junctions & Convert Existing to Overbridge (Standard 2km)



J7 - Option 3.3.2 - Provide 2 New Junctions & Convert Existing to Overbridge (Relaxation 1km)



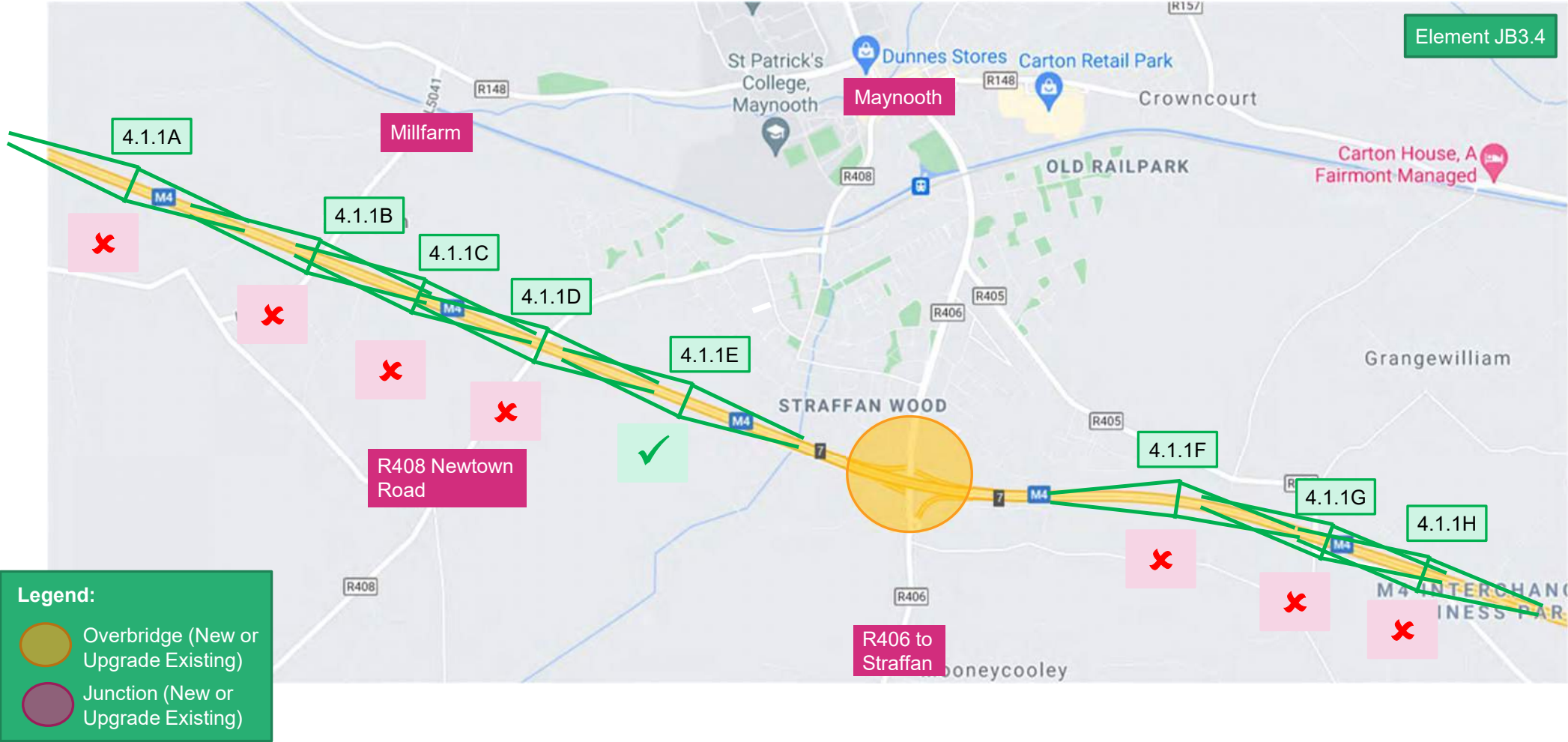
J7 - Option 3.4.1 - Provide 2 New Junctions & Convert Existing to Overbridge (Standard 2km)



J7 - Option 3.4.2 - Provide 2 New Junctions & Convert Existing to Overbridge (Relaxation 1km)

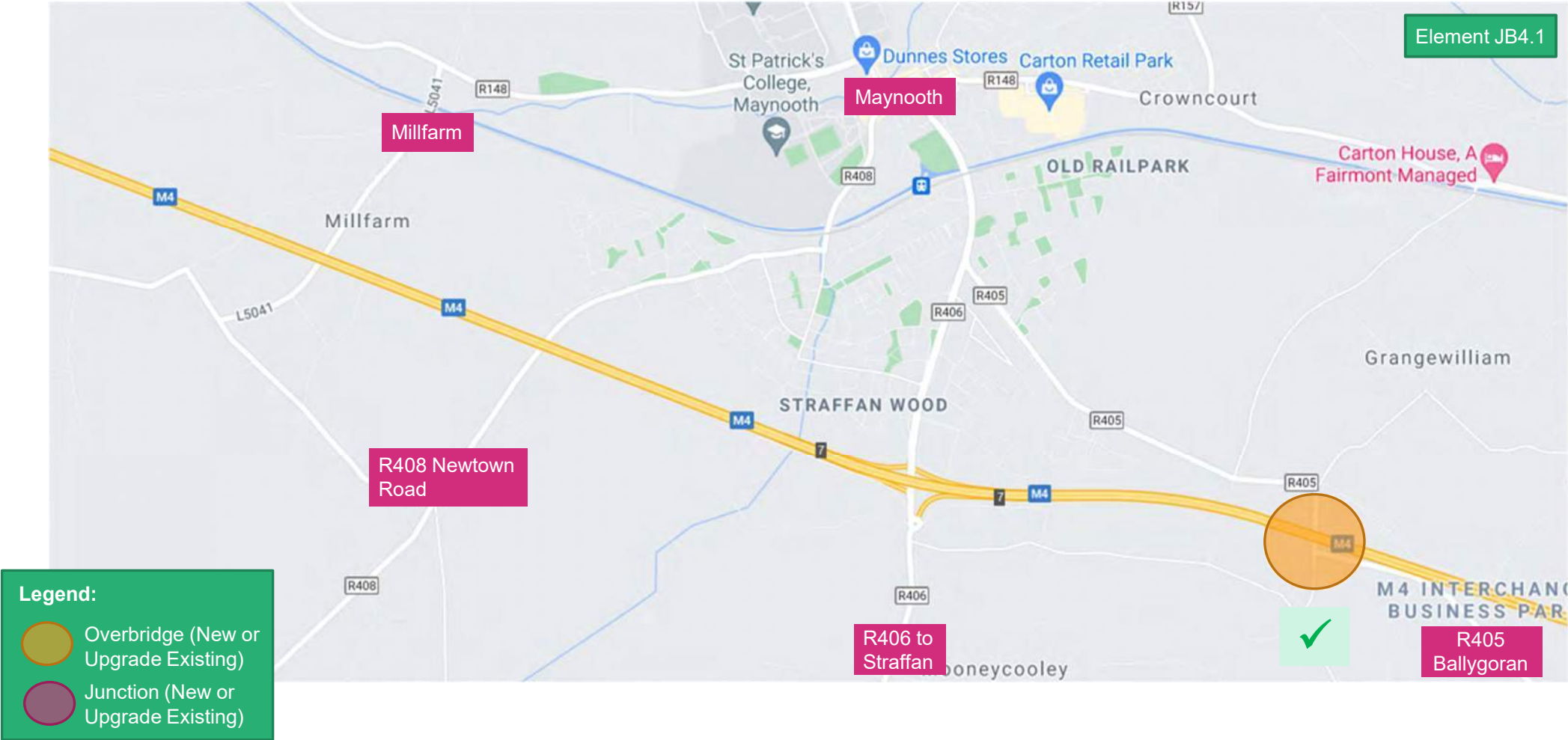


J7 - Option 4.1.1 - Provide 1 New Junction & Convert Existing to Overbridge



Element JB3.4

R405 Ballygoran Overbridge - Option 1 – Upgrade Existing Overbridge



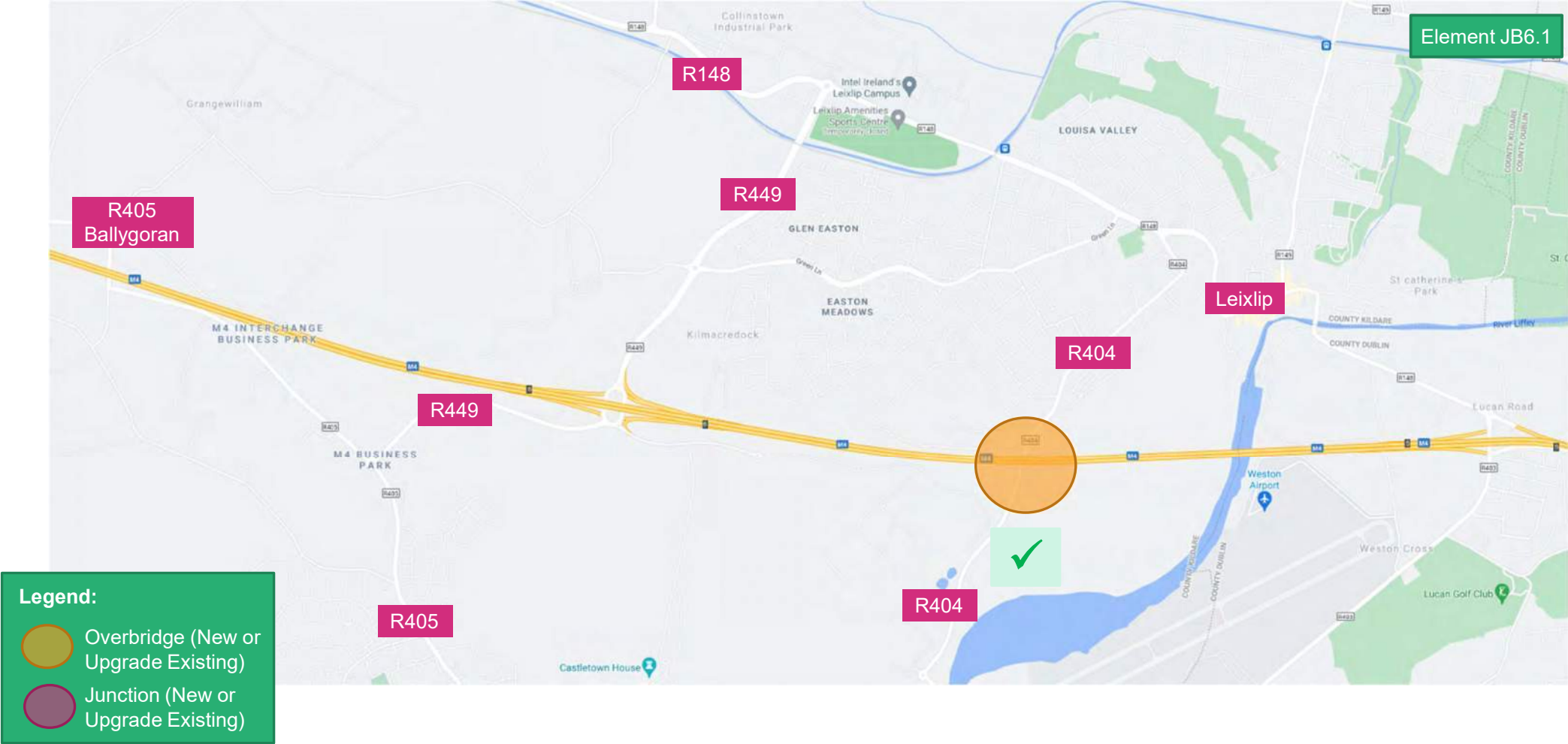
Junction 6 - Option 1 – Upgrade Existing Junction



Legend:

- Overbridge (New or Upgrade Existing)
- Junction (New or Upgrade Existing)

R404 Overbridge – Option 1 – Upgrade Existing Overbridge



Junction 5 – Option 1 – Upgrade Existing Junction



J5 – Option 2 – Provide New Junction & Convert Existing to Overbridge (Relaxation 1km)



**Stage 1 - Sift 2 Results
Summary**

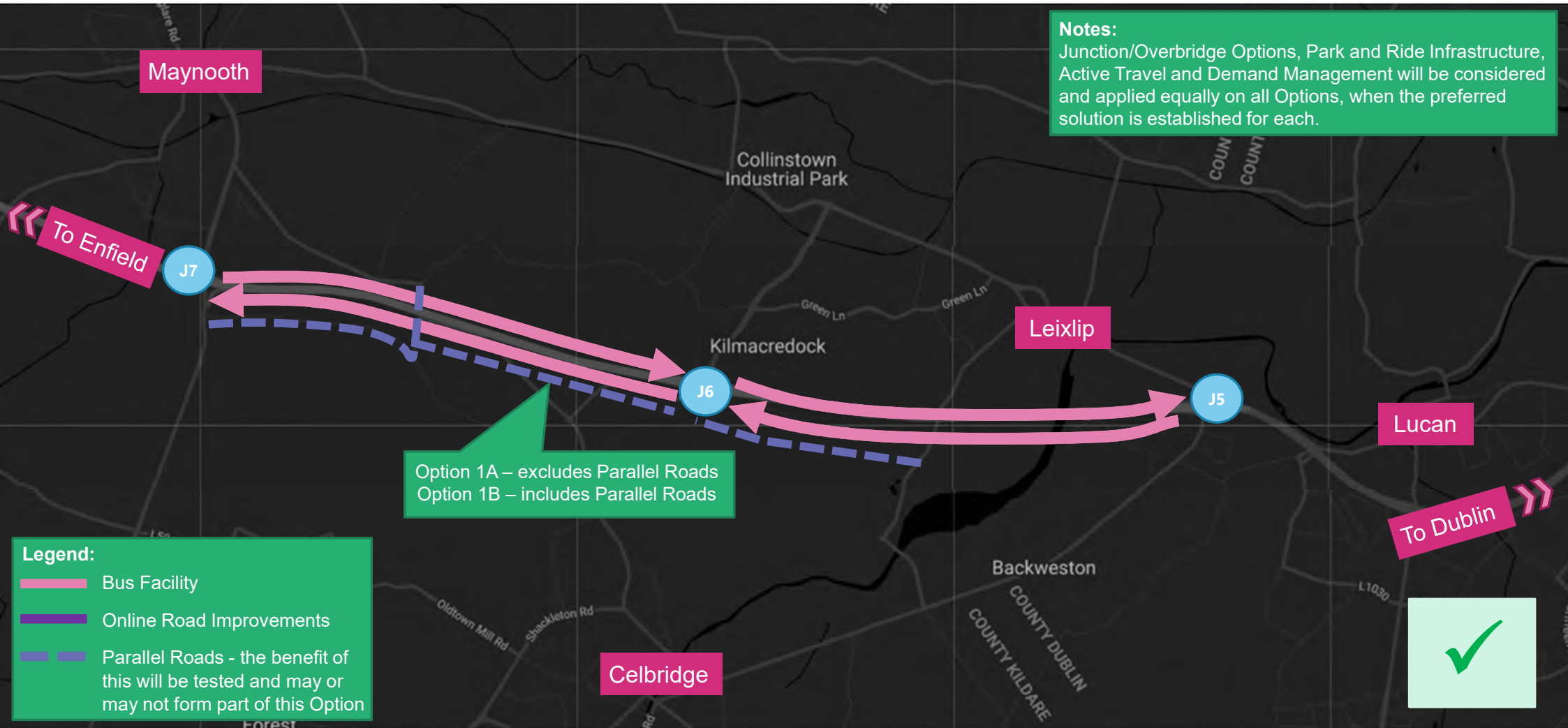
Results – Corridors

6 Options

Option 1A, 2A & 3A – excludes Parallel Roads

Option 1B, 2B & 3B – includes Parallel Roads

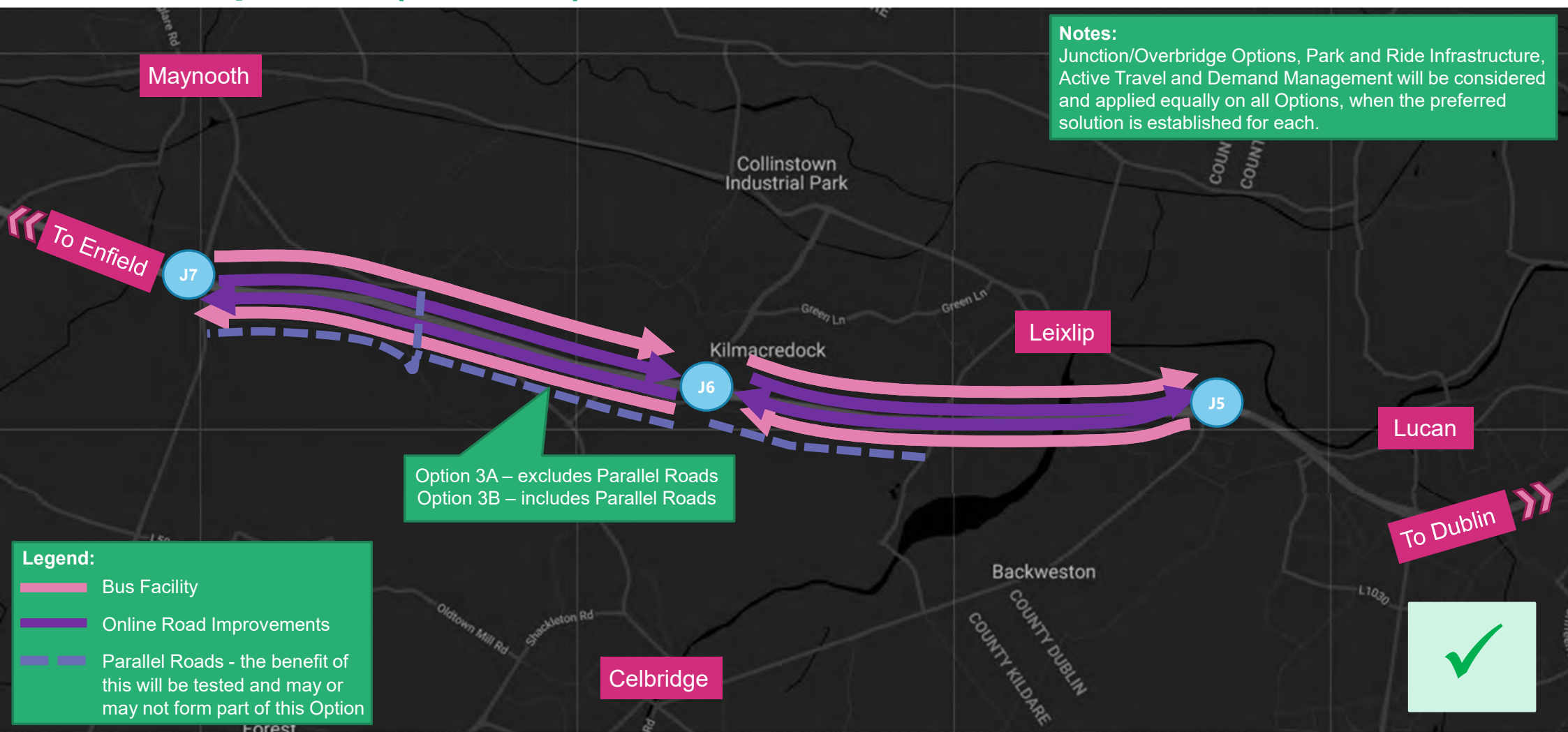
Corridor Option 1 (A and B)



Corridor Option 2 (A and B)



Corridor Option 3 (A and B)



Results – Junction/Bridges

Junction 7

8 Options (4 Categories):

1 No. – Upgrade Existing Junction

2 No. – Upgrade Existing Junction & Provide 2nd Junction

4 No. – Provide 2 New Junctions & Convert Existing to Overbridge

1 No. – Provide 1 New Junction & Convert Existing to Overbridge

1 No. – Upgrade Existing Junction

2 No. – Upgrade Existing Junction & Provide 2nd Junction



4 No. – Provide 2 New Junctions & Convert Existing to Overbridge

1 No. – Provide 1 New Junction & Convert Existing to Overbridge

J7 – Option 1 – Upgrade Existing Junction



Legend:

-  Overbridge (New or Upgrade Existing)
-  Junction (New or Upgrade Existing)

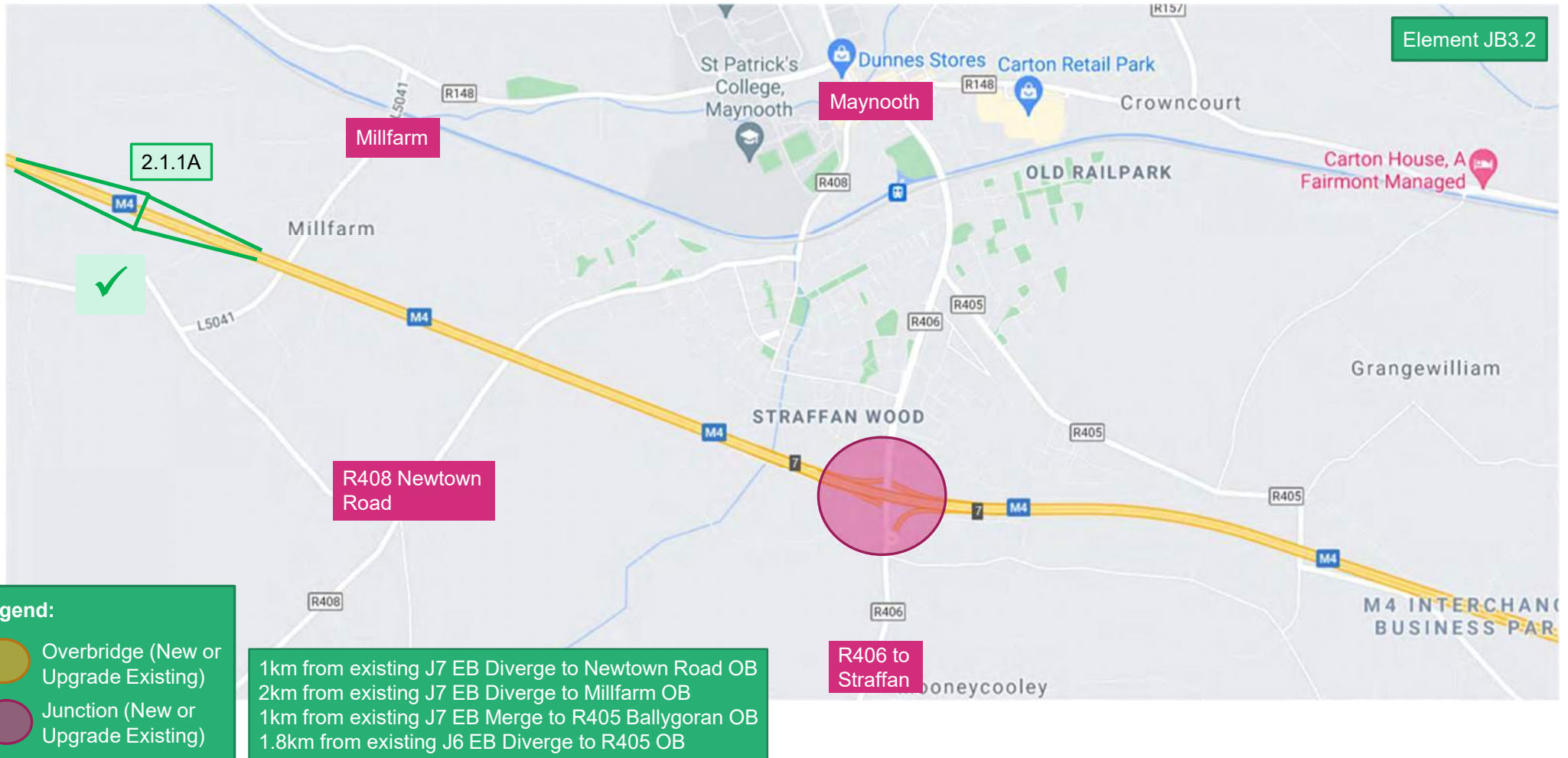
1 No. – Upgrade Existing Junction

2 No. – Upgrade Existing Junction & Provide 2nd Junction

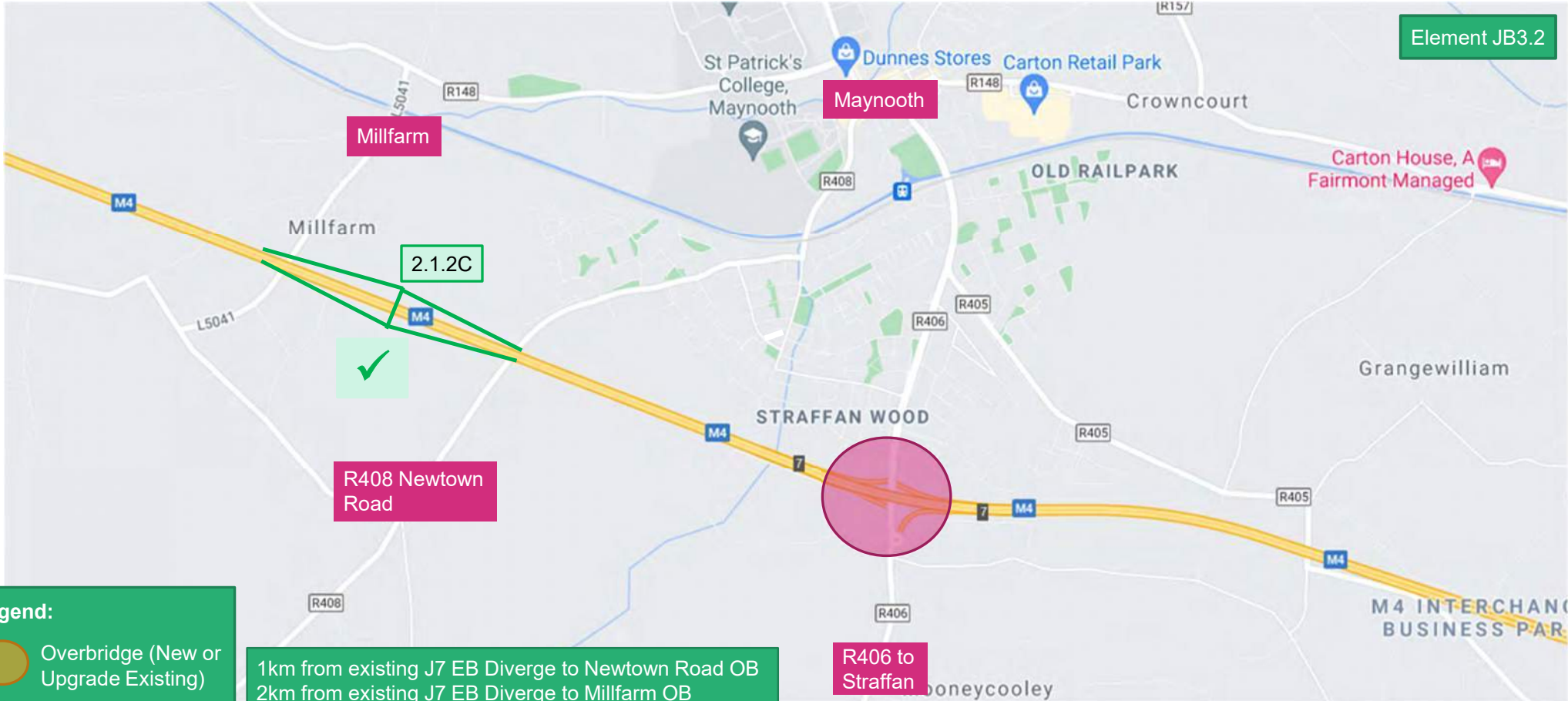
4 No. – Provide 2 New Junctions & Convert Existing to Overbridge

1 No. – Provide 1 New Junction & Convert Existing to Overbridge

J7 - Option 2.1.1 – Upgrade Existing Junction & Provide 2nd Junction (Standard 2km)



J7 - Option 2.1.2 – Upgrade Existing Junction & Provide 2nd Junction (Relaxation 1km)



Legend:

- Overbridge (New or Upgrade Existing)
- Junction (New or Upgrade Existing)

1km from existing J7 EB Diverge to Newtown Road OB
 2km from existing J7 EB Diverge to Millfarm OB
 1km from existing J7 EB Merge to R405 Ballygoran OB
 1.8km from existing J6 EB Diverge to R405 OB

1 No. – Upgrade Existing Junction

2 No. – Upgrade Existing Junction & Provide 2nd Junction

4 No. – Provide 2 New Junctions & Convert Existing to Overbridge

1 No. - Provide 1 New Junction & Convert Existing to Overbridge

J7 - Option 3.1.2 - Provide 2 New Junctions & Convert Existing to Overbridge (Relaxation 1km)



J7 - Option 3.2.2 - Provide 2 New Junctions & Convert Existing to Overbridge (Relaxation 1km)



J7 - Option 3.3.1 - Provide 2 New Junctions & Convert Existing to Overbridge (Standard 2km or Relaxation 1km)



J7 - Option 3.4.1 - Provide 2 New Junctions & Convert Existing to Overbridge (Standard 2km or Relaxation 1km)



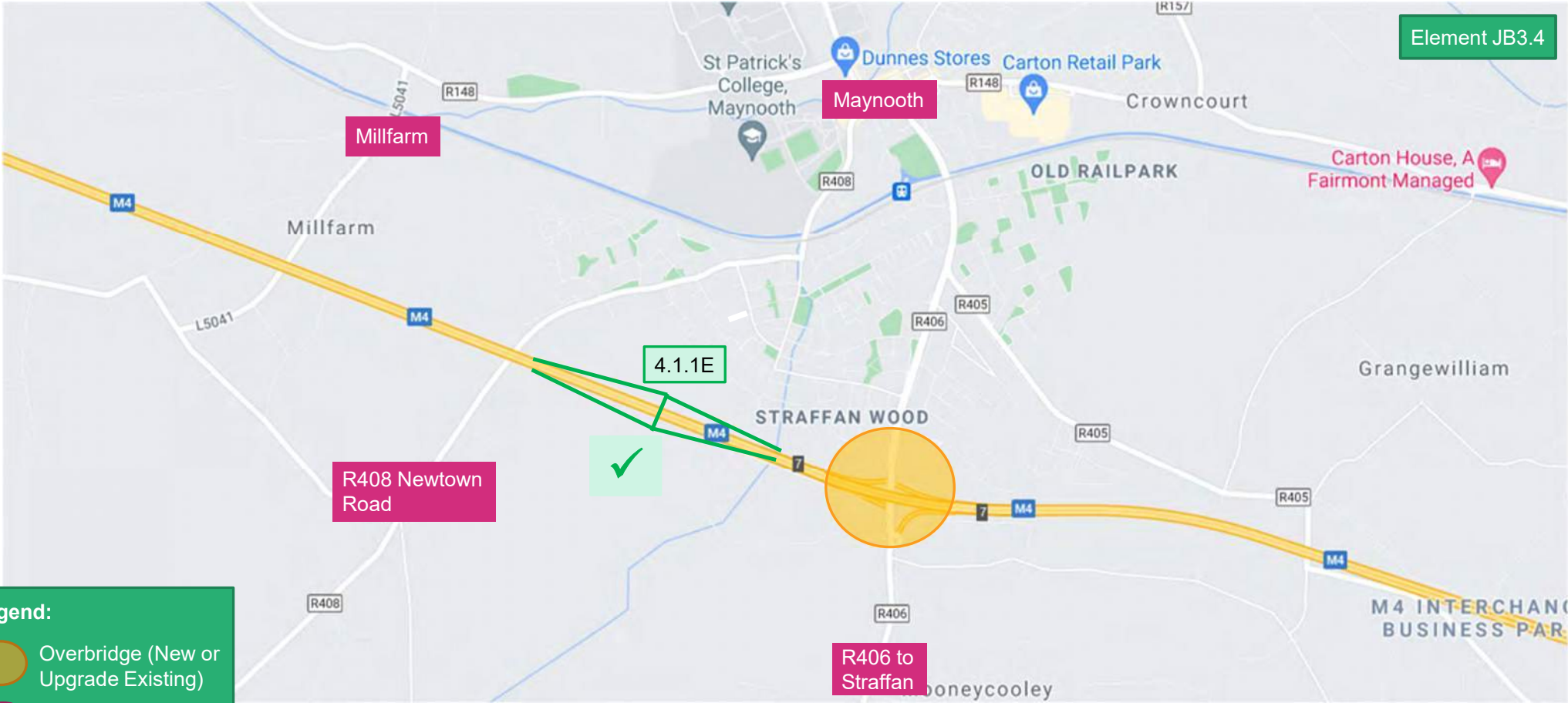
1 No. – Upgrade Existing Junction

2 No. – Upgrade Existing Junction & Provide 2nd Junction

4 No. – Provide 2 New Junctions & Convert Existing to Overbridge

1 No. - Provide 1 New Junction & Convert Existing to Overbridge

J7 - Option 4.1.1 - Provide 1 New Junction & Convert Existing to Overbridge



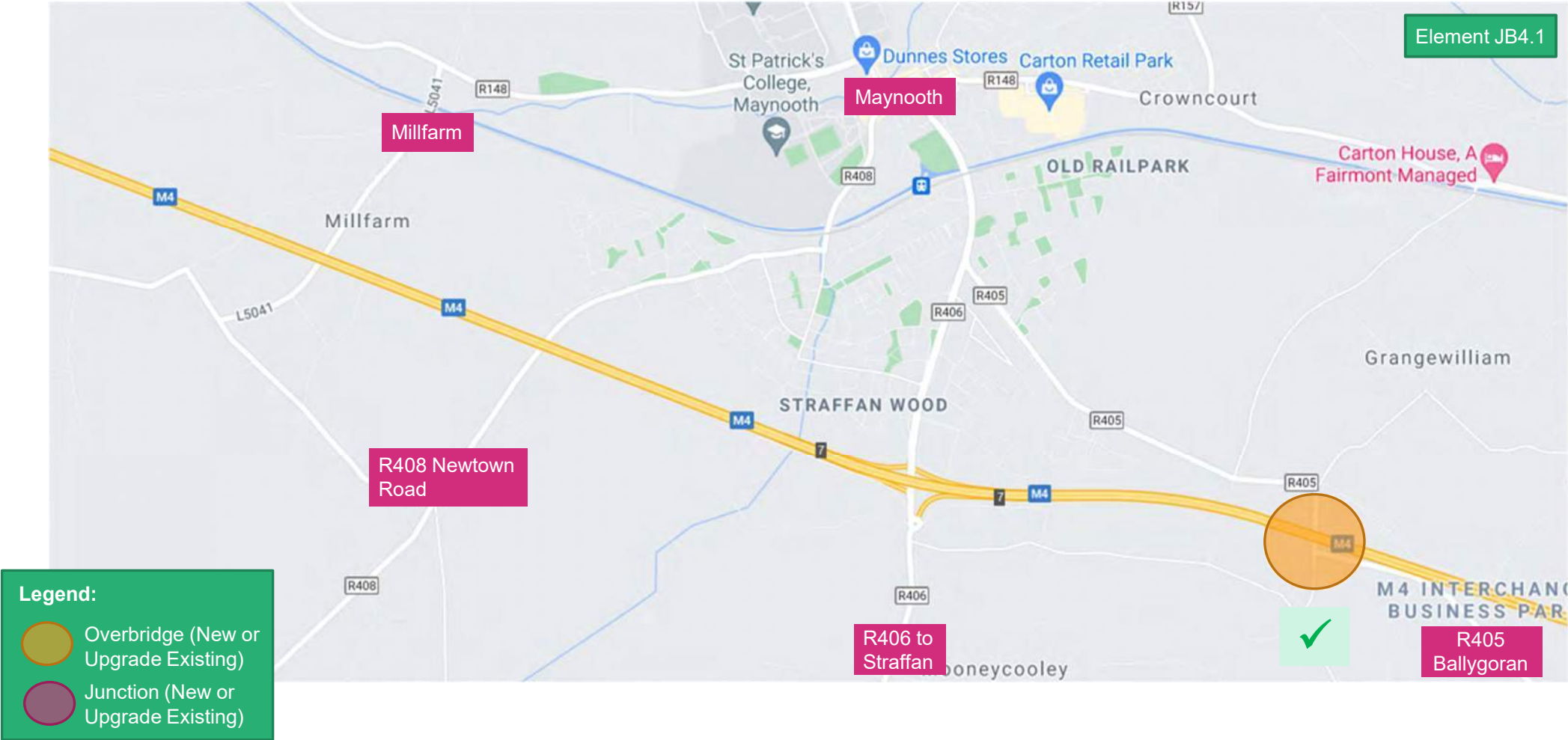
Legend:

- Overbridge (New or Upgrade Existing)
- Junction (New or Upgrade Existing)

Results – Junctions / Bridges

R405 Ballygoran Overbridge

R405 Ballygoran Overbridge - Option 1 – Upgrade Existing Overbridge



Results – Junctions / Bridges

Junction 6

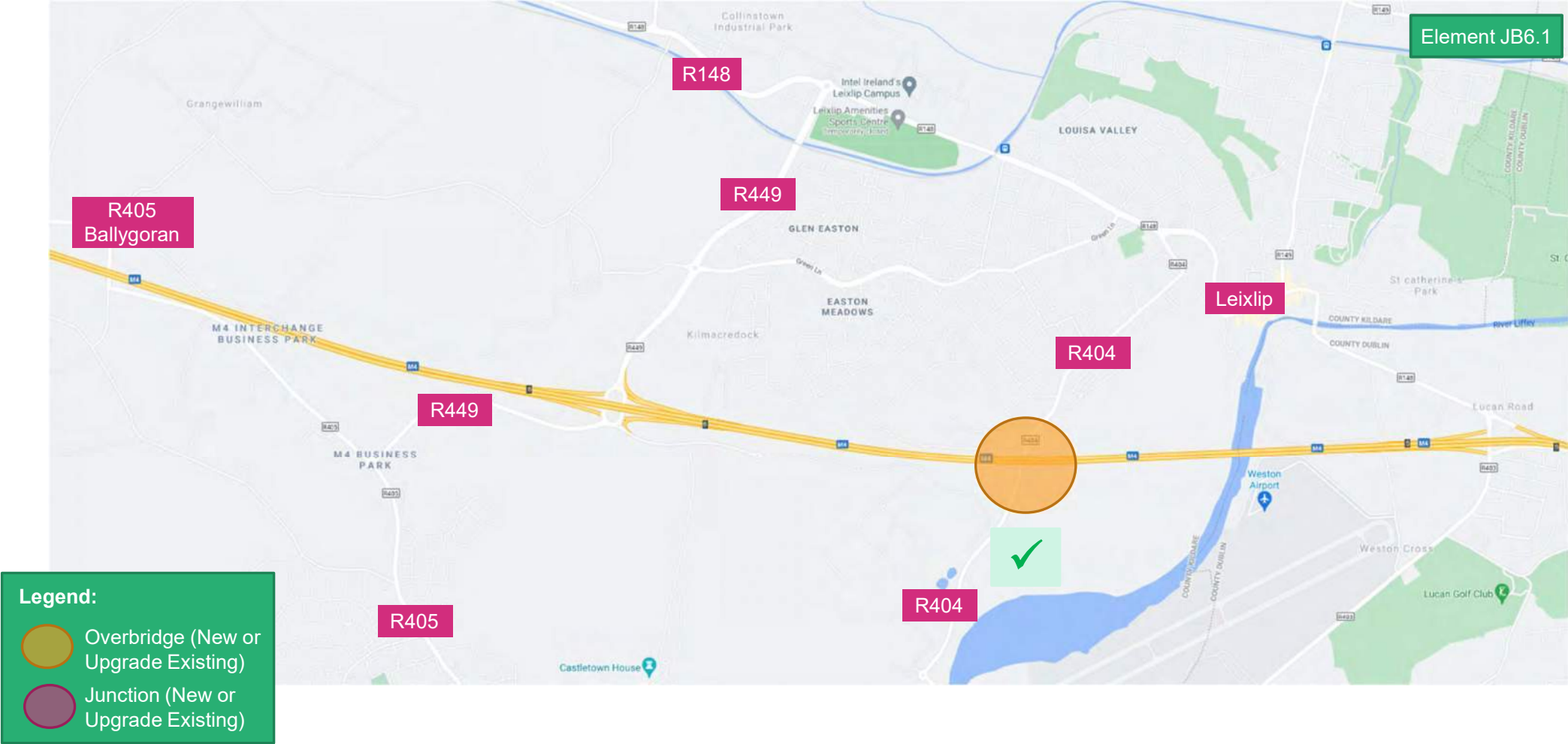
Junction 6 - Option 1 – Upgrade Existing Junction



Results – Junctions / Bridges

R404 Overbridge

R404 Overbridge – Option 1 – Upgrade Existing Overbridge



Results – Junctions / Bridges

Junction 5

3 Options (2 Categories):

1 No. – Upgrade Existing Junction

2 No. – Provide 1 New Junction & Convert Existing to Overbridge

Junction 5 – Option 1 – Upgrade Existing Junction



J5 – Option 2 – Provide New Junction & Convert Existing to Overbridge



Long-List of Options / Alternatives
(formed by passing elements)

Stage 1 - Sift 2 on Options/Alternatives based on "Objectives"

Discontinued

Pass

Stage 1 Sift 2 (Options)

Number	Option No.	Elements forming the Option	Category	Sift 2	Comments
1	Corridor Option 1A	B3.1 (Bus Facility in both directions)	Corridor Options	Pass (to Sift 3)	Adds public transport objectives. Whilst the bus facility would support modal shift and look to reduce congestion, it would not include a specific provision for strategic traffic. As highlighted, Demand Management may be applied to all Options to support strategic traffic and consideration of freight using bus facilities.
2	Corridor Option 2A	RD4.1 (Upgrade to 3 Lanes WB only) + B3.1 (Bus Facility in both directions)	Corridor Options	Pass (to Sift 3)	Adds public transport objectives. The 3rd lane westbound would benefit PM congestion. Thus this Option provides a level of support to strategic traffic.
3	Corridor Option 3A	B3.1 (Bus Facility in both directions) + RD3.1 (Upgrade to 3 Lanes in both directions)	Corridor Options	Pass (to Sift 3)	Adds both public transport and strategic traffic objectives with additional lanes in both directions
4	Corridor Option 4A	B1.1 (Bus Facility EB only) + RD4.1 (Upgrade to 3 Lanes WB only)	Corridor Options	Discontinued	Adds public transport objectives with the eastbound bus facility. The 3rd lane westbound would benefit in flushing out the westbound traffic including buses, particularly in the PM peak.
5	Corridor Option 1B	Element B3.1 (Bus Facility in both directions) + Element RD5.1 (Parallel Roads, including exist road upgrades)	Corridor Options	Pass (to Sift 3)	Adds public transport objectives with the inclusion of a bus facility in both directions. The parallel roads may potentially remove some of the local trips from the M4 and assist the M4 to perform its primary function as a strategic route. As highlighted, Demand Management may be applied to all Options to support strategic traffic and the consideration of freight using the bus facility.
6	Corridor Option 2B	Element B3.1 (Bus Facility in both directions) + Element RD5.1 (Parallel Roads, including exist road upgrades) + Element RD4.1 (Upgrade to 3 Lanes WB only)	Corridor Options	Pass (to Sift 3)	Adds public transport objectives with the inclusion of a bus facility in both directions. The parallel roads may potentially remove some of the local trips from the M4 and assist the M4 to perform its primary function as a strategic route. The 3rd lane westbound would benefit in flushing out the westbound traffic, particularly in the PM peak. Thus this Option would provide a level of support to strategic traffic.
7	Corridor Option 3B	Element B3.1 (Bus Facility in both directions) + Element RD5.1 (Parallel Roads, including exist road upgrades) + Element RD3.1 (Upgrade to 3 Lanes in both directions)	Corridor Options	Pass (to Sift 3)	Adds both public transport and strategic traffic objectives with additional lanes in both directions. The parallel roads may potentially remove some of the local trips from the M4 and assist the M4 to perform its primary function as a strategic route.
8	Corridor Option 4B	Element B1.1 (Bus Facility EB only) + Element RD4.1 (Upgrade to 3 Lanes WB only) + Element RD5.1 (Parallel Roads, including exist road upgrades)	Corridor Options	Discontinued	Adds public transport objectives with the eastbound bus facility. The 3rd lane westbound would benefit in flushing out the westbound traffic including buses, particularly in the PM peak. It will be investigated if the lane gain on the westbound would be an efficient solution to cater for effective westbound movements for both general traffic and buses. The parallel roads may potentially remove some of the local trips from the M4 and assist the M4 to perform its primary function of a strategic route.
9	Corridor Option 5	Element B1.1 (Bus Facility EB only) + Element RD5.1 (Parallel Roads, including exist road upgrades)	Corridor Options	Discontinued	This addresses public transport objectives with the inclusion of a bus facility in the eastbound direction. The parallel roads would potentially remove some of the local trips from the M4 and assist the M4 to perform its primary function as a strategic route. However, there are similar, but more preferable Options available.
10	J7 Option 1	Element JB3.1 (Upgrade Existing Junction)	Junctions / Bridges Options	Pass (to Sift 3)	There would be an overlap with active travel and it may be difficult to improve safety for vulnerable road users.
11	J7 Option 2.1.1A	Element JB3.2 (Upgrade Existing Junction and Provide 2nd Junction)	Junctions / Bridges Options	Pass (to Sift 3)	Option would be compliant with TII Standards. However, it would not fully align with the potential Western Orbital (LAP).
12	J7 Option 2.1.1B	Element JB3.2 (Upgrade Existing Junction and Provide 2nd Junction)	Junctions / Bridges Options	Discontinued	Not feasible due to the proximity of the existing Junction 7. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
13	J7 Option 2.1.1C	Element JB3.2 (Upgrade Existing Junction and Provide 2nd Junction)	Junctions / Bridges Options	Discontinued	Not feasible due to the proximity of the existing Junction 7. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
14	J7 Option 2.1.1D	Element JB3.2 (Upgrade Existing Junction and Provide 2nd Junction)	Junctions / Bridges Options	Discontinued	Not feasible due to the proximity of the existing Junction 6 and Junction 7. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
15	J7 Option 2.1.1E	Element JB3.2 (Upgrade Existing Junction and Provide 2nd Junction)	Junctions / Bridges Options	Discontinued	Not feasible due to the proximity of the existing Junction 6 and Junction 7. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
16	J7 Option 2.1.2A	Element JB3.2 (Upgrade Existing Junction and Provide 2nd Junction)	Junctions / Bridges Options	Discontinued	Option 2.1.2A, along with Option 2.1.2C, would be the most desirable second locations. Option 2.1.2A is the same location as Option 2.1.1 and would be assessed under Option 2.1.1.
17	J7 Option 2.1.2B	Element JB3.2 (Upgrade Existing Junction and Provide 2nd Junction)	Junctions / Bridges Options	Discontinued	2.1.2B would be feasible but 2.1.2C would be the most desirable second location. It would require a significant upgrade of the L5041 Millfarm Road.
18	J7 Option 2.1.2C	Element JB3.2 (Upgrade Existing Junction and Provide 2nd Junction)	Junctions / Bridges Options	Pass (to Sift 3)	Would align with the potential Western Orbital (LAP), is located in a greenfield site and would have good potential connectivity with the R148. With a relaxation from TII Standards to 1km weaving length to the existing Junction 7, this Option would be feasible.
19	J7 Option 2.1.2D	Element JB3.2 (Upgrade Existing Junction and Provide 2nd Junction)	Junctions / Bridges Options	Discontinued	Not feasible due to the proximity of the existing Junction 6 and Junction 7. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
20	J7 Option 2.1.2E	Element JB3.2 (Upgrade Existing Junction and Provide 2nd Junction)	Junctions / Bridges Options	Discontinued	Option feasible with a relaxation from TII Standards of a weaving length to 1km, however there are other more suitable Options available.
21	J7 Option 3.1.1A	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.1.1F would not be feasible due to proximity of the existing Junction 6. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
22	J7 Option 3.1.1B	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.1.1F would not be feasible due to proximity of the existing Junction 6. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
23	J7 Option 3.1.1C	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.1.1F would not be feasible due to proximity of the existing Junction 6. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
24	J7 Option 3.1.1D	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.1.1F would not be feasible due to proximity of the existing Junction 6. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
25	J7 Option 3.1.1E	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.1.1F would not be feasible due to proximity of the existing Junction 6. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
26	J7 Option 3.1.1F	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.1.1F would not be feasible due to proximity of the existing Junction 6. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
27	J7 Option 3.1.2A	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Pass (to Sift 3)	3.1.2F would be feasible with a relaxation from TII Standards. Option 3.1.2A, along with Option 3.1.2C, would be the most desirable second location to the west of the R406 Straffan Road.
28	J7 Option 3.1.2B	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.1.2F would be feasible with a relaxation from TII Standards. Option 3.1.2B would be feasible, however Option 3.1.2A, along with Option 3.1.2C, would be the most desirable second location to the west of the R406 Straffan Road.
29	J7 Option 3.1.2C	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Pass (to Sift 3)	3.1.2F would be feasible with a relaxation from TII Standards. Option 3.1.2A, along with Option 3.1.2C, would be the most desirable second location to the west of the R406 Straffan Road.
30	J7 Option 3.1.2D	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.1.2F would be feasible with a relaxation from TII Standards. Option 3.1.2D would be feasible, however, Option 3.1.2A, along with Option 3.1.2C, would be the most desirable second location to the west of the R406 Straffan Road.
31	J7 Option 3.1.2E	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.1.2F would be feasible with a relaxation from TII Standards. Option 3.1.2E would be feasible, however, Option 3.1.2A, along with Option 3.1.2C, would be the most desirable second location to the west of the R406 Straffan Road.
32	J7 Option 3.1.2F	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Pass (to Sift 3)	3.1.2F would be feasible with a relaxation from TII Standards.
33	J7 Option 3.2.1A	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.2.1F would not be feasible due to proximity of the existing Junction 6. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
34	J7 Option 3.2.1B	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.2.1F would not be feasible due to proximity of the existing Junction 6. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
35	J7 Option 3.2.1C	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.2.1F would not be feasible due to proximity of the existing Junction 6. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
36	J7 Option 3.2.1D	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.2.1F would not be feasible due to proximity of the existing Junction 6. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
37	J7 Option 3.2.1E	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.2.1F would not be feasible due to proximity of the existing Junction 6. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
38	J7 Option 3.2.1F	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.2.1F would not be feasible due to proximity of the existing Junction 6. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
39	J7 Option 3.2.2A	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Pass (to Sift 3)	3.2.2F would be feasible with a relaxation from TII Standards. Option 3.2.2A, along with Option 3.2.2C, would be the most desirable second location to the west of the R406 Straffan Road.
40	J7 Option 3.2.2B	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.2.2F would be feasible with a relaxation from TII Standards. Option 3.2.2B would be feasible, however Option 3.2.2A, along with Option 3.2.2C, would be the most desirable second location to the west of the R406 Straffan Road.

Stage 1 Sift 2 (Options)

Number	Option No.	Elements forming the Option	Category	Sift 2	Comments
41	J7 Option 3.2.2C	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Pass (to Sift 3)	3.2.2F would be feasible with a relaxation from TII Standards. Option 3.2.2A, along with Option 3.2.2C, would be the most desirable second location to the west of the R406 Traffan Road.
42	J7 Option 3.2.2D	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.2.2F would be feasible with a relaxation from TII Standards. Option 3.2.2D would be feasible, however, Option 3.2.2A, along with Option 3.2.2C, would be the most desirable second location to the west of the R406 Traffan Road.
43	J7 Option 3.2.2E	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.2.2F would be feasible with a relaxation from TII Standards. Option 3.2.2E would be feasible, however, Option 3.2.2A, along with Option 3.2.2C, would be the most desirable second location to the west of the R406 Traffan Road.
44	J7 Option 3.2.2F	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Pass (to Sift 3)	3.2.2F would be feasible with a relaxation from TII Standards.
45	J7 Option 3.3.1A	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Pass (to Sift 3)	3.3.1F would be feasible. Option 3.3.1A, or Option 3.3.1C, would be the most desirable second location to the west of the R406 Traffan Road.
46	J7 Option 3.3.1B	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.3.1F would be feasible. Option 3.3.1B would be feasible, however Option 3.3.1A, or Option 3.3.1C, would be the most desirable second location to the west of the R406 Traffan Road.
47	J7 Option 3.3.1C	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Pass (to Sift 3)	3.3.1F would be feasible. Option 3.3.1A, or Option 3.3.1C, would be the most desirable second location to the west of the R406 Traffan Road.
48	J7 Option 3.3.1D	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.3.1F cannot be located further east due to the proximity of the existing Junction 6. Option 3.3.1D would not be feasible. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
49	J7 Option 3.3.1E	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.3.1F cannot be located further east due to the proximity of the existing Junction 6. Option 3.3.1E would not be feasible. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
50	J7 Option 3.3.1F	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Pass (to Sift 3)	3.3.1F would be feasible, however the location has significant constraints which would need to be taken into account.
51	J7 Option 3.3.2A	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.3.2A would be feasible. This is the same location chosen as 3.3.1A, therefore 3.3.1A is taken forward rather than both.
52	J7 Option 3.3.2B	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	Option 3.3.2B would be feasible, however Option 3.3.2A, or Option 3.3.2C, would be the most desirable second location to the west of the R406 Traffan Road.
53	J7 Option 3.3.2C	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.3.2C would be feasible. This is the same location chosen as 3.3.1C, therefore 3.3.1C is taken forward rather than both.
54	J7 Option 3.3.2D	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	Option 3.3.2D would not be feasible. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
55	J7 Option 3.3.2E	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	Option 3.3.2E would not be feasible. It would fail to provide the desirable minimum weaving length in accordance with TII Standards.
56	J7 Option 3.3.2F	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.3.2F would be feasible. This is the same location chosen as 3.3.1F, therefore 3.3.1F is taken forward rather than both.
57	J7 Option 3.4.1A	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Pass (to Sift 3)	3.4.1A would be feasible. In conjunction with 3.4.1B, it would provide two junctions that would provide the desirable minimum weaving length in accordance with TII Standards.
58	J7 Option 3.4.1B	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Pass (to Sift 3)	3.4.1B would be feasible. In conjunction with 3.4.1A, it would provide two junctions that would provide the desirable minimum weaving length in accordance with TII Standards.
59	J7 Option 3.4.2A	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.4.2A would be feasible. This is the same location chosen as 3.4.1A, therefore 3.4.1A is taken forward rather than both.
60	J7 Option 3.4.2B	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.4.2B would not be feasible due to the proximity of 3.4.2A and 3.4.2E.
61	J7 Option 3.4.2C	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.4.2C would not be feasible due to the proximity of 3.4.2A and 3.4.2E.
62	J7 Option 3.4.2D	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.4.2D would not be feasible due to the proximity of 3.4.2A and 3.4.2E.
63	J7 Option 3.4.2E	Element JB3.3 (Provide 2 New Junctions and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	3.4.2E would be feasible. This is the same location chosen as 3.4.1B, therefore 3.4.1B is taken forward rather than both.
64	J7 Option 4.1.1A	Element JB3.4 (Provide 1 New Junction and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	4.1.1A would be feasible and the location would offer the benefits of a greenfield site close to Maynooth west. However 4.1.1E would be a better Option as it would be more centrally located and serve the whole of Maynooth.
65	J7 Option 4.1.1B	Element JB3.4 (Provide 1 New Junction and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	4.1.1B would be feasible. However 4.1.1E would be a better Option as it would be more centrally located and serve the whole of Maynooth.
66	J7 Option 4.1.1C	Element JB3.4 (Provide 1 New Junction and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	4.1.1C would be feasible. However 4.1.1E would be a better Option as it would be more centrally located and serve the whole of Maynooth.
67	J7 Option 4.1.1D	Element JB3.4 (Provide 1 New Junction and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	4.1.1D would be feasible. However 4.1.1E would be a better Option as it would be more centrally located and serve the whole of Maynooth.
68	J7 Option 4.1.1E	Element JB3.4 (Provide 1 New Junction and convert existing to an Overbridge)	Junctions / Bridges Options	Pass (to Sift 3)	4.1.1E would serve the whole of Maynooth, be compliant with TII Standards, would be centrally located and would also have good alignment with LAP and potential orbital infrastructure.
69	J7 Option 4.1.1F	Element JB3.4 (Provide 1 New Junction and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	Required to serve the whole of Maynooth, Option 4.1.1E would be more centrally located. This location would have significant constraints.
70	J7 Option 4.1.1G	Element JB3.4 (Provide 1 New Junction and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	4.1.1G would not be feasible due to proximity of the existing Junction 6.
71	J7 Option 4.1.1H	Element JB3.4 (Provide 1 New Junction and convert existing to an Overbridge)	Junctions / Bridges Options	Discontinued	4.1.1H is not feasible due to proximity of the existing Junction 6.
72	R405 Option 1	Element JB4.1 (Upgrade Existing Overbridge)	Junctions / Bridges Options	Pass (to Sift 3)	May become a Junction as part of another Option. Overbridge improvements, active travel and bus infrastructure connectivity potential under this Option.
73	J6 Option 1	Element JB5.1 (Upgrade Existing Junction)	Junctions / Bridges Options	Pass (to Sift 3)	There would be an overlap with active travel. It may be difficult to improve safety for vulnerable road users.
74	R404 Option 1	Element JB6.1 (Upgrade Existing Overbridge)	Junctions / Bridges Options	Pass (to Sift 3)	There would be overbridge improvements, active travel and bus infrastructure connectivity potential under this Option.
75	J5 Option 1	Element JB7.1 (Upgrade Existing Junction)	Junctions / Bridges Options	Pass (to Sift 3)	There would be an overlap with active travel. It may be difficult to improve safety for vulnerable road users.
76	J5 Option 2.1	Element JB7.4 (Provide 1 New Junction and convert existing to an Overbridge)	Junctions / Bridges Options	Pass (to Sift 3)	Option 2.1 would be feasible with a relaxation from TII Standards in weaving length to 1km for Junction 6. Active travel to be incorporated.
77	J5 Option 2.2	Element JB7.4 (Provide 1 New Junction and convert existing to an Overbridge)	Junctions / Bridges Options	Pass (to Sift 3)	It would improve existing weaving issues between Junction 5 and Junction 4A. Its proximity to Junction 6 is noted, however the desirable minimum weaving length is achieved, therefore would be compliant with TII Standards. There would be an overlap with active travel.

Stage 1 Sift 2 - Parallel Road Sub-Sift

Parallel Roads Sub-Sift

Context: Parallel roads can be applied to all Options, therefore, a sub-sift was completed to identify the preferred parallel road layout which may then be applied to all Corridor Options in Stage 1 - Sift 2.

Sub-Sift 1

Option	Description	Sub-Sift Result	Sub-Sift Comments
P1	Northern Parallel Road	Discontinued	The R148 already runs parallel to the north of the M4, therefore a southern parallel road would provide greater benefits
P2	Southern Parallel Road	Pass	The specific extents of this parallel road intervention will be determined in a further sift
P3	Combination of Northern and Southern Parallel Roads	Discontinued	This has been discontinued as it would increase traffic crossing at strategic junctions as they try to continue on the parallel road. For example a parallel road starting on the north, and then crossing at a junction/overbridge to the south.

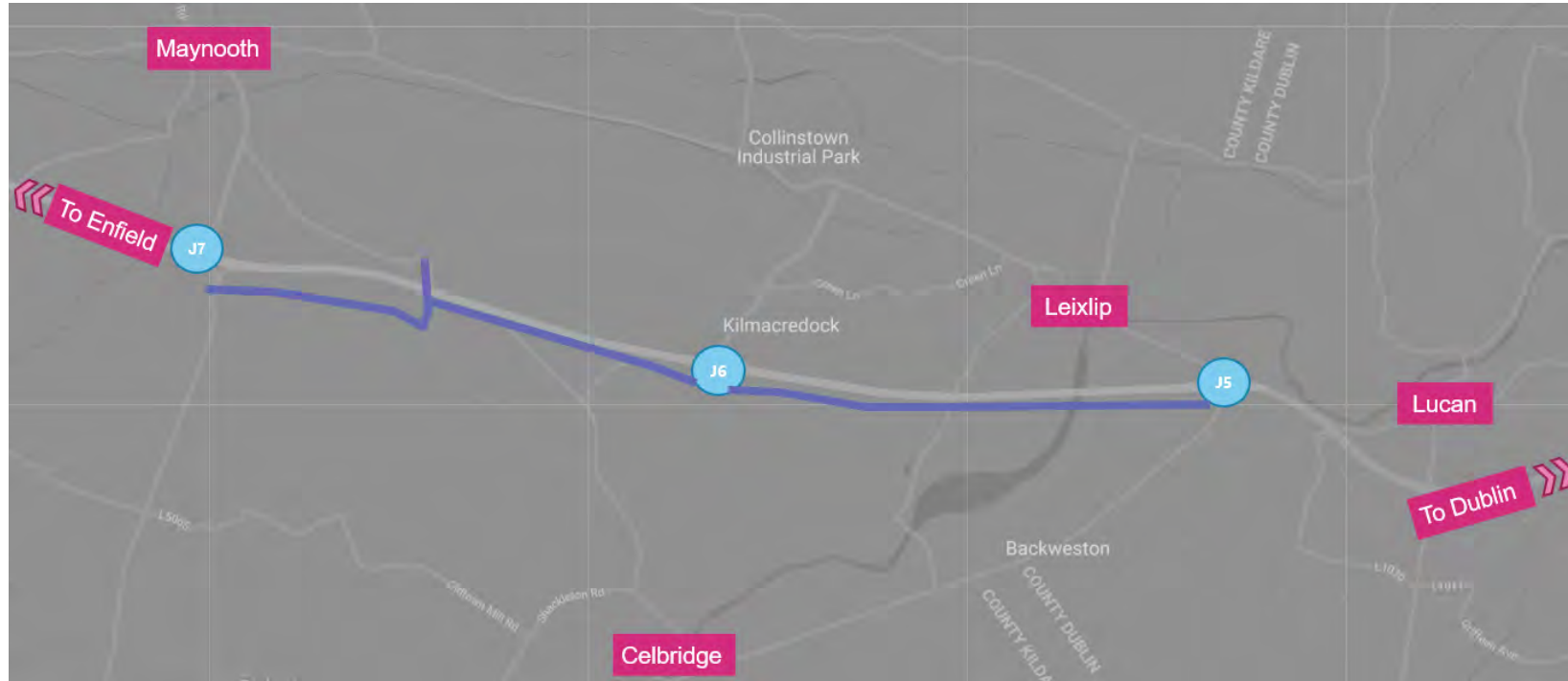


Sub-Sift 2

Sub-Options	Description	Sub-Sift Result	Sub-Sift Comments
P2.1	Sub-Option 1 (Refer to graphic below)	Discontinued	This would include a parallel road (including reuse of some existing roads) to the south of the M4/N4 from Junction 7 to Junction 5, and would incorporate linkage and a connection to the R405 Ballygoran Overbridge. A proposed parallel road from the R404 Celbridge Road to Junction 5 would be in close vicinity of the Weston Airport. It would also require a new River Liffey crossing, parallel to the existing bridge. For these reasons, Sub-Option P2.2 is preferred.
P2.2	Sub-Option 2 (Refer to graphic below)	Pass	This would include a parallel road (including reuse of some existing roads) to the south of the M4/N4 from Junction 7 to the R404 Celbridge Road, and would incorporate linkage and a connection to the R405 Ballygoran Overbridge. A proportion of this proposal is included in the Leixlip LAP. Therefore, this Sub-Option is preferred.
P2.3	Sub-Option 3 (Refer to graphic below)	Discontinued	This would include a parallel road (including reuse of some existing roads) to the south of the M4/N4 from Junction 7 to Junction 6, and would incorporate linkage and a connection to the R405 Ballygoran Overbridge. This would terminate at Junction 6 and would not extend east to the R404 Celbridge Road. For this reason, Sub-Option P2.2 is preferred.

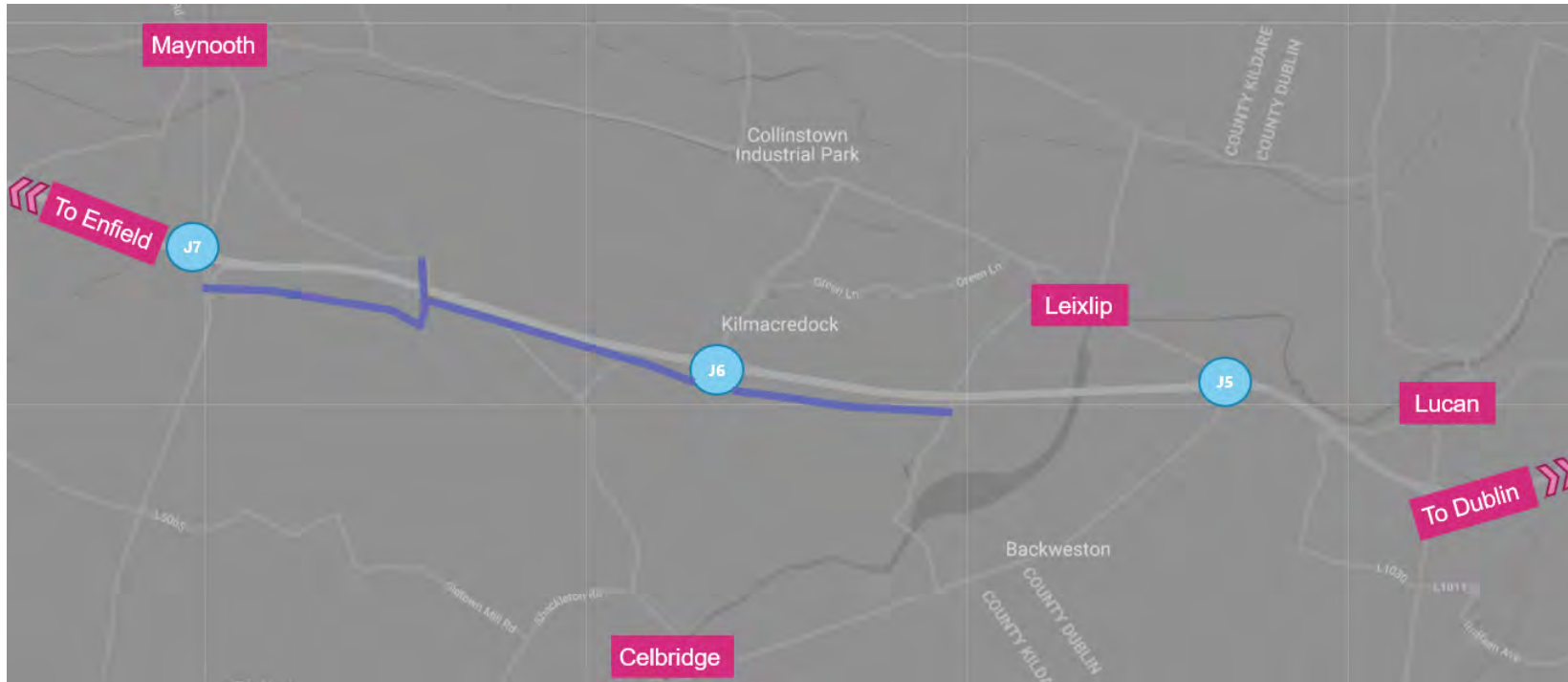
Stage 1 Sift 2 - Parallel Road Sub-Sift

Sub-Option P2.1



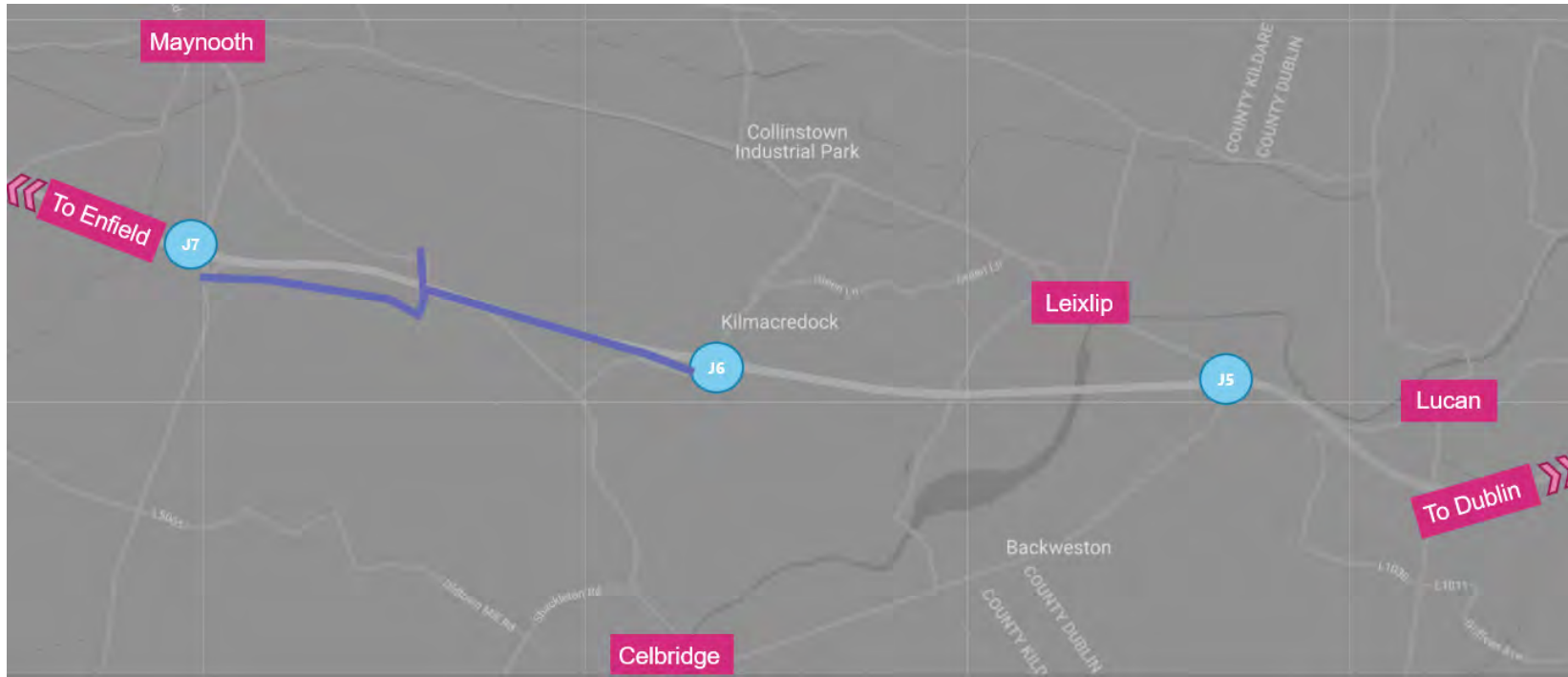
Stage 1 Sift 2 - Parallel Road Sub-Sift

Sub-Option P2.2



Stage 1 Sift 2 - Parallel Road Sub-Sift

Sub-Option P2.3



Stage 1 Sift 2 - Parallel Road Sub-Sift

Key Conclusions:

Journey time savings (compared to the Do-Minimum) on the M4 eastbound and westbound are almost identical to the journey time savings observed in models without the parallel roads, therefore, it is concluded that there is little or no benefit generated from this section from an M4 journey time perspective.

There are negligible benefits in terms of flow reduction and delay reduction in Maynooth, Leixlip and Celbridge town centres, indicating that there is little or no benefit generated from this section in terms of benefits to links in Maynooth, Leixlip and Celbridge.

The number of links exhibiting a major or moderate beneficial impact indicate there is little or no benefit generated from this section.

Link flows indicate that there are little or no benefits generated from upgrading this section of parallel road.

The Parallel Roads Option is not taken forward to Stage 2 MCA



MAYNOOTH TO LEIXLIP PROJECT

Appendix 3.3

Public Consultation Report

Kildare County Council

Maynooth to Leixlip Project

**Public Consultation – Constraints
and Options**

272691-ARUP-02-OS-RP-ZM-000001-S3-P02

Draft 2 | 20 October 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691

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Table 1.1: Public Consultation Visitors

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Figure 1.1: Study Area (© Google Map data ©2020 Tele Atlas)

Appendices

Appendix A

Public Consultation Advertisements

Appendix B

Public Consultation on Project Website

Appendix C

Junction 7 Landowner Letter Template

Appendix D

Public Consultation Information Boards

Appendix E

Notification on the Project Website that the Public Consultation has now ended

Appendix F

Project Website Analytics

Appendix G

Virtual Engage Analytics

1 Introduction

1.1 General

Arup has been appointed by Kildare County Council to provide multi-disciplinary technical consultancy services for the delivery of the Maynooth to Leixlip Project, on behalf of Kildare County Council and South Dublin County Council.

The aim of the Maynooth to Leixlip Project is to assess the needs of the M4/N4 mainline corridor and junctions from Maynooth to Leixlip in terms of catering for future demand from a safety and operational efficiency perspective. This includes assessing alternative transport modes within the study area.

The Maynooth to Leixlip Project is being implemented in accordance with Transport Infrastructure Ireland's Project Management Guidelines (PMGs). These guidelines provide a framework for the management, development and delivery of national road and public transport capital projects. The Project Management Guidelines divide the evolution and progression of a project into an eight-phase process (Phase 0 – 7 inclusive).

Arup has been appointed to progress the delivery of the project through Phases 1 to 4 of the Project Management Guidelines. Phase 1 Concept and Feasibility was completed in July 2020. The project is now at Phase 2 Options Selection.

1.2 Context

The planning, design, implementation, and safe operation of national roads in Ireland is the responsibility of Transport Infrastructure Ireland (TII), under Section 17 of the Roads Act, 1993. Working in partnership with the Department of Transport, the National Transport Authority and local authorities, TII strives to provide sustainable transport infrastructure and services, delivering a better quality of life, supporting economic growth and respecting the environment.

The M4/N4 national road is the primary artery connecting Dublin to the west and northwest of the country from the M50 in Dublin to Sligo over a total length of approximately 200km. It is a dual carriageway standard from the M50 to Junction 5 Leixlip incorporating direct accesses, bus facilities, bus stops, footways and cycleways. It is motorway standard from Junction 5 Leixlip in County Dublin to Coralstown in County Westmeath over a length of approximately 53km and it is a mixture of single and dual carriageway from Coralstown in County Westmeath to Sligo.

The section of M4/N4 corridor under consideration includes the M4 mainline carriageway from Maynooth to Leixlip, the associated mainline junctions and the surrounding transport network.

This section traverses two local authority boundaries, Kildare County Council and South Dublin County Council.

A Section 85 Agreement has been entered into by both local authorities, which appointed Kildare County Council as the Lead Local Authority and Sponsoring Agency of the project. TII, acting as the Approving Authority, have appointed Kildare National Roads Office to project manage the delivery of the project. The project is being delivered in conjunction with the National Transport Authority.

The existing M4/N4 corridor is predominantly within the boundary of Kildare County Council, with 1.5km of the approximate 10km length within the boundary of South Dublin County Council.

The study area is largely greenfield agricultural land punctuated by the urban centres of Maynooth, Celbridge and Leixlip.

The study area for the project is presented in Figure 1.1.

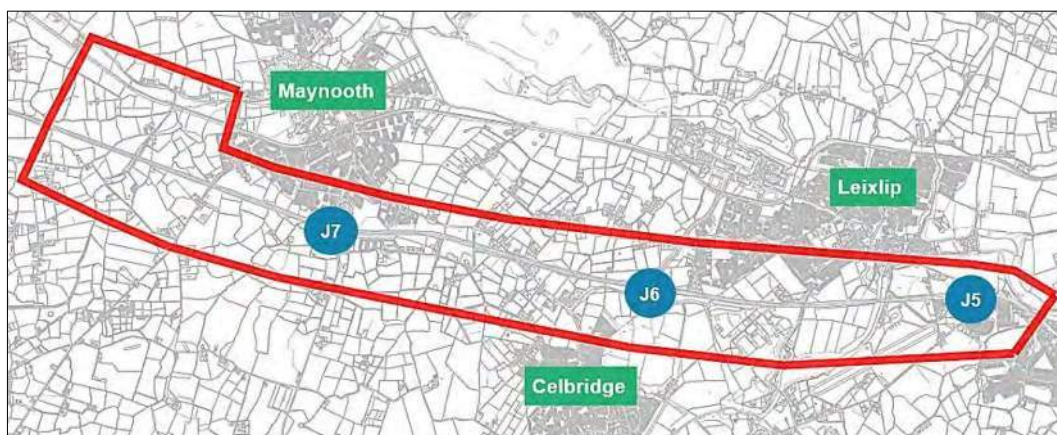


Figure 1.1: Study Area (© Google Map data ©2020 Tele Atlas)

1.3 Public Consultation

In line with the TII PMGs, a key attribute of project development is the facilitation of stakeholder engagement by the Sponsoring Agency. To be effective and informative, such stakeholder engagements must be open, engaging, and continuous.

Public consultation during the options development phase is non-statutory in nature. It aims to engage the public in the project delivery process, inform the public of the statutory process and likely time scales, seek the public's cooperation and understanding of the project and capture local knowledge as part of the EIA process. Statutory submissions and observations can be made to the Competent Authority once the statutory processes commence.

In accordance with the TII Project Managers Manual for Major National Road Projects (PE-PMG-02042), a public consultation showing options shall be held during Phase 2. This public consultation for the Maynooth to Leixlip Project has combined constraints and options.

The feedback received from this period of consultation has been reviewed by Arup and will be used to inform the development of Phase 2 Stage 2 options for the Maynooth to Leixlip Project. This report details the consultation process undertaken and summarises the key themes and commentary received from the public.

2 Public Consultation Process

2.1 Informing the Public

Prior to the commencement of the public consultation for the Maynooth to Leixlip Project, the following measures were undertaken to inform the public of this event including:

- Advertisements for the public consultation event were placed in local media, including the Leinster Leader and Liffey Champion newspapers. A copy of these adverts is included in **Appendix A**.
- Advertisements for the public consultation event were released through local radio (KFM) three times a day and throughout the duration of the public consultation.
- Notification of the public consultation was placed on the project website homepage (www.maynoothleixlip.ie) on the 8th of September 2022. This is included in **Appendix B**.
- The public consultation event was advertised by Kildare County Council and South Dublin County Council via their websites and social media platforms.
- In addition, 122 letters were issued on the 31st of August to landowners or property owners in the vicinity of Junction 7 Maynooth. Ownership details were obtainable from the Property Registration Authority. A copy of this notification is included in **Appendix C**.

2.2 Informing the Public

The online public consultation showing the constraints and options went live at 09:00 on the 8th of September 2022 and ran for a two-week period until the 22nd of September 2022. It was available to view via the project website <http://www.maynoothleixlip.ie/> on <https://maynoothleixlip.virtual-engage.com/>.

In-person public consultation events were held on the 14th and 15th of September 2022 from 14:00 – 20:00 at the Springfield Hotel in Leixlip.

Specific details of the display material presented in the online consultation room and in-person events are discussed below.

2.3 Public Consultation Information

Visitors to the online virtual room were initially directed towards a number of information boards which were developed to provide some context and explanation on the project progress, the various constraints and the selection of the options. The information boards on display were as follows:

- **Board 1 – Project Background and Description/ What are the issues:** presented an overview of the project and the issues, describing the need for intervention;

- **Board 2 – Project Objectives:** outlined the project objectives identified;
- **Board 3 – Work Completed/Timeline:** provided an overview of the Phase 1 to 4 process as well as the expected project timeline for Phases 3 and 4;
- **Board 4 - Option Selection Process/Possible Components of the Transport Options:** gave an overview of the Phase 2 assessments (Stage 1 Preliminary Options Assessment, Stage 2 Project Appraisal Matrix and the sifting process, as well as the possible components of the transport options and considerations);
- **Board 5 - Corridor Options:** provided an overview of the corridor options that have been shortlisted and will be taken forward for further assessment;
- **Board 6 – Junction/Bridge Options:** provided an overview of the junction/bridge options that have been shortlisted and will be taken forward for further assessment;
- **Board 7 – Junction/Bridge Options:** provided an overview of the junction/bridge options and active travel considerations that have been shortlisted and will be taken forward for further assessment;
- **Board 8 – Transport Options:** Demand Management, Enhanced Bus, Rail and NTA Park and Ride;
- **Board 9 – Draft Discounted Options:** provided an overview of the draft transport options and considerations that have been discounted; and
- **Board 10 – Tell us your views:** provided information on how the public can provide local knowledge and feedback on the options put forward.

The information boards are included in **Appendix D**.

2.4 Public Consultation Information

Constraints and options were displayed on an interactive map accessible within the online consultation room. Additional information included existing junctions, the Maynooth to Leixlip study area and the Maynooth Local Area Plan New Roads Objective.

Users could navigate through the map and click on the various ‘information’ symbols which provided additional information and detail on proposals/constraints for selected locations as required.

2.5 Information Brochure

A colour information brochure was prepared to provide a brief overview of the project and option development progress to date. The brochure included the same information that was provided in the display boards as noted in Section 2.3 above.

The brochure also informed members of the public on the next steps for the project and provided contact details should a member of the public wish to make a submission or speak to an Arup project team or Kildare County Council representative.

2.6 Landowner Meetings

The option of face-to-face landowner meetings were provided for landowners and property owners in the vicinity of Junction 7 Maynooth. Landowners were provided this opportunity due to an offline junction proposal in the immediate area. These took place on the 20th and 27th of September 2022 in the Glenroyal Hotel, Maynooth.

2.7 Project Email and Phonenumber

The dedicated Maynooth to Leixlip Project email address maynoothleixlip@arup.com and phone number (086 128 5719) were advertised on the project website and all public consultation material. Both were used during and after the public consultation event to answer queries and receive submissions. These means of communication will remain available to the public through the planning and design phases to enable the ongoing public engagement to continue.

An additional email (maynoothleixlipPLO@arup.com) was also provided for landowners and property owners in the vicinity of Junction 7 Maynooth.

2.8 Project Website

All material displayed during the public consultation, including the information boards, brochure and interactive maps were published on the project website (<https://maynoothleixlip.ie/>) following the conclusion of the event. A notification was included on the project website homepage and also in the bulletins section. These are included in **Appendix E**.

3 Feedback from Public Consultation

3.1 Online Platform Visitors and Views

The online consultation room attracted a total of 2,913 views over the course of the public consultation period. A breakdown of the number of visitors to the display room over the duration of the event is presented in Table 1.1 below.

Date	Total Public Consultation Clicks	Day
08/09/2022	343	Thursday
09/09/2022	422	Friday
10/09/2022	116	Saturday
11/09/2022	413	Sunday
12/09/2022	570	Monday
13/09/2022	270	Tuesday
14/09/2022	163	Wednesday
15/09/2022	748	Thursday
16/09/2022	91	Friday
17/09/2022	59	Saturday
18/09/2022	111	Sunday
19/09/2022	79	Monday
20/09/2022	116	Tuesday
21/09/2022	33	Wednesday
22/09/2022	49	Thursday

Table 1.1: Public Consultation Visitors

3.2 Online Platform Analytics

The project website analytics are included in **Appendix F**. The virtual engage room analytics are included in **Appendix G**.

3.3 Consultation Meetings with Landowners

A total of ten meetings were held on the 20th and 27th of September in the Glenroyal Hotel, Maynooth with resident landowners in the vicinity of Junction 7 Maynooth.

3.4 Submissions Received

A total of 47 submissions were received through the online project feedback form.

4 Analysis of Submissions Received

The information presented below provides a summary representation of the feedback received during the consultation period. Feedback is not presented in order of importance. The submissions received raised issues and topics across a very broad spectrum, including inter alia environmental concerns, local and community issues, amenities, property and land impacts and personal matters. It is not intended to convey particular personal concerns raised within this report and instead, submissions have been reviewed to establish principal themes and topics identified therein.

Junction 6 Celbridge was brought to the attention of the project team numerous times in relation to the safety of vulnerable road users. It was noted that it is difficult to make safe movements through Junction 6 due to the high speed of vehicular traffic and the current configuration of vulnerable road user facilities.

Junction 7 Maynooth was brought to the attention of the project team numerous times in relation to capacity and traffic issues throughout the morning and evening peak times. Additional concerns were raised regarding the safety of vulnerable road users navigating through this junction.

Numerous members of the public commented on the noise levels emitted from the M4 mainline and requested that low road surfacing and noise barriers were utilised to minimise noise pollution.

General concerns for the rising population of the surrounding areas and the road network capability of coping with rising population and associated increased vehicular traffic levels.

The bus priority measures received very positive feedback throughout the public consultation process with members of the public noting infrastructure that could support improved bus services are paramount to the successful implementation of any improvement measures.

Concerns were raised over the Maynooth Local Area Plan orbital road that was indicated on the Junction 7 Maynooth options graphics. These concerns related to the potential proximity of a new road to residents, such as Straffan Court.

Business and landowners in the vicinity of Junction 7 Maynooth noted their dissatisfaction with a potential new junction, including converting the existing Junction 7 to an overbridge, due to a potential reduction in incidental footfall to business premises along with the disturbance that new link roads in the vicinity of their dwelling houses may cause.

5 Next Steps

All submissions received as part of this non-statutory public consultation have been reviewed. The feedback received will be considered and will inform the Stage 2 Options Selection process.

The Maynooth to Leixlip Project team would like to sincerely thank all members of the public, stakeholders, community groups, businesses and other interested parties for the submissions received during the public consultation. The time and effort that has been spent in providing this input into the project is appreciated.

Appendix A

Public Consultation Advertisements

Call 045 897302

Classifieds

PLANNING NOTICES	PLANNING NOTICES	PLANNING NOTICES	PLANNING NOTICES	PLANNING NOTICES	PLANNING NOTICES	PLANNING NOTICES	PLANNING NOTICES	PLANNING NOTICES
<p>Kildare Co. Council WILLIAM HOPKINS Ireland to apply for PERMISSION for development of the site at BALLINCAMON KILDECK, CO. KILDE- RE. W/19/21/01/01 SINGLE STOREY DETACHED GARAGE AND BURNING STOVE. The planning application may be inspected at the office of the Planning Authority during its public opening hours and a submission in writing on the applica- tion may be made to the authority in the period of 5 weeks beginning on the date of receipt by the authority of the applica- tion. The planning application may be inspected at the office of the Planning Authority during its public opening hours and a submission in writing on the applica- tion may be made to the authority in the period of 5 weeks beginning on the date of receipt by the authority of the applica- tion.</p>	<p>Kildare Co. Council WILLIAM HOPKINS Ireland to apply for PERMISSION for development of the site at BALLINCAMON KILDECK, CO. KILDE- RE. W/19/21/01/01 SINGLE STOREY DETACHED GARAGE AND BURNING STOVE. 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KILDARE COUNTY COUNCIL
Kildare National Roads Office

15 SEP 2022
Lorraine Hill Dara 2022
Kildare County Council 19794

EXTENSION OF TEMPORARY ROAD CLOSURE

NOTICE IS HEREBY GIVEN OF THE DECISION OF Kildare County Council to EXTEND the duration of the closure as detailed below of the following road in accordance with section 75 of the Road Traffic Act, 1933 and the Road Regulations, 1954.

No.	Road to be Closed	From (commencing with)	To (terminating with)
1	L8010 Canal Road, Salinas	L2005	R427 Main Street, Salinas

Road Closure extended to Saturday, 21 December 2022.

The closure is required to facilitate pedestrian bypasses.

Alternative Routes:

Traffic travelling west along the L2005 (Rennistown Road, Salinas) towards Main Street Salinas, will be diverted left at the junction of the L2005 and the L8010, continuing along Church Avenue and onto the R427, Main Street Salinas, where the diversion ends.

Overseas routes will be clearly signposted, as agreed with the Council and An Garda Síochána. Emergency access and restricted local access will be maintained. Any inconvenience caused is regretted.

M4 MAYNOOTH TO LEIXLIP PROJECT

A public consultation is being held for the Maynooth to Leixlip Project.

This comprises of a virtual consultation taking place from Thursday, 8 September 2022 to Thursday, 22 September 2022.

In addition, a two-day in-person event is being held at the Springfield Hotel, Leixlip, Co. Kildare (N23 M28), as follows:

- Wednesday, 14 September 2022 from 2:00 p.m. to 8:00 p.m.
- Thursday, 15 September 2022 from 1:00 p.m. to 6:00 p.m.

For further information or to visit the virtual consultation, please visit www.kildarecounty.ie.

KILDARE COUNTY COUNCIL
Kildare National Roads Office
Tel: 045 897302 - 24 hours helpline
www.kildarecounty.ie

www.kildarecounty.ie

17 September 2022 • Liffey Champion

NEWS | 9

Maynooth housing development site discussed at special MD meeting

By Melissa O'Leary

A STRATEGIC housing development at Marlinilla, Moyrath Road, Maynooth, was the subject of discussion among councillors at a recent special meeting of Kildare County Council's District Committee.

The development of Cairn House Properties Ltd involves the construction of 200 apartments, 20 of which are student accommodations, offering 200 student beds spaces, as well as a crèche consisting

of 700 sqm, two retail units, and associated site works. Mr Robert Lynch, Senior Executive Director of Cairn House Properties, presented a proposal to the committee at the meeting.

Mr Lynch said the development is in line with the county's housing strategy and will provide much-needed student accommodation in the area.

Other councillors raised questions about the development's impact on the local area and the need for a crèche facility.

Mr Peter Healy (DUP) asked the developer to provide more information on the crèche facility and the impact on the local area.

Mr John O'Connell (DUP) asked the developer to provide more information on the impact on the local area and the need for a crèche facility.

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Carolan White (left) and Phil Wynn were enjoying the sunshine in Leixlip on Sunday morning, 18 September. By Joe Kelly

Strong demand in CAO applications to MU

By Melissa O'Leary

MAYNOOTH University has seen strong demand in CAO applications for its courses this year. There has been a high level of interest across the range of programmes of study it offers, and first year students are set to grow to over 5,500 students.

The university will offer increased places in disciplines such as computer science, biomedical sciences, physics and science education, in response to the Government's plan to increase higher education places in high demand courses where possible.

The course that had the highest number of applicants to date was the Bachelor of Science (Honours) in Biomedical Sciences.

First year students in the university. There is a significant demand for the university's new Maynooth full-time degree in Business and Law, which is set to start in 2023.

MU has an ongoing focus on research and research excellence, and there has been strong interest in the Maynooth Institute of Biomedical and Therapeutic Sciences degree.

This interest is reflected in increased public awareness of the university, particularly among first year students.

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COMHAIRLE CONTAE CHILLICK
Kildare County Council

M4 MAYNOOTH TO LEIXLIP PROJECT

A public consultation is being held for the Maynooth to Leixlip Project. This comprises of a virtual consultation taking place from Thursday, 15 September 2022 to Thursday, 22 September 2022.

In addition, a two-day in-person event is being held at the Springfield Hotel, Leixlip, Co. Kildare W22 WY08, as follows:

Thursday, 15 September 2022 from 2:00 p.m. to 8:00 p.m.

For further information or to view the virtual consultation, please visit www.maynoothleixlip.ie

KILDARE COUNTY COUNCIL
New Court Yard, Cherry Hill, Kildare, Co. Kildare, W91 22YD
Telephone: 045 832222 | Email: enquiries@kildare.ie
Council Office Hours: 09:00-17:00

www.kildarecountycouncil.ie

Appendix B

Public Consultation on Project Website

ML

Maynooth to Leixlip Project

2040

MAYNOOTH TO LEIXLIP PROJECT WELCOME / CONSULTATION / PROJECT PHASES / FAQs / CONTACT US

Maynooth to Leixlip Project
Public Consultation

[Click to enter the Public Consultation](#)

Welcome

NEWS AND UPDATES

PUBLICATIONS

Appendix C

Junction 7 Landowner Letter Template



Kildare County Council
Head Office Area- Chill Derm
Devoe Park, Naas
Co. Kildare W51 3Z73

[Redacted]

Your Ref [Redacted]

28th August 2022

Maynooth to Leixlip Project – Public Consultation on Constraints and Options

Dear Sir/ Madam,

This letter is to provide you with an introduction to the Maynooth to Leixlip Project and offer you the opportunity to meet with members of the project team to answer any questions or queries you may have on the project.

Maynooth to Leixlip Project - Background

The aim of the project is to assess the needs of the M4/N4 mainline corridor and junctions from Maynooth to Leixlip in terms of catering for future demand from a safety and operational efficiency perspective. Additionally, it aims to assess suitable alternative transport modes or routes within the study area of the M4/N4. The section of M4/N4 corridor under consideration includes the M4/N4 mainline carriageway from Maynooth to Leixlip, the associated mainline junctions and the surrounding transport network.

Kildare County Council is the lead Local Authority and Sponsoring Agency for the project. The project is being developed in partnership with South Dublin County Council. Kildare National Roads Office is the Client Project Manager for the project. Transport Infrastructure Ireland (TII) is the Approving Authority. Arup is the Technical Advisor progressing the planning and design for the project.

The project is currently in the Option Selection phase. The purpose of this phase is to firstly identify constraints to the development of the project, followed by the development of potential feasible options. These options will be examined and compared to determine an emerging preferred option for the project following public consultation.





Kildare County Council
Head Office Area Chill Dara
Olive Park, Naas
Co. Kildare W90 MTTF

Public Consultation and Public Display

It is proposed to complete a public consultation and public display as follows:

1. Public Consultation on Constraints and Options – the purpose of this event is to:
 - a. Identify known and potential key constraints;
 - b. Outline the potential options being considered; and
 - c. Based on the assessment completed to date, outline the draft short-list of options being proposed for further and more detailed assessment.
2. Public Display of Emerging Preferred Option – this will outline the emerging preferred option and how the assessment came to this conclusion.

The public consultation on constraints and options, will be held in September.

Invitation to Meet

You are being contacted as your land/property is in the vicinity of potential options being considered (refer to attachment). The project team will be available to meet you at the Public Consultation event, which will have in-person events on Wednesday 14th and Thursday 15th of September at the Springfield Hotel from 14:00 – 20:00. Additionally, we have arranged availability for face-to-face meetings at the Glenroyal Hotel on Tuesday 20th and Tuesday 27th of September. Please contact me if you would like to book a meeting in the Glenroyal Hotel. Alternatively, this meeting can be facilitated via an online virtual meeting if you prefer.

If you would like to book a meeting with the project team to discuss, please contact the Maynooth to Leixlip project liaison officer at:

Telephone: +353 86 128 5719

Email: MaynoothLeixlipPLO@arup.com

Yours faithfully,

Gerard Hall

Chartered Engineer | Project Liaison Officer

Maynooth to Leixlip Project





Kildare County Council
Head Office Áras Chill Dara
Devoe Park, Naas,
Co. Kildare W91 X77F

Appended – Draft Options

Please see below the draft shortlisted options being considered in the vicinity of the existing Junction 7 Maynooth. There are two draft shortlisted options, as follows:

- Option 1 would improve the existing junction in its current location; and
- Option 2 would convert the existing junction to an overbridge and then provide a new junction between the R406 and R408.

Either of these options may impact upon your land/ property, and we would like to meet to discuss these options with you.

Option 1



Option 2



Appendix D

Public Consultation Information Boards

Project Background and Description

Kildare County Council, in partnership with South Dublin County Council, Transport Infrastructure Ireland (TII) and the Department of Transport (DoT) are developing the Maynooth to Leixlip Project.

The project is included in the National Development Plan 2021–2030 and the draft Greater Dublin Area Transport Strategy 2022–2042. The network forms part of the Trans-European Transport Network (TEN-T) comprehensive network. The section of M4/N4 corridor under consideration includes the M4 mainline carriageway from Maynooth to Leixlip, the associated mainline junctions and the surrounding transport network.

The existing M4/N4 corridor is predominantly in County Kildare with 1.5km of the approximate 10km length in County Dublin.

The study area is largely greenfield agricultural land punctuated by the urban centres of Maynooth, Celbridge and Leixlip. The Rye Water Valley/Carton SAC (Special Area of Conservation) runs parallel to the line of the M4/N4 along the Rye River from Maynooth to Leixlip. The R157 and R406 allow for the transfer of strategic traffic from the M4/N4 to the M3 and M7 respectively.

National Road projects are typically progressed through TII Phases 0 to 7 (refer to Board 3). The need for intervention and project specific objectives were determined in Phase 1 (Concept and Feasibility). The project is now at Phase 2 (Options Selection) where potential transport options to address the issues identified have been developed and are presented as part of this consultation. These options will be subject to a comparative assessment of their potential impacts, and their relative success in achieving the project objectives to determine the preferred option(s) for the project.

Who we are?

Kildare County Council is the lead Local Authority and Sponsoring Agency for the project. The project is being developed in partnership with **South Dublin County Council**.

Kildare National Roads Office is the Client Project Manager for the project.

Transport Infrastructure Ireland (TII) is the Approving Authority.

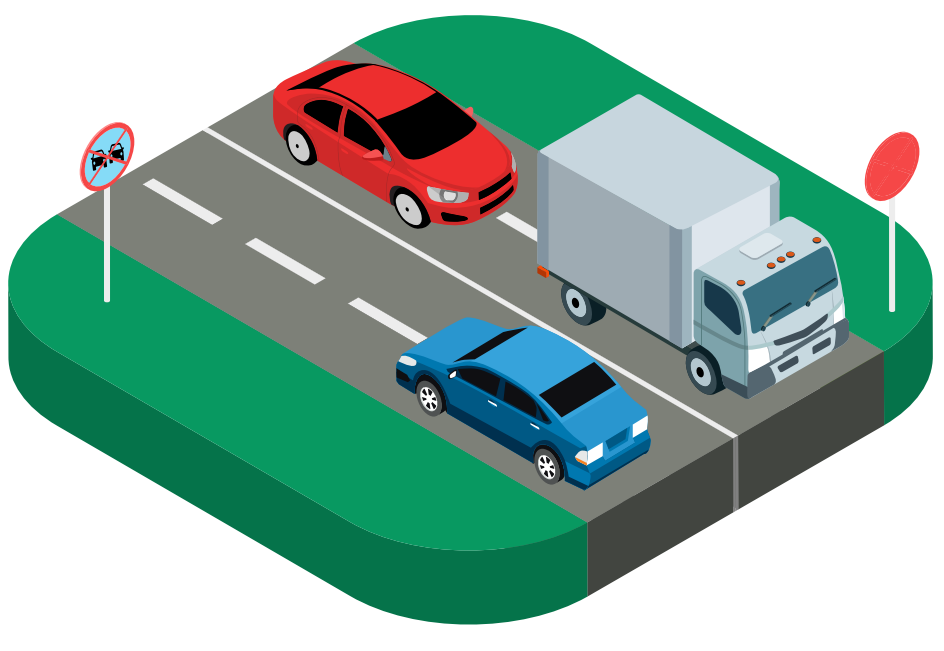
Arup is the Technical Advisor progressing the Planning and Design for the Project.

The project is being delivered in collaboration with the **National Transport Authority (NTA)**

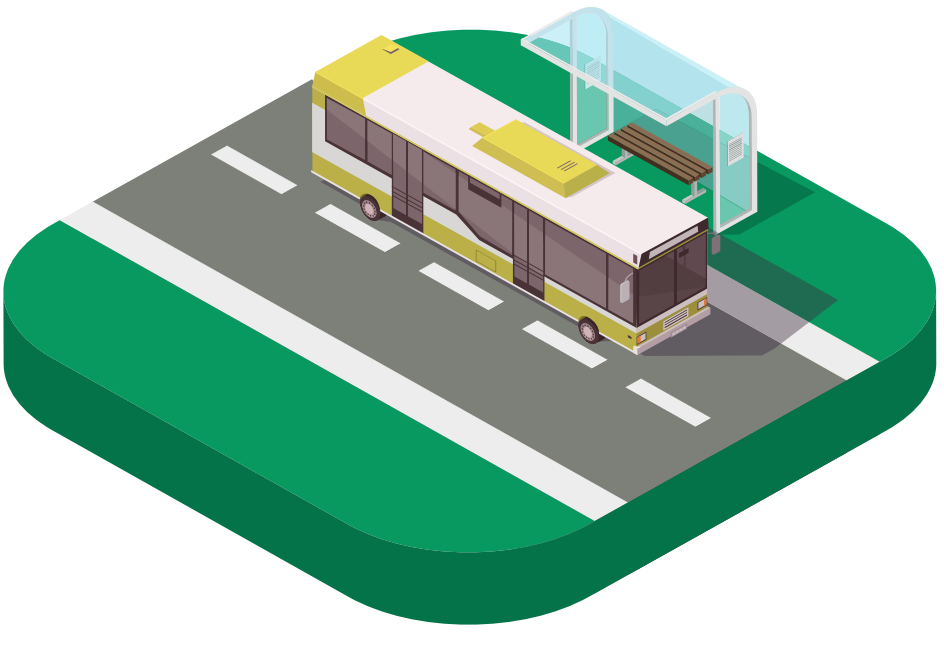


What are the issues? What is the need for intervention?

Existing Transport Situation and Initial Findings



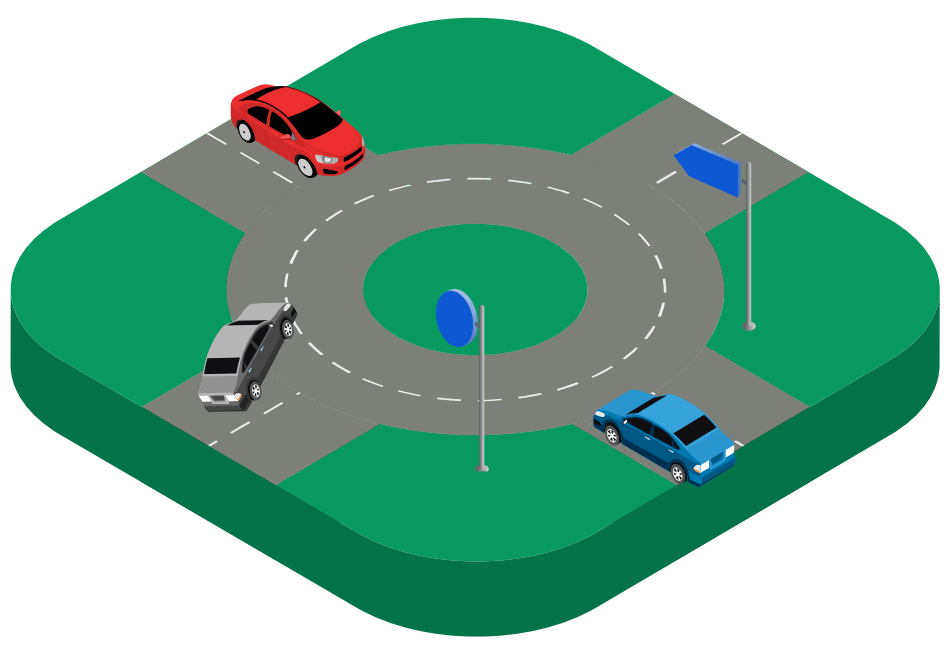
Congestion on the M4, particularly at peak times. The average annual daily traffic between Junction 6 and Junction 8 increased by circa 19% between 2013 and 2019.



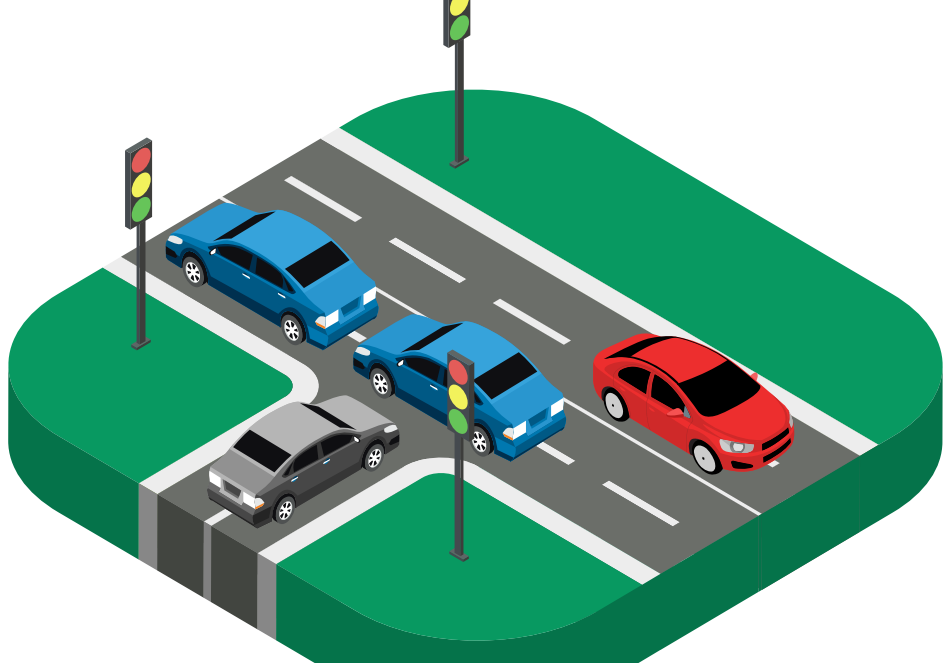
A sufficient modal shift from private car to public transport has not materialised. Bus services utilising the M4 must negotiate the same traffic volumes as private cars.



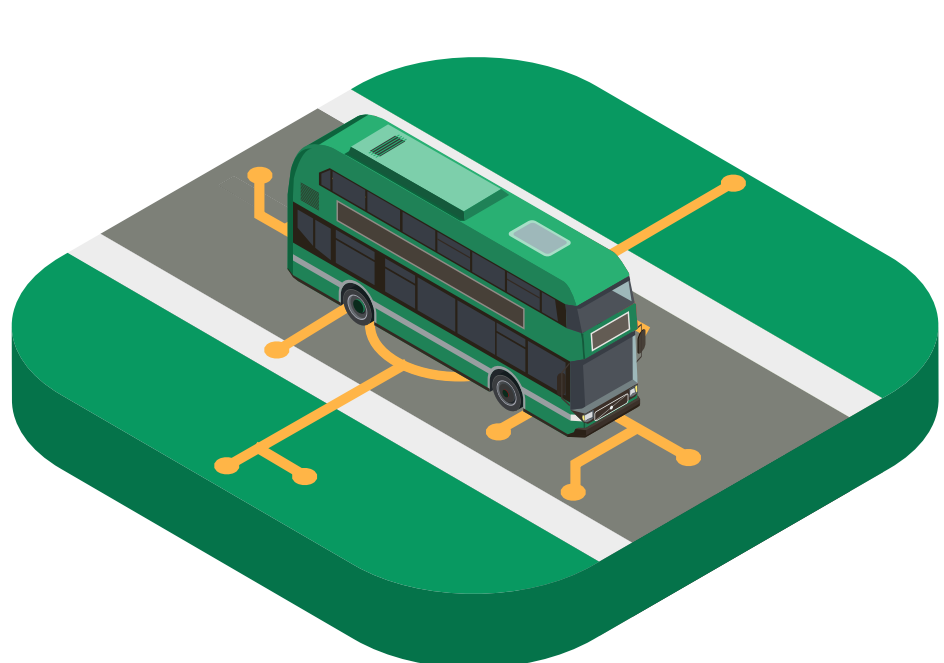
There are extensive public transport services in the study area. However, there is a relatively high dependency on private cars (>60% for Maynooth commuters).



Junction 7 Maynooth has constrained geometry and conflict issues exist between pedestrians/cyclists and road traffic.



The M4 currently serves both strategic traffic and local Greater Dublin Area traffic. This local traffic is impacting on the M4 capacity to act as a strategic route.



There is an opportunity to enhance or complement the existing and proposed bus infrastructure within the study area.

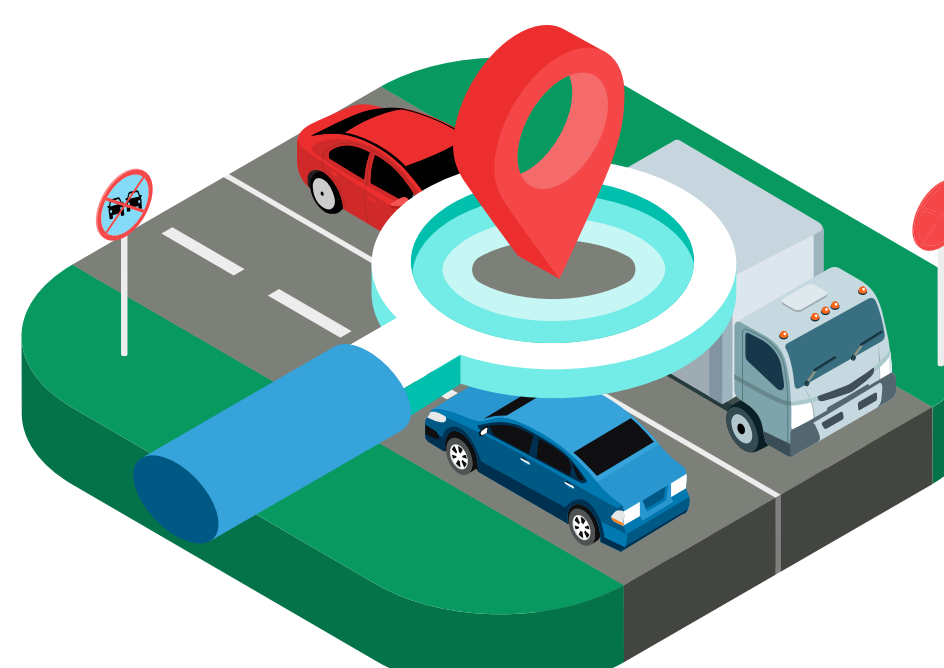


A number of options for improvement and enhancement may be required which are integrated and connected.



Options will need to support a dedicated modal shift from private car to public transport.

Policy



The M4/N4 is part of the TEN-T comprehensive network and is specifically noted in the National Planning Framework, National Development Plan and draft Greater Dublin Area Transport Strategy 2022 - 2042.



Local policy documents reinforce the requirement to improve the safety and operational efficiency of Junction 7 Maynooth and the optimisation and protection of Junction 6 Celbridge.

Project Objectives



- E1** - Provide a more reliable and resilient transport solution
- E2** - Manage congestion on the M4 corridor
- E3** - Provide the infrastructure to enable transport solutions to move more people more efficiently
- E4** - Support the protection of the economic prospects of Maynooth, Leixlip, Celbridge, Kilcock, Enfield and their rural hinterland
- E5** - Facilitate effective strategic traffic movement, including from the regional centres of Athlone and Sligo
- E6** - Facilitate effective freight movement

S1 - Enable the provision of a safer travelling environment for all road users, including vulnerable road users



ENV 1 - Facilitate an increase in modal shift from private car to public transport and walking/cycling thus supporting a transition towards low carbon and climate resilience

A1 - Provide improved accessibility to the Greater Dublin Area public transport network from regions outside of the Greater Dublin Area

A2 - Support improved connectivity for all road users to public transport

A3 - Enable the successful creation of place making and assist in the generation of vibrant communities



- I1** - Provide the infrastructure to support an improved balance of transport modes
- I2** - Support greater road based user integration and connectivity with all other transport modes

PA 1 - Improve infrastructure in, across and adjacent to the M4/N4 corridor which may form barriers to physical activity and in particular linkage between key local trip attractors including education, work, residential, leisure and natural environment

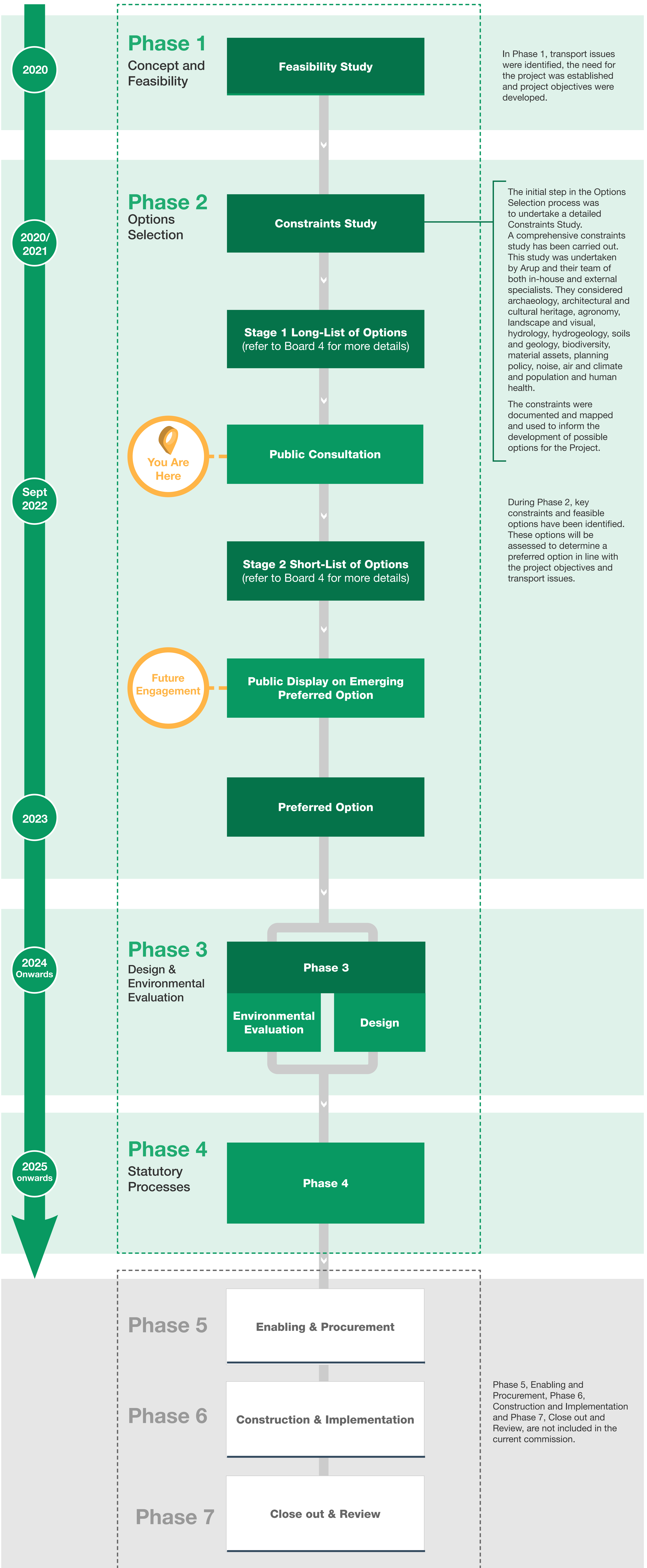
PA 2 - Support the provision for cycle parking and infrastructure at key public transport nodes and destinations

PA 3 - Support the creation of a healthy environment conducive to active travel

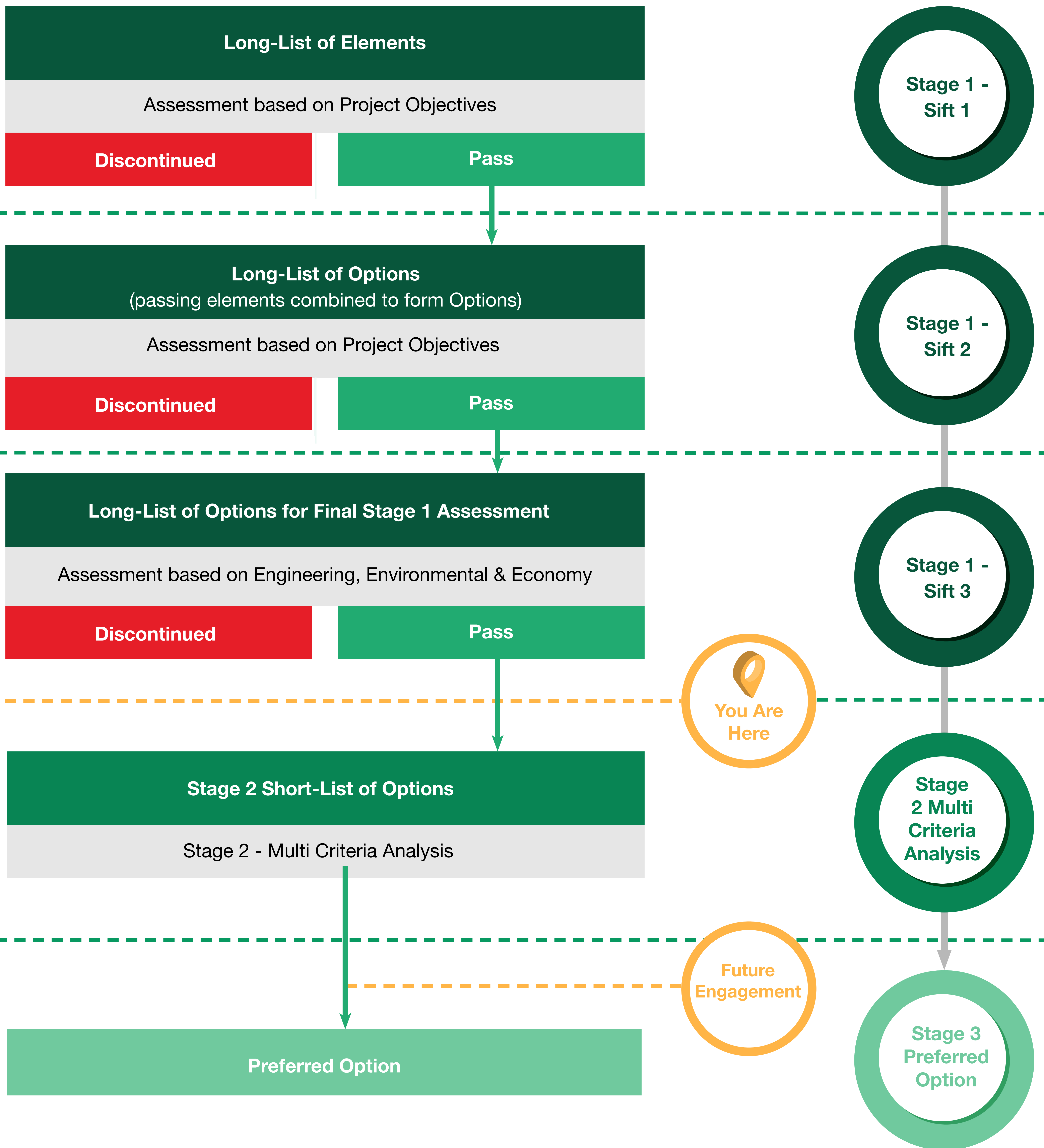


Work Completed to Date and Timeline

The current commission is to progress the project to the completion of Phase 4, Statutory Processes, of the TII Project Management Guidelines. Phase 5, Enabling and Procurement, Phase 6, Construction and Implementation and Phase 7, Close out and Review, are not included in the current commission.



Options Selection Process Overview



Possible Components of the Transport Options



Options Versus Considerations

Options

are potential interventions being assessed and if chosen as the preferred option, would typically be delivered under the scope of this project.

Considerations

are potential solutions that would complement this project but would not typically be within the scope of this project to deliver. For example, under Rail, the DART+West benefits have been factored into the traffic projection. Under NTA Park & Ride considerations, potential NTA Park & Ride sites would be considered on the preferred option to complement each project, as appropriate.

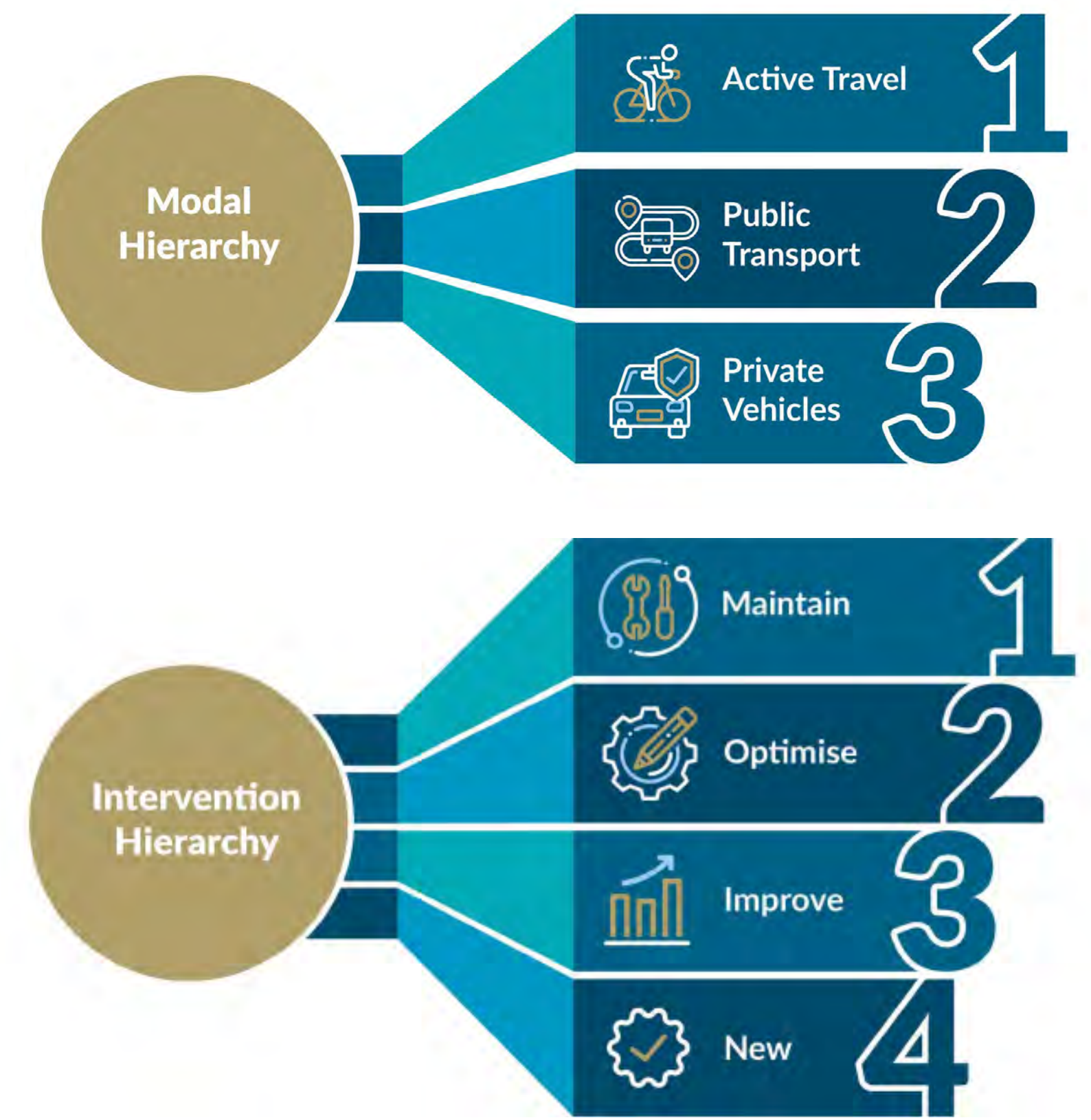


Overview

The potential transport options have been developed to include all modes in the National Investment Framework for Transport in Ireland hierarchy which seeks to prioritise active travel modes such as walking and cycling, followed by public transport over the use of private vehicles.

The potential transport options have also been considered incrementally in line with the hierarchy of intervention which seeks to make the best use of the existing asset through maintenance, optimisation, improvement and finally through the construction of new infrastructure.

The potential transport options to address the issues include bus, rail, active travel, demand management, park and ride and corridor options (contain bus and road based options).

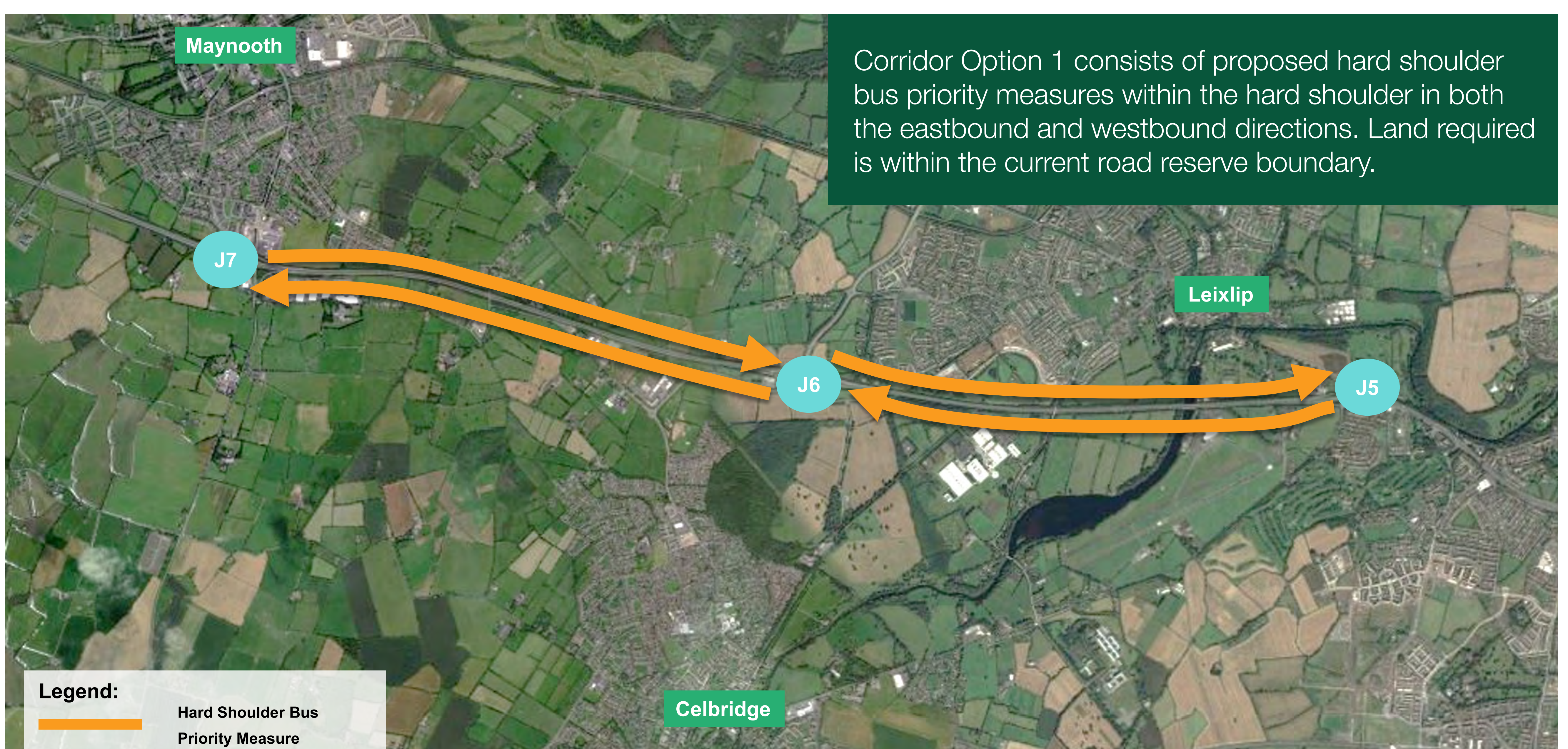


National Investment Framework for Transport in Ireland - Modal and Intervention Hierarchy

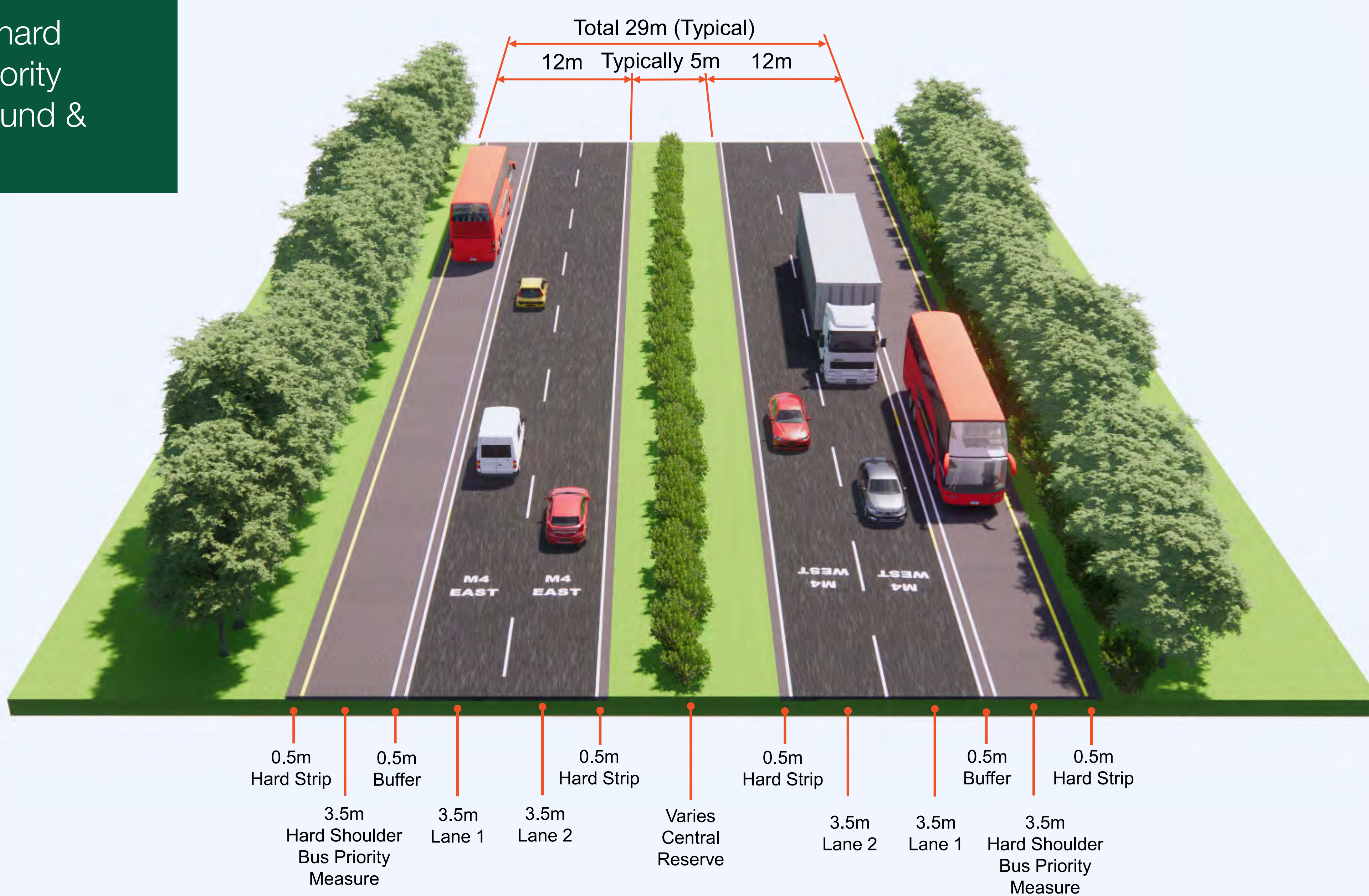
Corridor Options (Corridors contain Bus and Road based Options)

Potential Transport Options that have been shortlisted and will be taken forward for further assessment

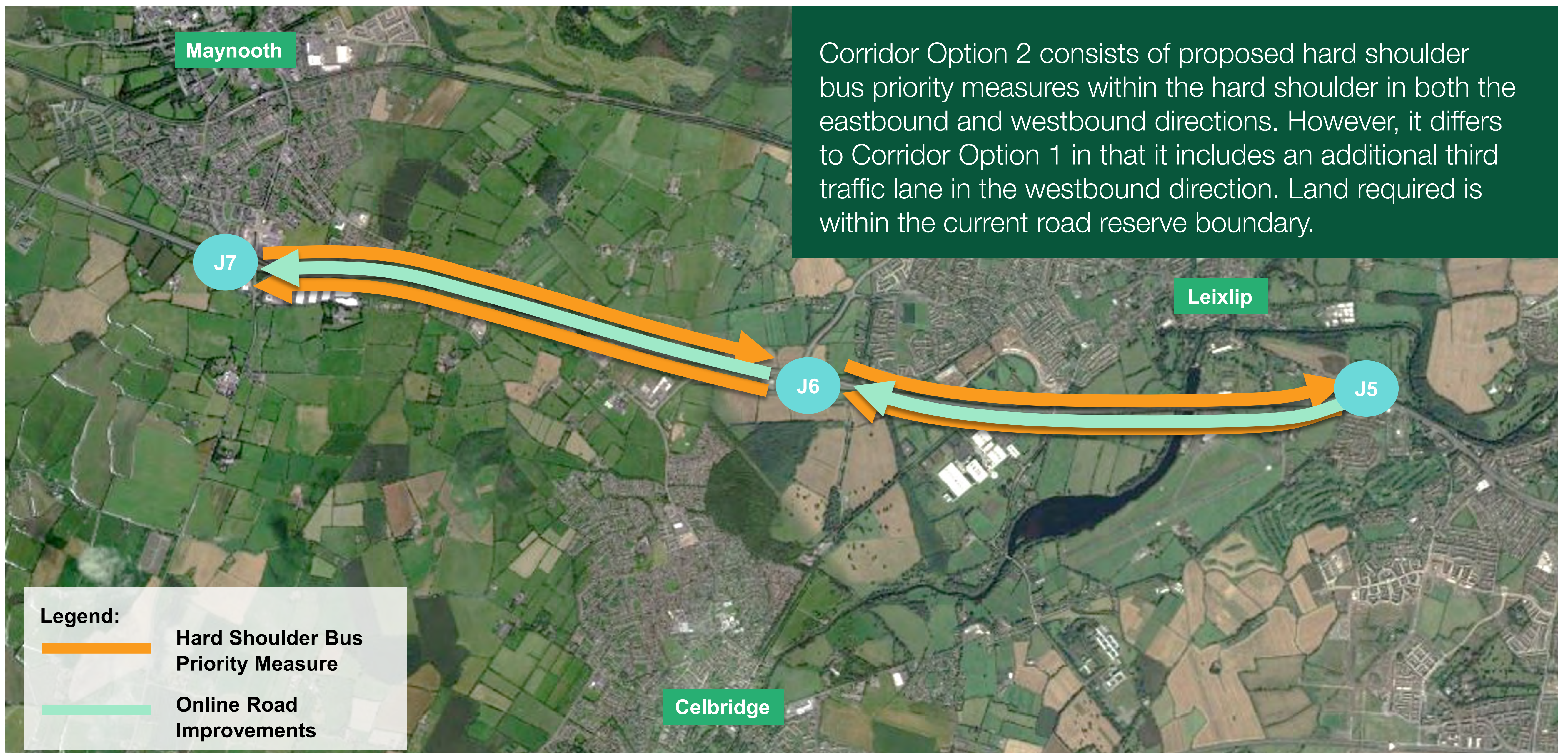
Corridor Option 1



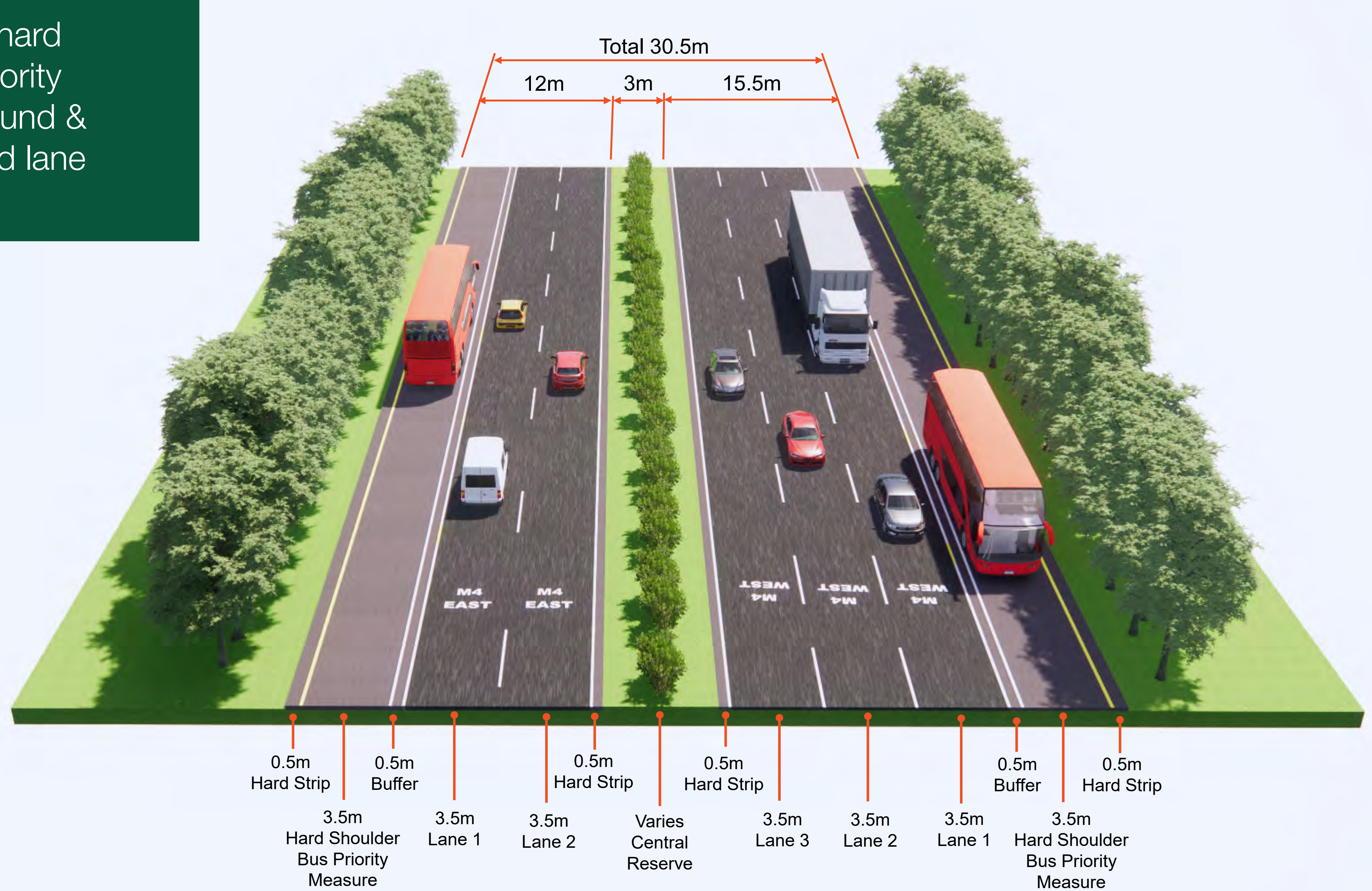
Typical detail of hard shoulder bus priority measure eastbound & westbound



Corridor Option 2



Typical detail of hard shoulder bus priority measure eastbound & westbound & 3rd lane westbound

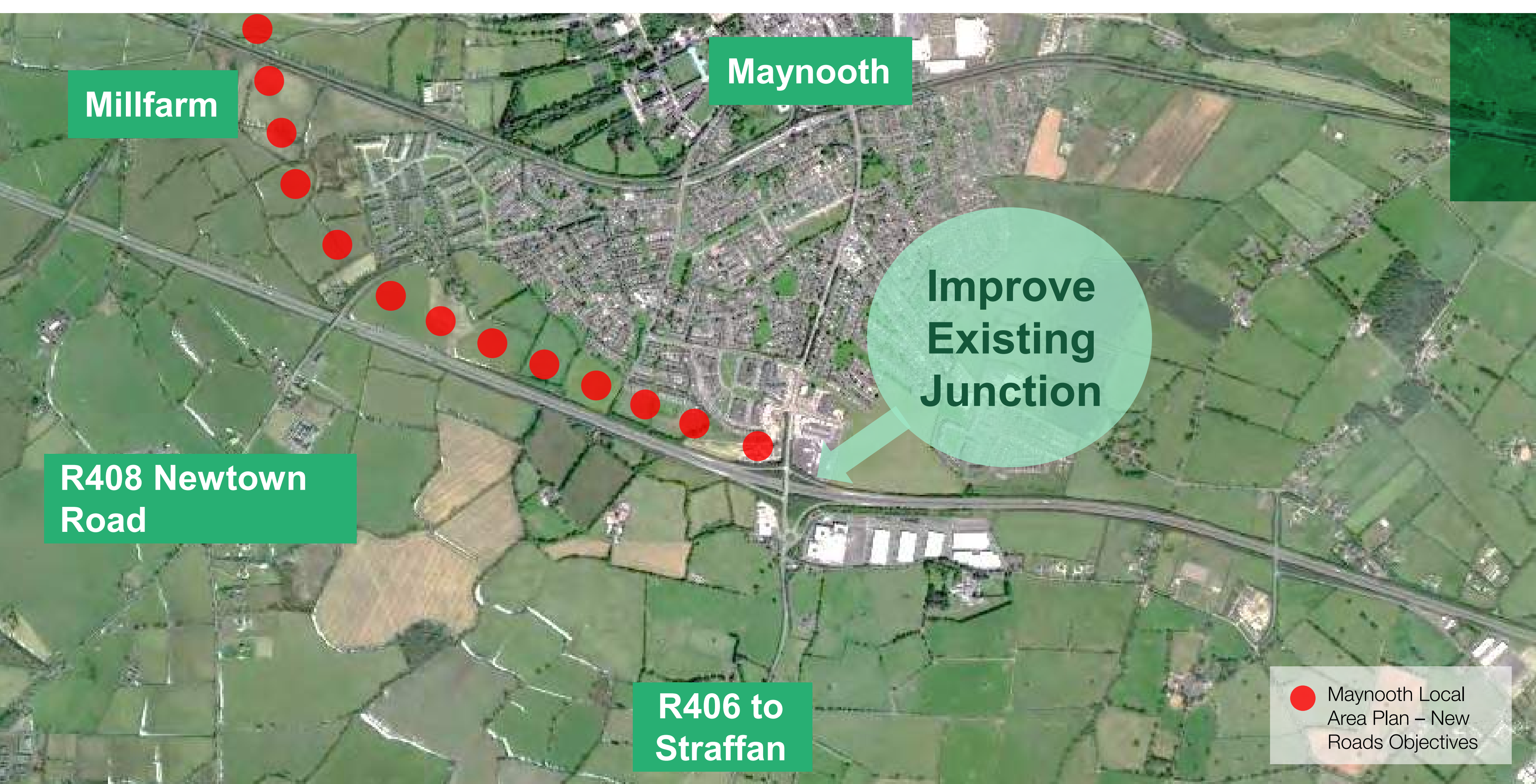


Junctions / Bridges Options

Potential Transport Options that have been shortlisted and will be taken forward for further assessment

Active Travel options are being considered at all junction and bridge locations shown.

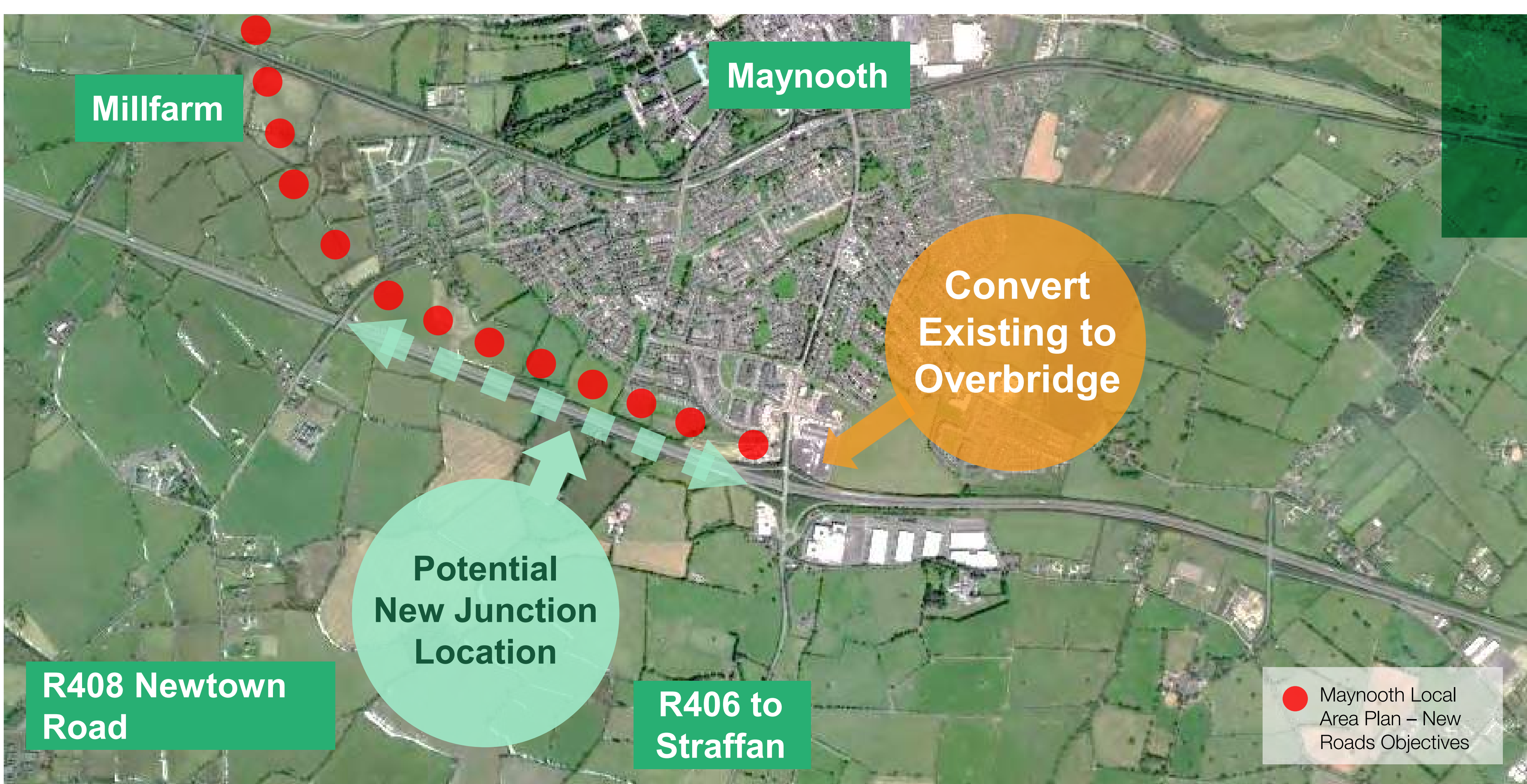
Junction 7 Maynooth Option 1



Option 1 - Maintain and Optimise / Improve Existing

- 1 Maintain
- 2 Optimise
- 3 Improve

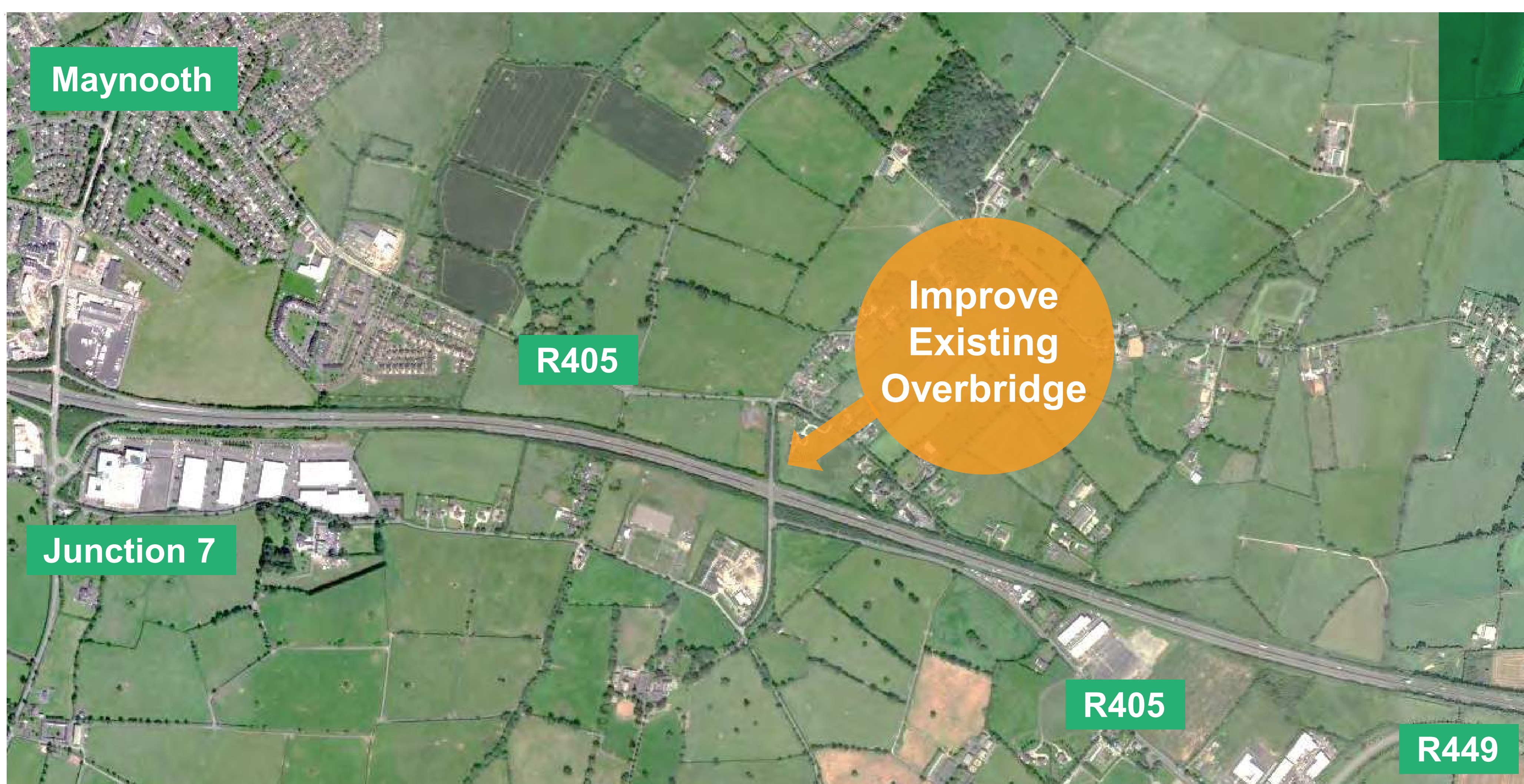
Junction 7 Maynooth Option 2



Option 2 - Provide 1 New Junction & Convert Existing to an Overbridge

- 1 Maintain
- 2 Optimise
- 3 Improve
- 4 New

R405 Ballygoran Overbridge



Maintain and Optimise / Improve Existing

- 1 Maintain
- 2 Optimise
- 3 Improve

Junction 6 Celbridge



Maintain and Optimise / Improve Existing

- 1 Maintain
- 2 Optimise
- 3 Improve

R404 Overbridge



Maintain and Optimise / Improve Existing

- 1 Maintain
- 2 Optimise
- 3 Improve

Junctions / Bridges Options

Potential Transport Options that have been shortlisted and will be taken forward for further assessment

Active Travel options are being considered at all junction and bridge locations shown.

Junction 5 Leixlip



Maintain and Optimise / Improve Existing

-  Maintain 1
-  Optimise 2
-  Improve 3



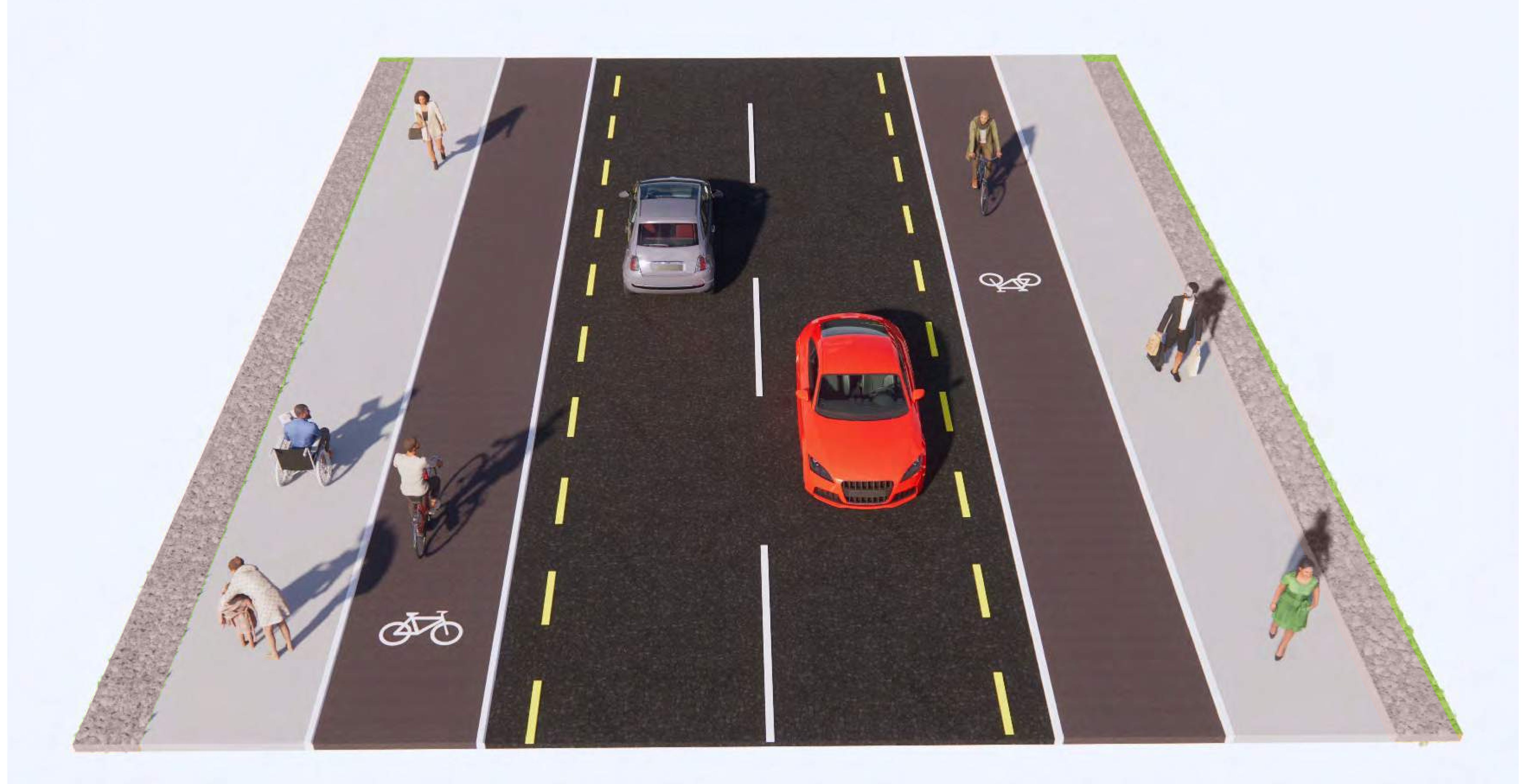
Active Travel means walking or cycling as part of a purposeful journey. Walking as part of a commute to work, cycling to the shop, or scooting to school are all considered Active Travel.

Active Travel is included in all junction and bridge options.



Legend:

 Key Active Travel Linkage shortlisted for further assessment



Cycle Parking

Provision for cycle parking and infrastructure will be a consideration on the preferred option.

Demand Management, Enhanced Bus, Rail and NTA Park and Ride

Potential Transport Options & Considerations that have been shortlisted and will be taken forward for further assessment



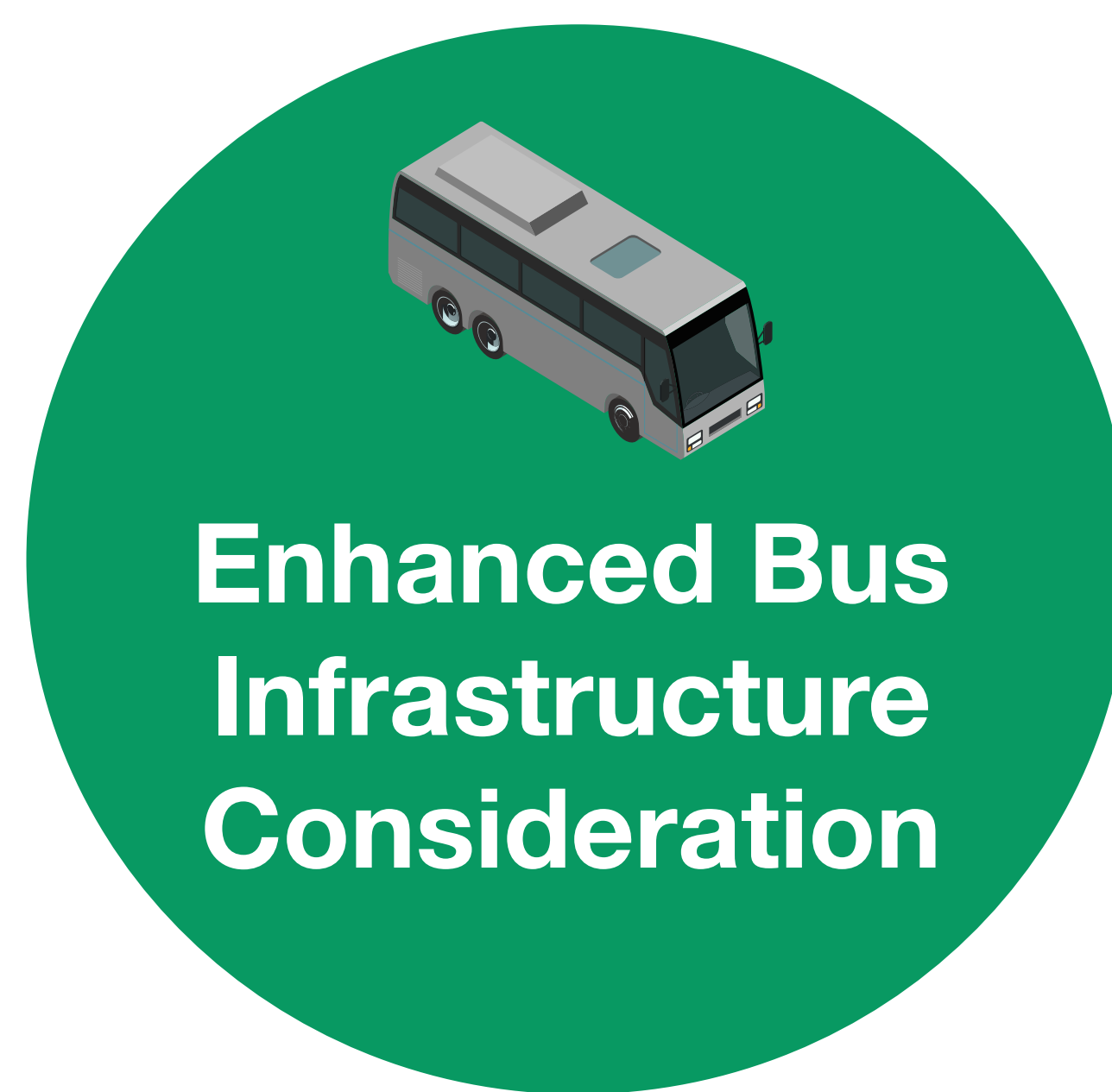
Demand Management Options & Considerations

Demand management includes measures to optimise the operational efficiency of the transport network.

A number of options will be taken forward for consideration on the preferred option.

In addition, two options have been shortlisted for further assessment at the next stage of assessment before being considered on the preferred option, these include:

- Congestion Charges, Road Pricing and Tolling; and
- Ramp Metering/Junction Access Control Signals



Enhanced Bus Infrastructure Consideration

This will be considered on the preferred option in consultation with the NTA.



Rail Considerations

The DART+ West Project is a project proposed by Irish Rail and separate to the Maynooth to Leixlip Project. However, the potential benefits and impacts of the DART+ West Project will be accounted for within the Maynooth to Leixlip Project.



NTA Park & Ride Considerations

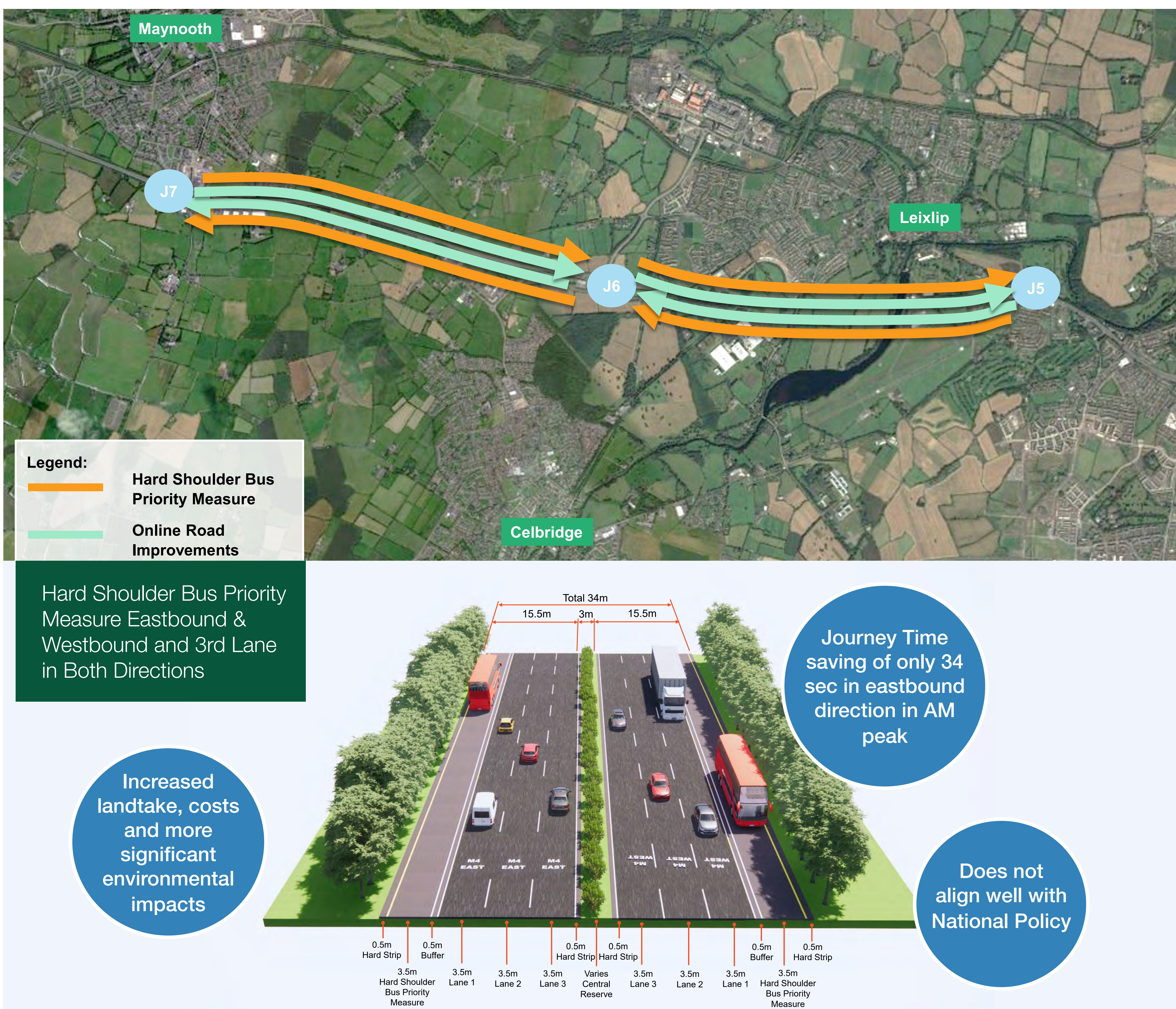
As per the GDA Transport Strategy 2022 – 2042, the NTA are currently developing a Park & Ride Strategy for the M4/ N4 corridor. The Park & Ride Strategy is separate to the Maynooth to Leixlip Project. However, any proposals by the NTA for Park & Ride locations on the M4/ N4 corridor will be accounted for within the Maynooth to Leixlip Project.

Draft Discounted Options

Corridor Option 3 consisted of proposed hard shoulder bus priority measures within the hard shoulder in both the eastbound and westbound directions. However, it differed to Corridor Option 1 and 2 in that it included an additional third traffic lane in both the eastbound and westbound directions. Therefore, it had wider extents than either Corridor Option 1 or Corridor Option 2. The typical width of this option was circa 34m.

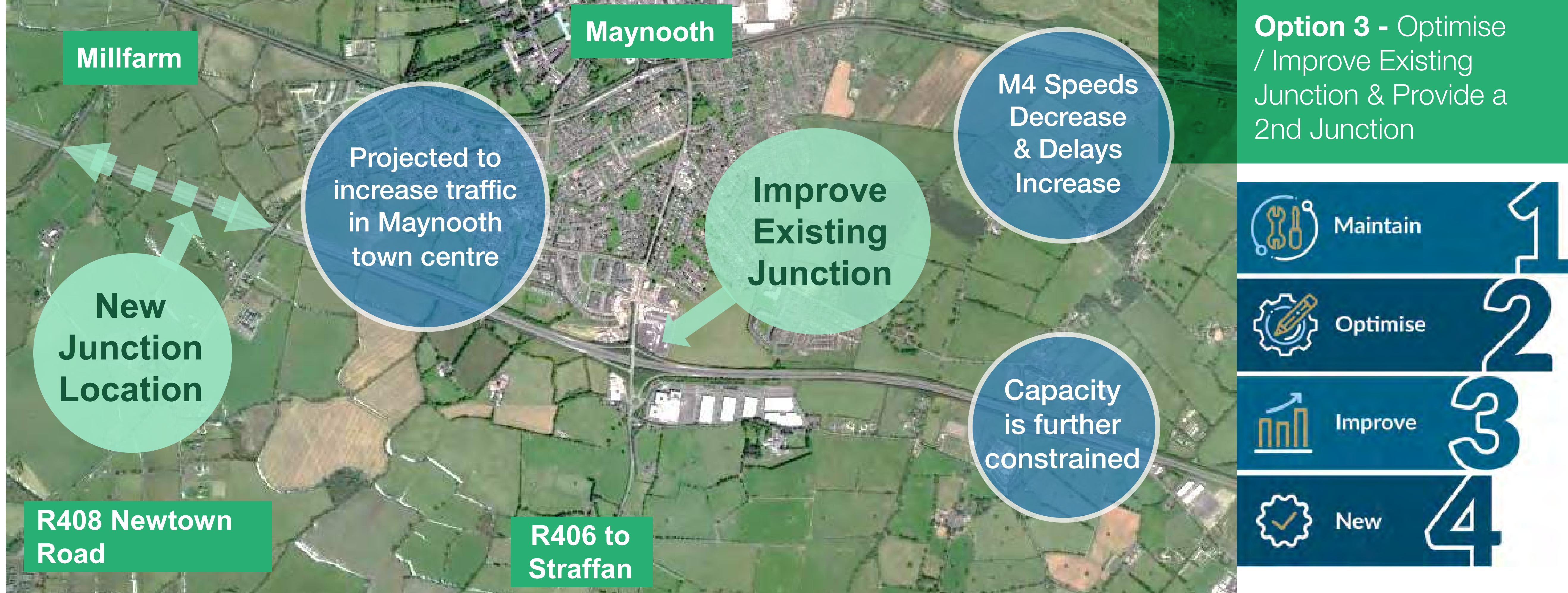
This option was not shortlisted following Stage 1 Engineering, Environment and Economy Assessment and did not align well with national policy, therefore it has been discounted.

Corridor Option 3 - Draft Discounted

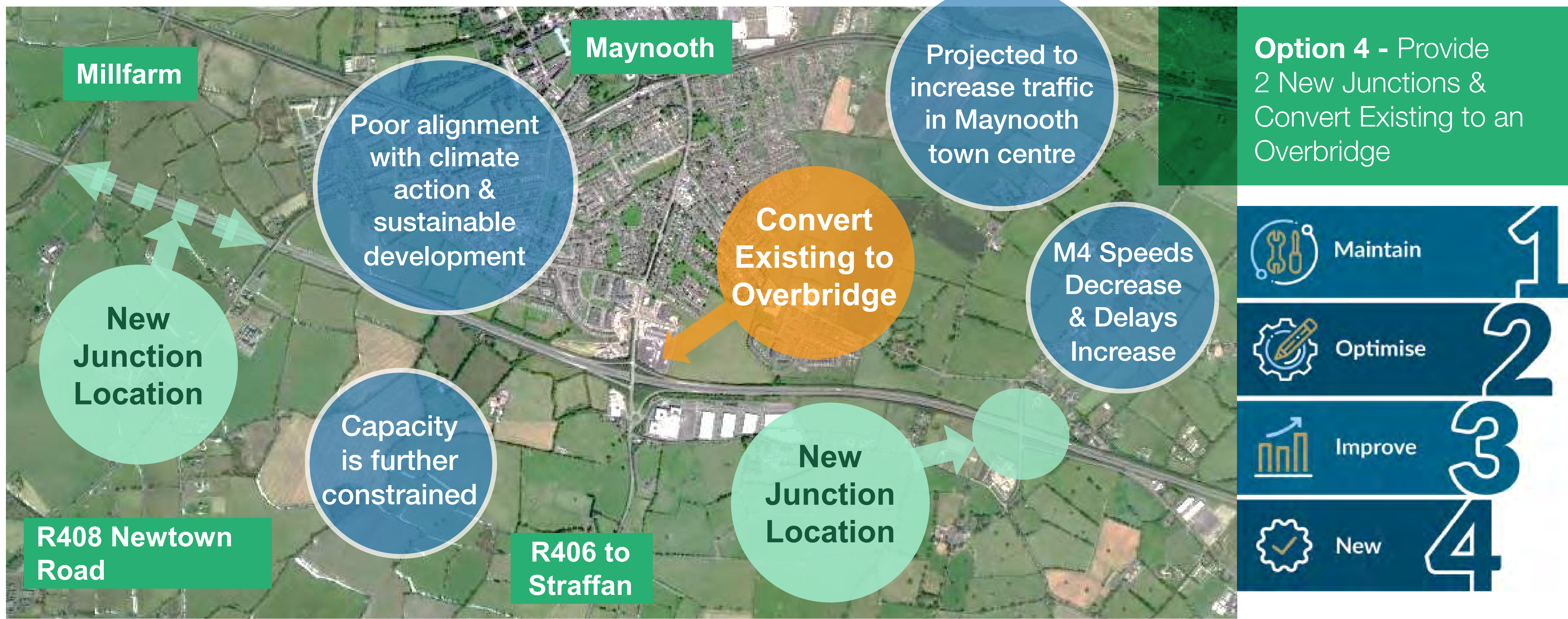


Junction 7 Maynooth Option 3 - Draft Discounted

Junction 7 Option 3 and 4 were not shortlisted following Stage 1 Engineering, Environment and Economy Assessment and did not align well with national policy, therefore they have been discounted.



Junction 7 Maynooth Option 4 - Draft Discounted

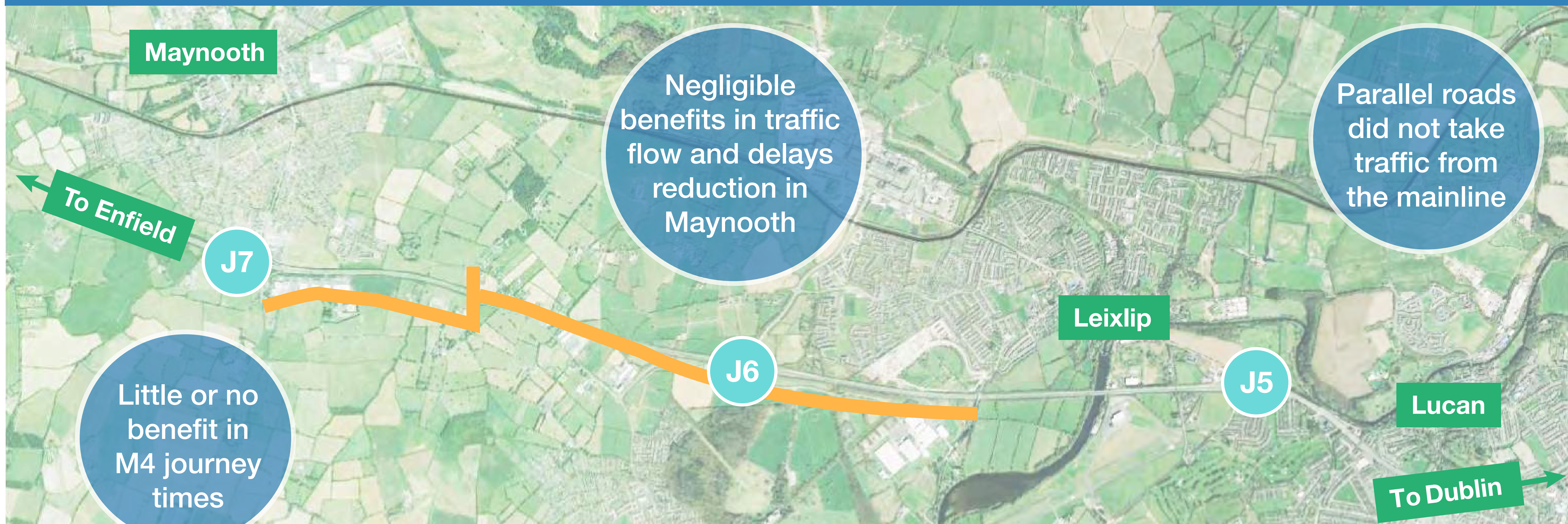


Parallel Roads - Draft Discounted

Three Options were examined:



A comparative assessment of the three options was carried out, whereby Option 2 Southern Parallel Road was preferred over Option 1 Northern Parallel Road and Option 3 Combination of Northern and Southern Parallel Roads. Therefore, Option 2 Southern Parallel Road was brought forward for further assessment. However, this option did not meet the project objectives when assessed at the subsequent Sift 2, therefore it has been discounted.





Tell us your views

What transport options within the scope of the project do you think we should consider and why?

What potential transport option shown do you prefer and why?

What do you think matters?

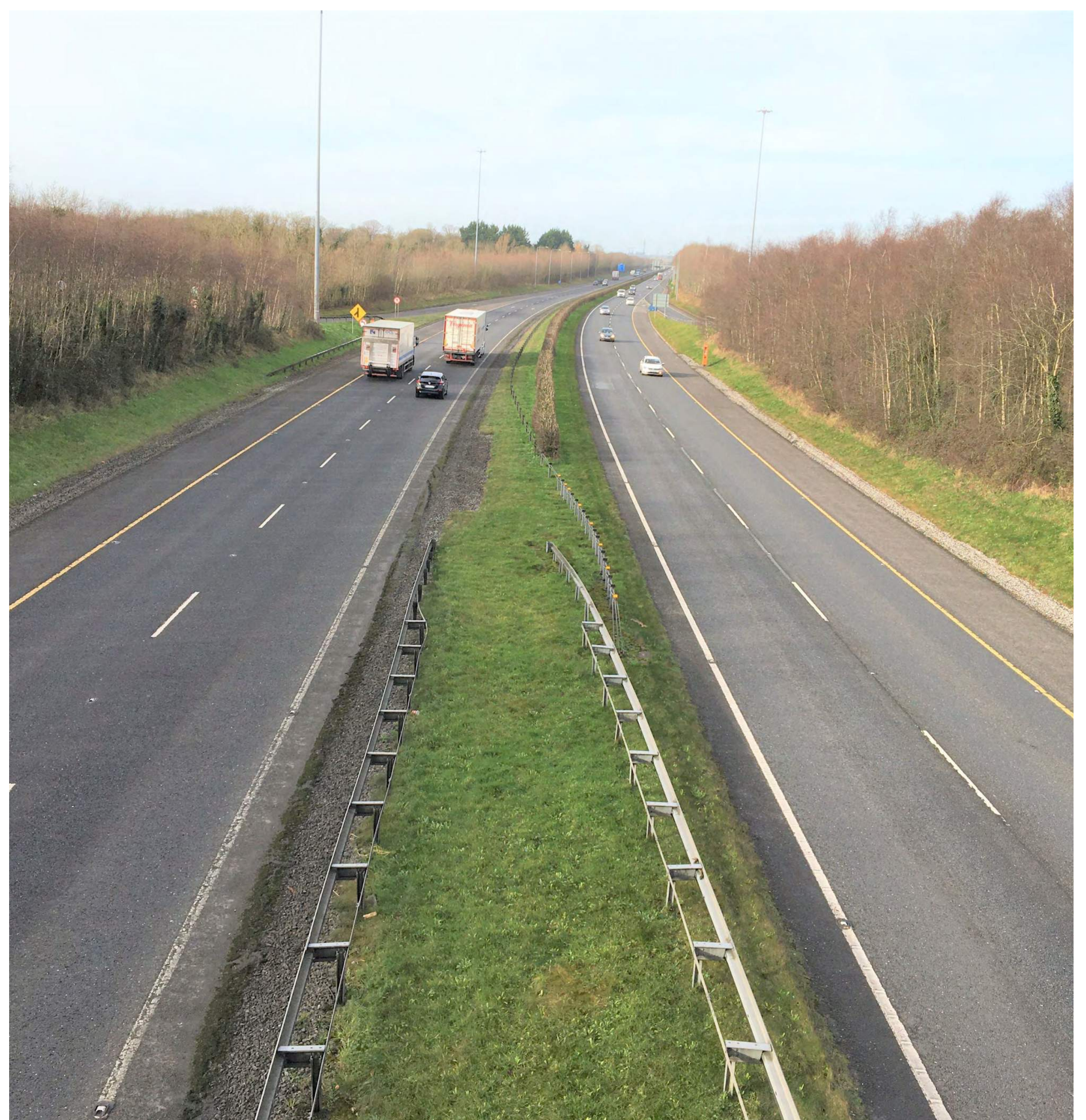


Together with a virtual consultation taking place from Thursday 8th September 2022 to Thursday 22nd September 2022, a two-day in-person event is being held at the Springfield Hotel, Leixlip, Co. Kildare W23 W280, as follows:

Wednesday 14th September 2022 from 2pm to 8pm

Thursday 15th September 2022 from 2pm to 8pm

If you have any questions and would like to meet with a member of the design team please come along to one of our in-person events. Alternatively you can send us an email at the address below.



Your opinion counts – Tell us what you think! Please complete the feedback form



Contact

Website	www.maynoothleixlip.ie	Post	Arup 50 Ringsend Road, Dublin D04 T6X0
Phone	+353 86 128 5719		
Email	maynoothleixlip@arup.com		



Appendix E

Notification on the Project
Website that the Public
Consultation has now ended

here.' On the right, a sidebar lists 'NEWS AND UPDATES', 'PUBLICATIONS', and 'BULLETIN NO. 1'."/>

Maynooth to Leixlip Project

Tionscatal Éireann
Project Ireland
2040

MAYNOOTH TO LEIXLIP PROJECT WELCOME / CONSULTATION ▾ / MAPS ▾ / PROJECT PHASES ▾ / FAQS / CONTACT US

The Maynooth to Leixlip Project Public Consultation Constraints and Options has now ended. The material that was on display at the public consultation is available [here](#).

NEWS AND UPDATES

PUBLICATIONS

BULLETIN NO. 1



Bulletin No. 1 – 23 September 2022

The planning and design of the Maynooth to Leixlip Project has been progressing over the past number of years.

Phase 1 (Concept and Feasibility) concluded in 2020.

Phase 2 (Options Selection) is currently ongoing. An online virtual public consultation showing constraints and options took place from Thursday the 8th of September 2022 to Thursday the 22nd of September 2022. A two-day in-person event was held at the Springfield Hotel, Leixlip, Co. Kildare W23 W280 on Wednesday the 14th of September 2022 from 2pm to 8pm and Thursday the 15th of September 2022 from 2pm to 8pm.

A public display of an emerging preferred option(s) for the project, together with the publication of the Option Selection Report is scheduled for early 2023.

The project will take a number of years to pass through the various steps required for Phase 2, Phase 3 (Design and Environmental Evaluation) and Phase 4 (Statutory Processes), provided it successfully progresses through each Phase.

Phase 3 (Design and Environmental Evaluation) timeframes will be dependent on the nature, scale and complexity of the emerging preferred option(s) identified in Phase 2. Provisionally, this will be 2024 onwards.

This in turn will impact on the subsequent Phase 4 (Statutory Processes). Provisionally, this will be 2025 onwards.

Further information on the Maynooth to Leixlip Project will be communicated via the project website (<https://maynoothleixlip.ie/>) as the project progresses.

Should you have any queries, contact details are below.

Website: <https://maynoothleixlip.ie/contact-us/>

Phone: +353 86 128 5719

Email: maynoothleixlip@arup.com

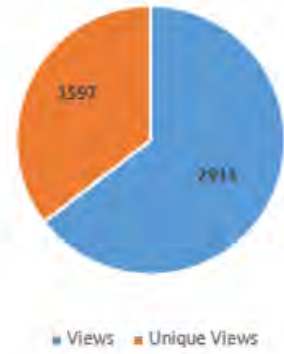


Appendix F

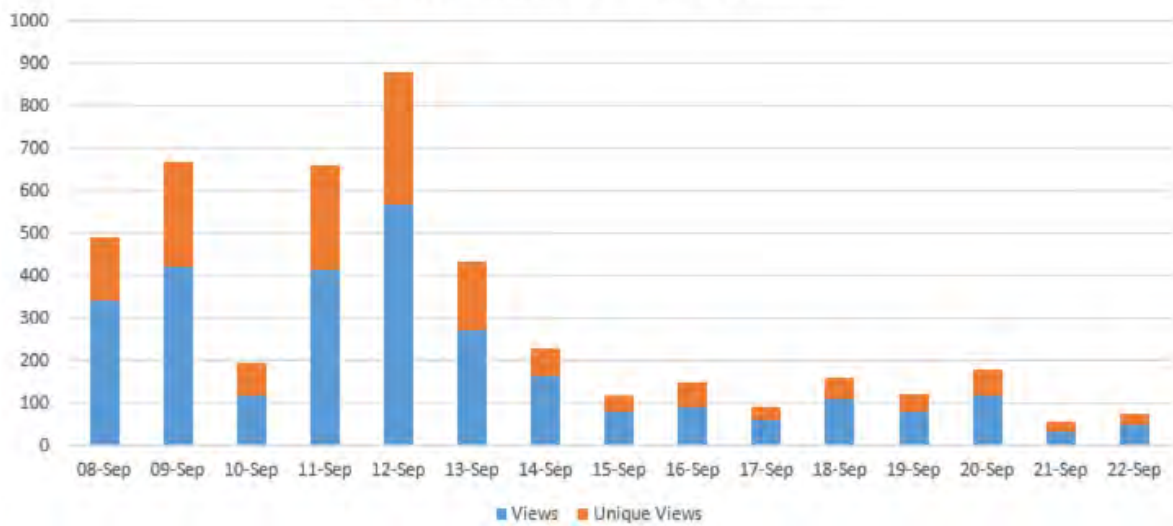
Project Website Analytics

Date	Views	Unique Views
08-Sep	343	147
09-Sep	422	247
10-Sep	116	77
11-Sep	413	249
12-Sep	570	312
13-Sep	270	163
14-Sep	163	67
15-Sep	78	40
16-Sep	91	59
17-Sep	59	32
18-Sep	111	49
19-Sep	79	43
20-Sep	116	65
21-Sep	33	22
22-Sep	49	25
Total	2913	1597

Total Views 8th - 22nd September



Public Consultation 8th - 22nd September



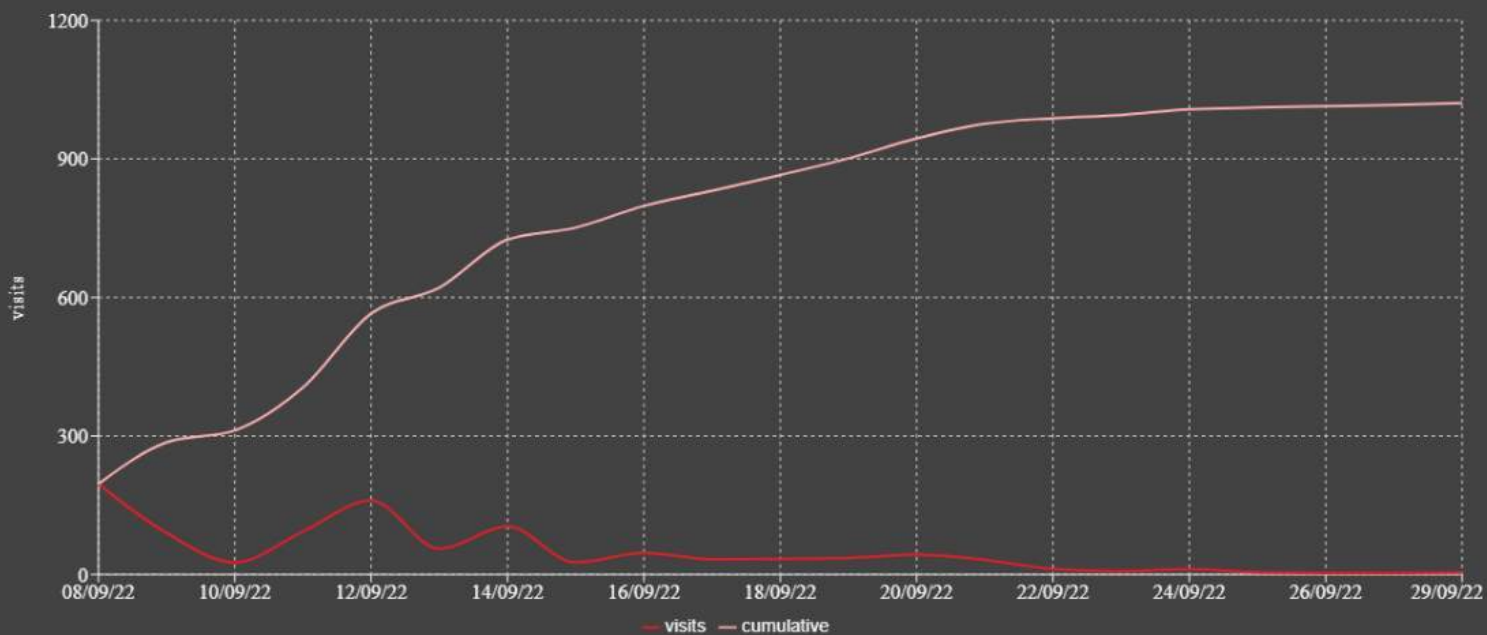
Appendix G

Virtual Engage Analytics

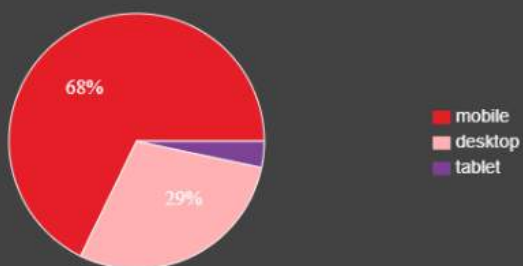
Total Page Views
1021

Total Users
242

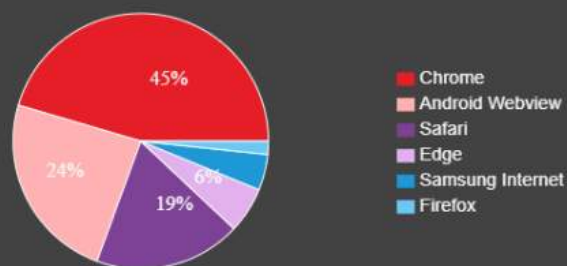
Pageviews by Date



Device



Browser



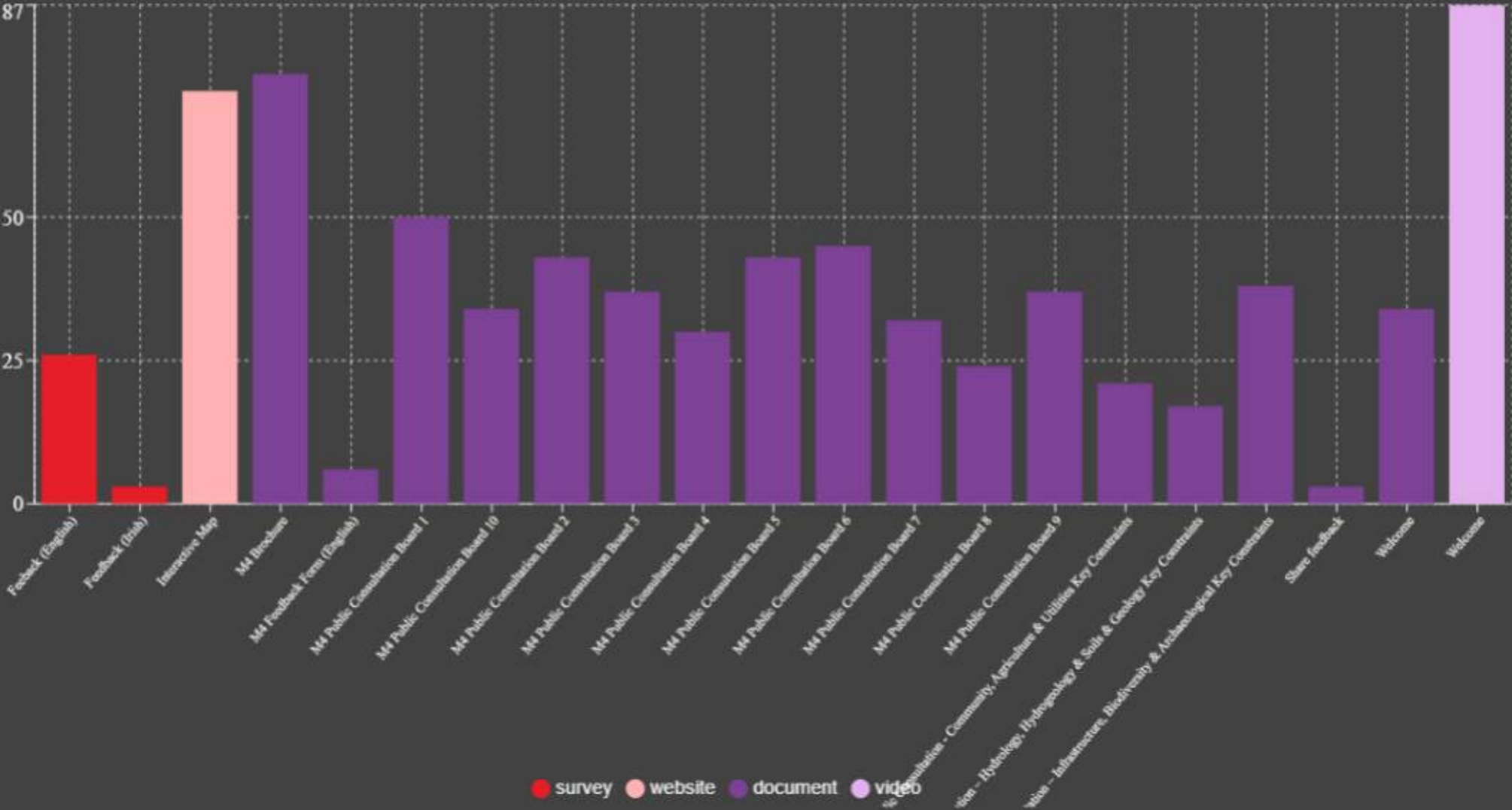
Source	Users
(direct)	142
maynoothlexdip.ie	79
consult.sdublincoco.ie	27
irishmotorwayinfo.com	19
kirkleesculturalheart.co.uk	11
statics.leams.cdn.office.net	8
google	5
highwaysengland.citizenspace.com	4
bing	3
l.co	3

City	Users
Dublin	157
Naas	17
Maynooth	15
Cork	14
Manchester	7
London	6
Celbridge	5
Kildare	5
Lucan	5
Portlaoise	5

CHANGE TO COUNTRY

Event Tracking (Clicks)

Show all labels





MAYNOOTH TO LEIXLIP PROJECT

Appendix 5.1
Stage 1 Sift 3 POA
Graphics (High Level)



MAYNOOTH TO LEIXLIP PROJECT

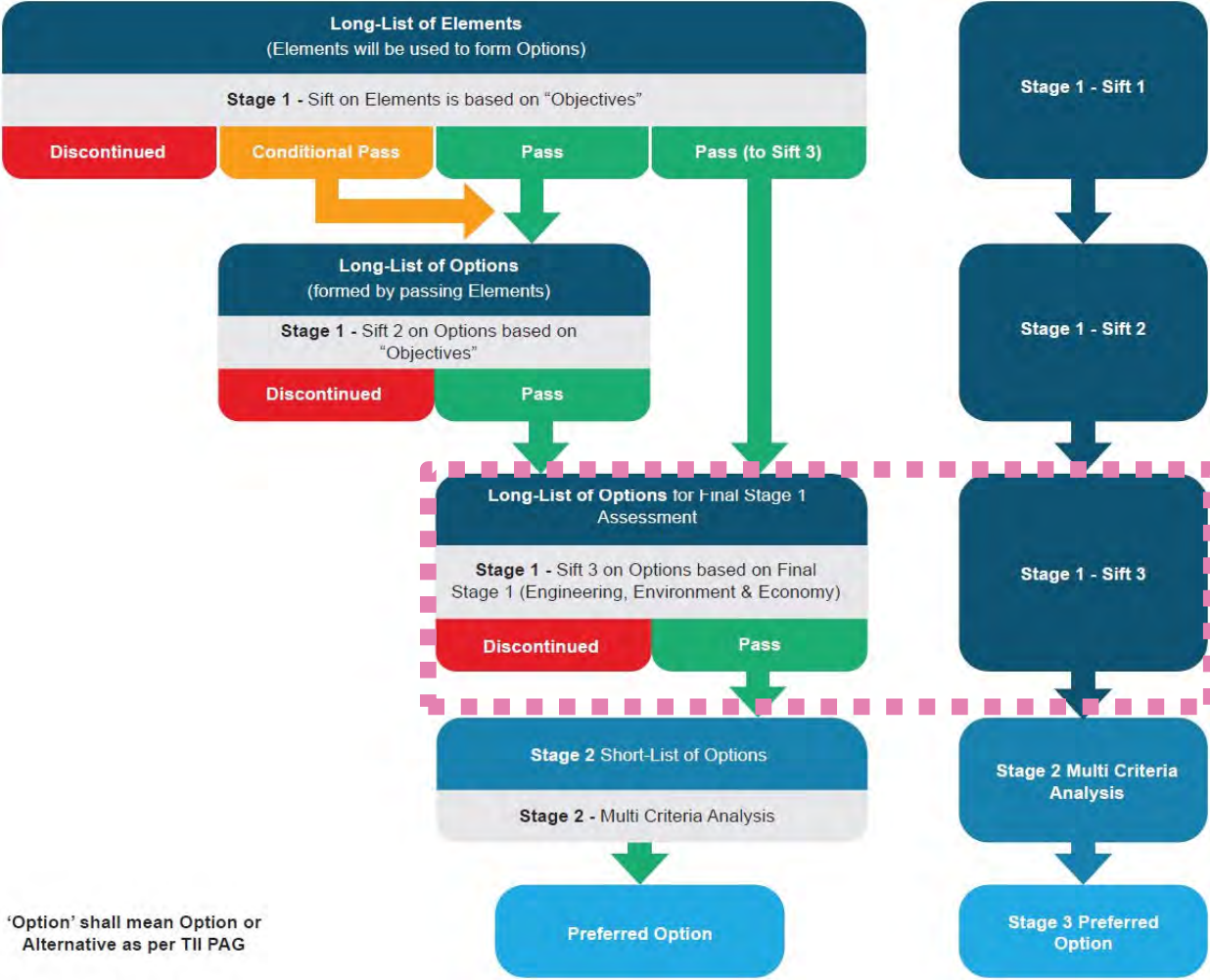


Tionscadal Éireann
Project Ireland
2040



**Stage 1 – Sift 3 on Options
(Engineering, Environment &
Economy)**

Stage 1 – Sift 3 on Options



Option shall mean Option or Alternative as per TII PAG

Stage 1 – Sift 3 on Options

- Following the Sift 1 and Sift 2 Process, a Long-List of Options for the Final Stage 1 Sift 3 has been completed. These include:
 - Options passed from Stage 1 Sift 2 (20 No.); and
 - Elements that were passed directly from Stage 1 Sift 1 (26 No.).
- The combination of this forms the Stage 1 Sift 3 Long-List as follows:
 - 6 No. Corridor Options (Corridors contain Bus and Road based Options);
 - 1 No. Enhanced Bus Infrastructure;
 - 14 No. Junctions / Bridges Options;
 - 11 No. Demand Management Options;
 - 6 No. Park and Ride Options;
 - 6 No. Active Travel Options; and
 - 2 No. Test Rail Options.

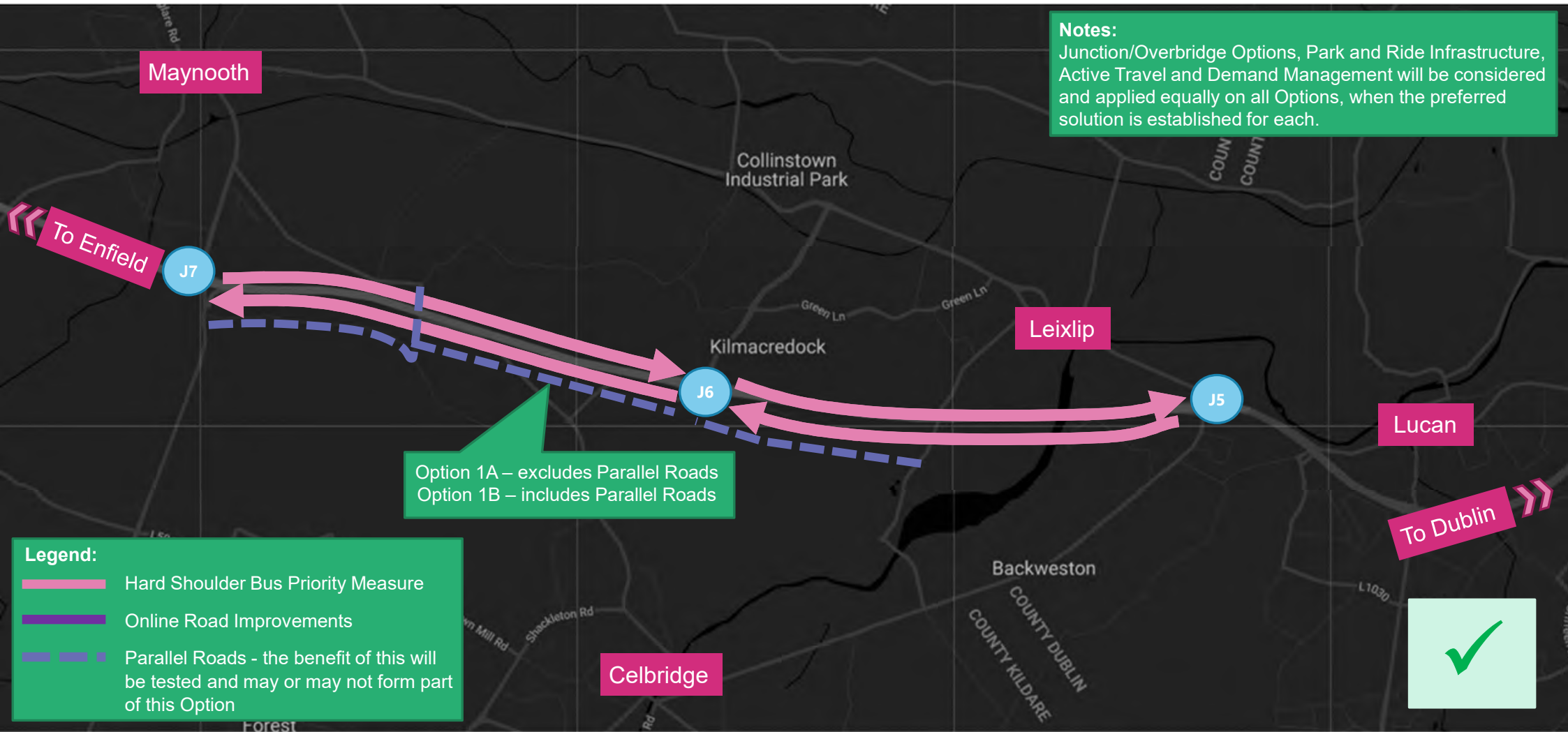
Corridors

6 Options

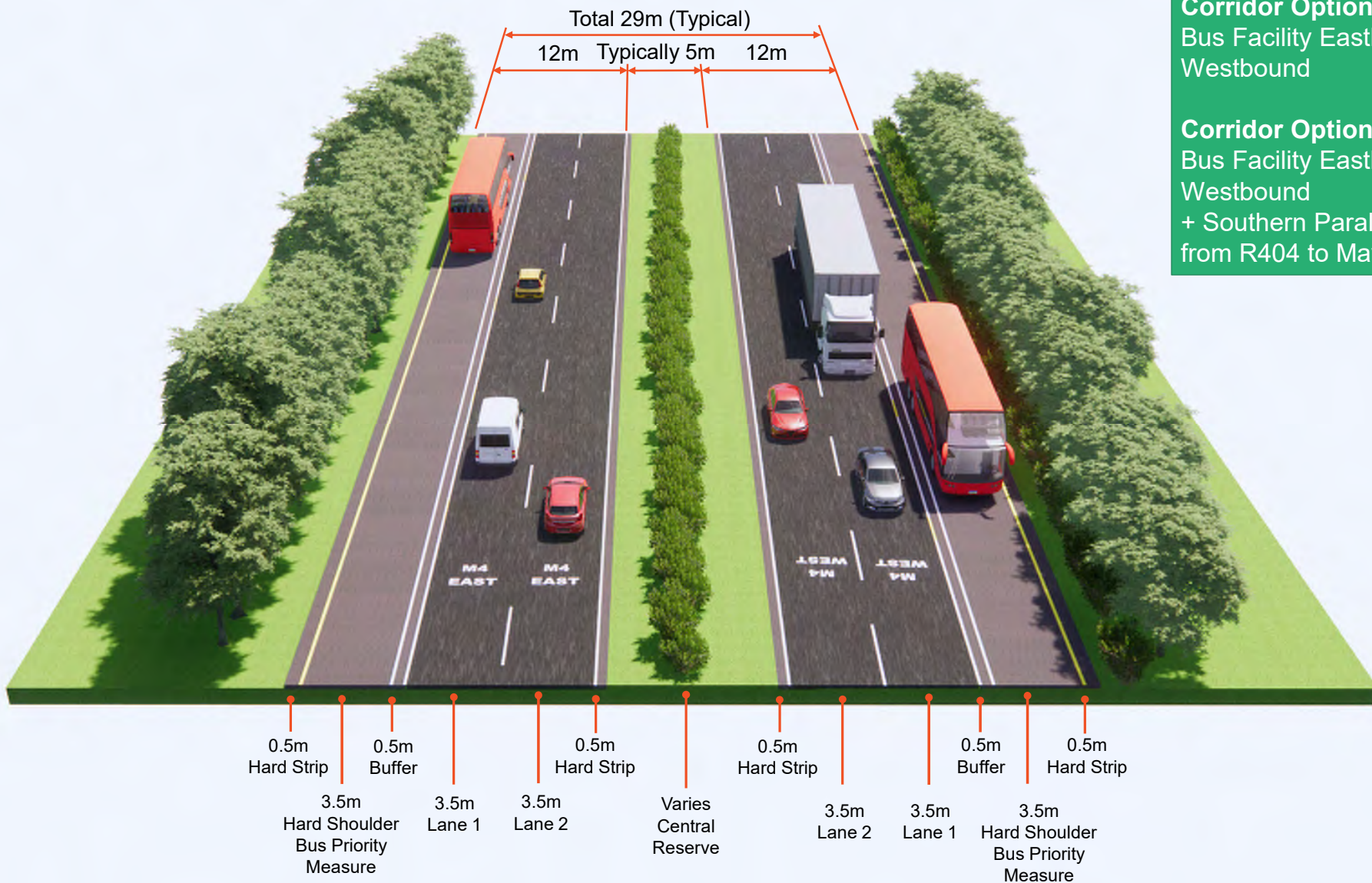
Option 1A, 2A & 3A – excludes Parallel Roads

Option 1B, 2B & 3B – includes Parallel Roads

Corridor Option 1 (A and B)



Corridor Option 1 (A and B) – Cross Section



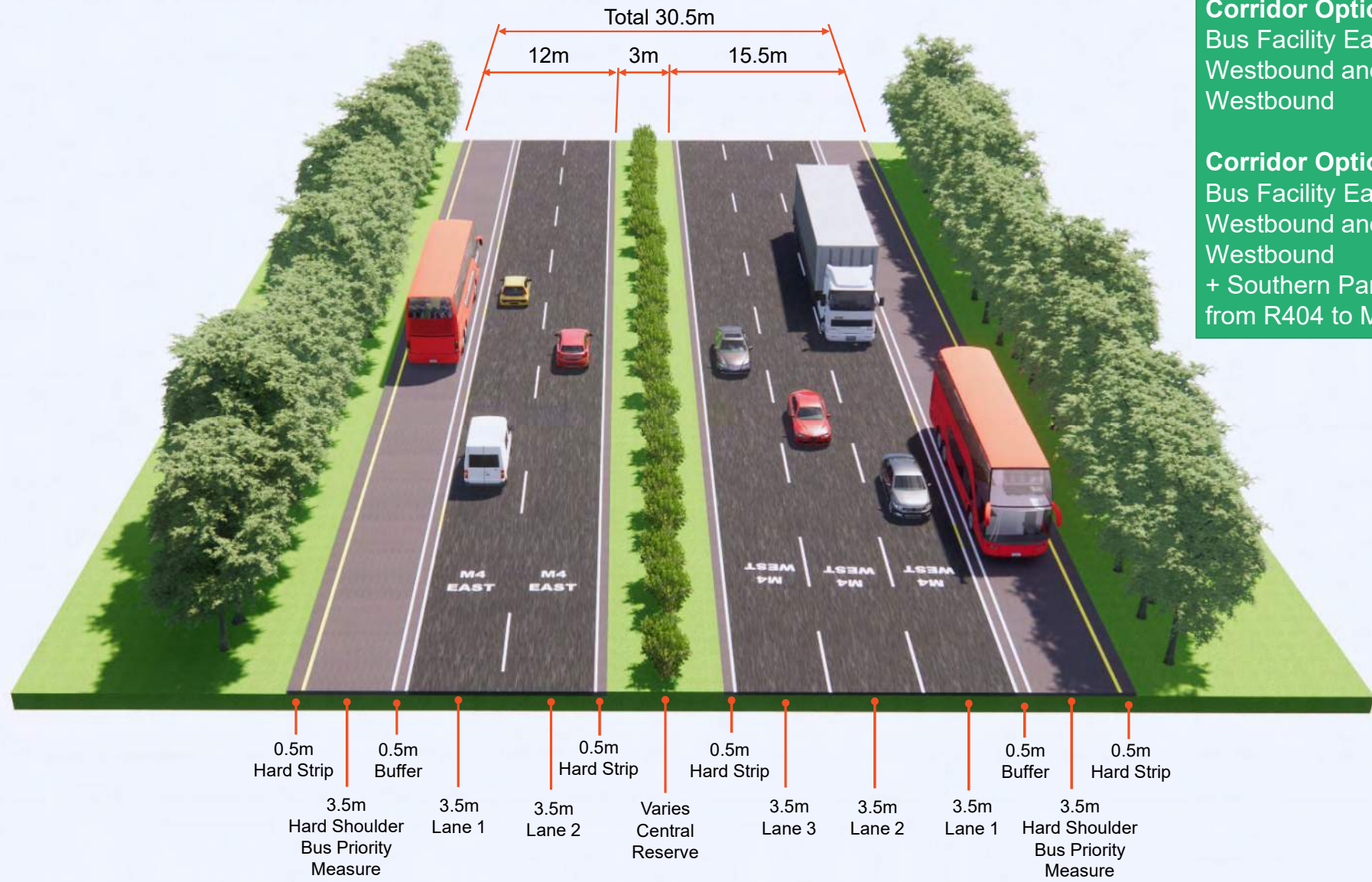
Corridor Option 1 A
Bus Facility Eastbound & Westbound

Corridor Option 1 B
Bus Facility Eastbound & Westbound
+ Southern Parallel Road from R404 to Maynooth

Corridor Option 2 (A and B)



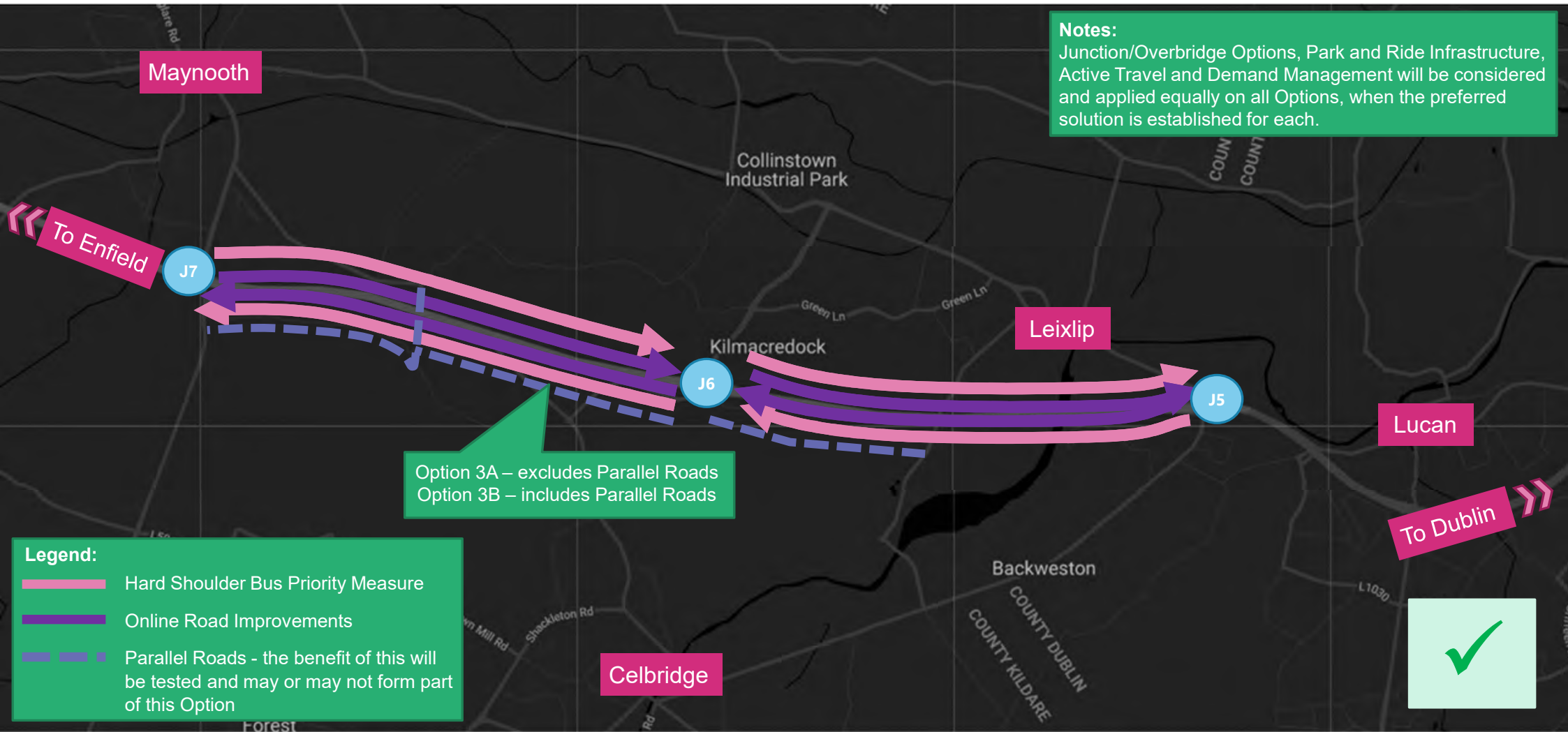
Corridor Option 2 (A and B) – Cross Section



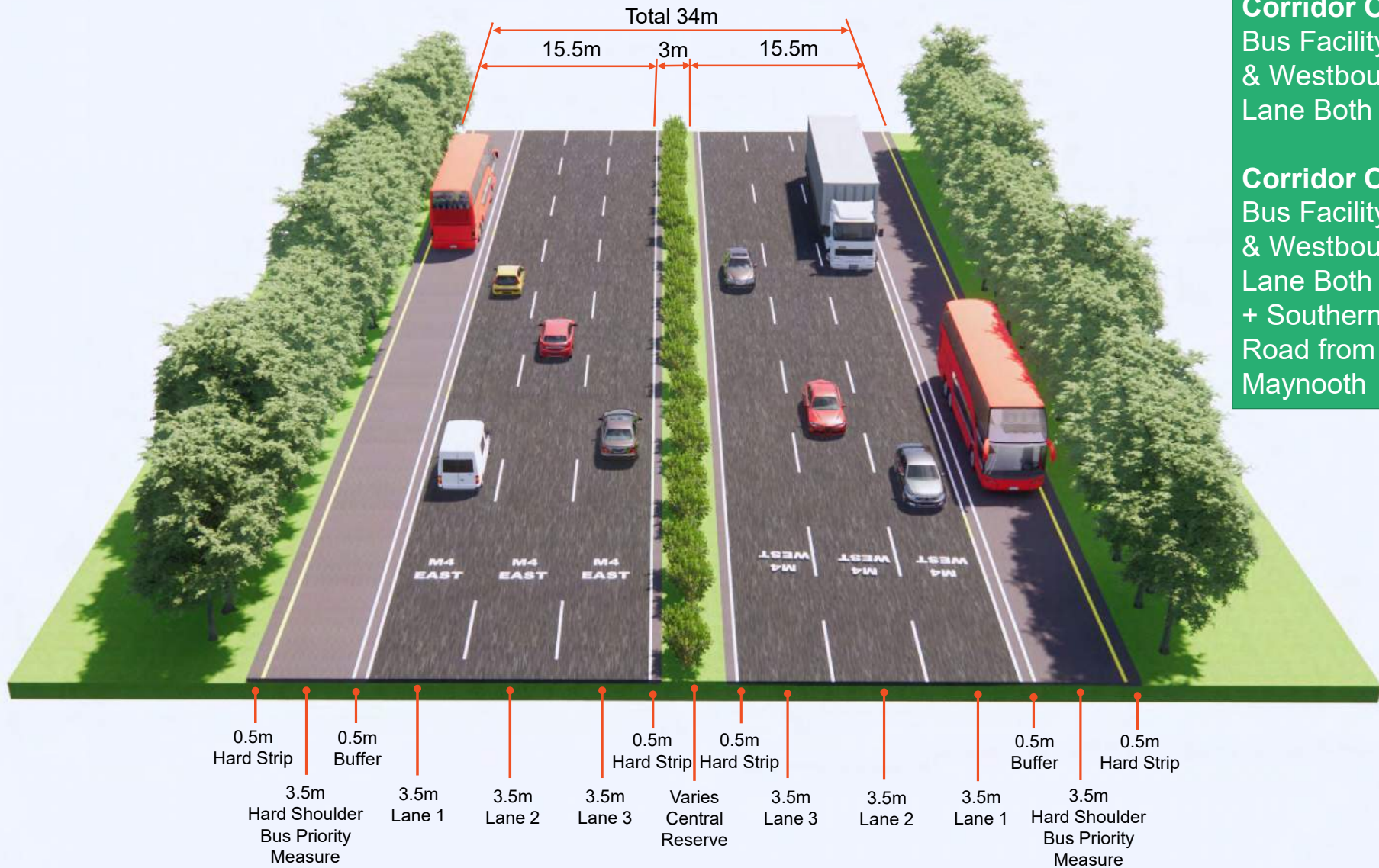
Corridor Option 2 A
Bus Facility Eastbound & Westbound and 3rd Lane Westbound

Corridor Option 2 B
Bus Facility Eastbound & Westbound and 3rd Lane Westbound
+ Southern Parallel Road from R404 to Maynooth

Corridor Option 3 (A and B)



Corridor Option 3 (A and B) – Cross Section



Corridor Option 3 A
Bus Facility Eastbound & Westbound and 3rd Lane Both Directions

Corridor Option 3 B
Bus Facility Eastbound & Westbound and 3rd Lane Both Directions + Southern Parallel Road from R404 to Maynooth

Enhanced Bus Infrastructure

1 No. 1 Option - Enhanced Bus Infrastructure

B6.1 – Enhanced Bus Infrastructure



This element would include enhancements to the existing bus infrastructure. Map shows proposed BusConnects network.

Junctions / Bridges

14 Options

8 No. at Junction 7 environs

1 No. at R405 Ballygoran Overbridge

1 No. at Junction 6

1 No. at R404 Overbridge

3 No. at Junction 5 environs

Junction 7

8 Options (4 Categories):

1 No. – Upgrade Existing Junction

2 No. – Upgrade Existing Junction & Provide 2nd Junction

4 No. – Provide 2 New Junctions & Convert Existing to Overbridge

1 No. – Provide 1 New Junction & Convert Existing to Overbridge

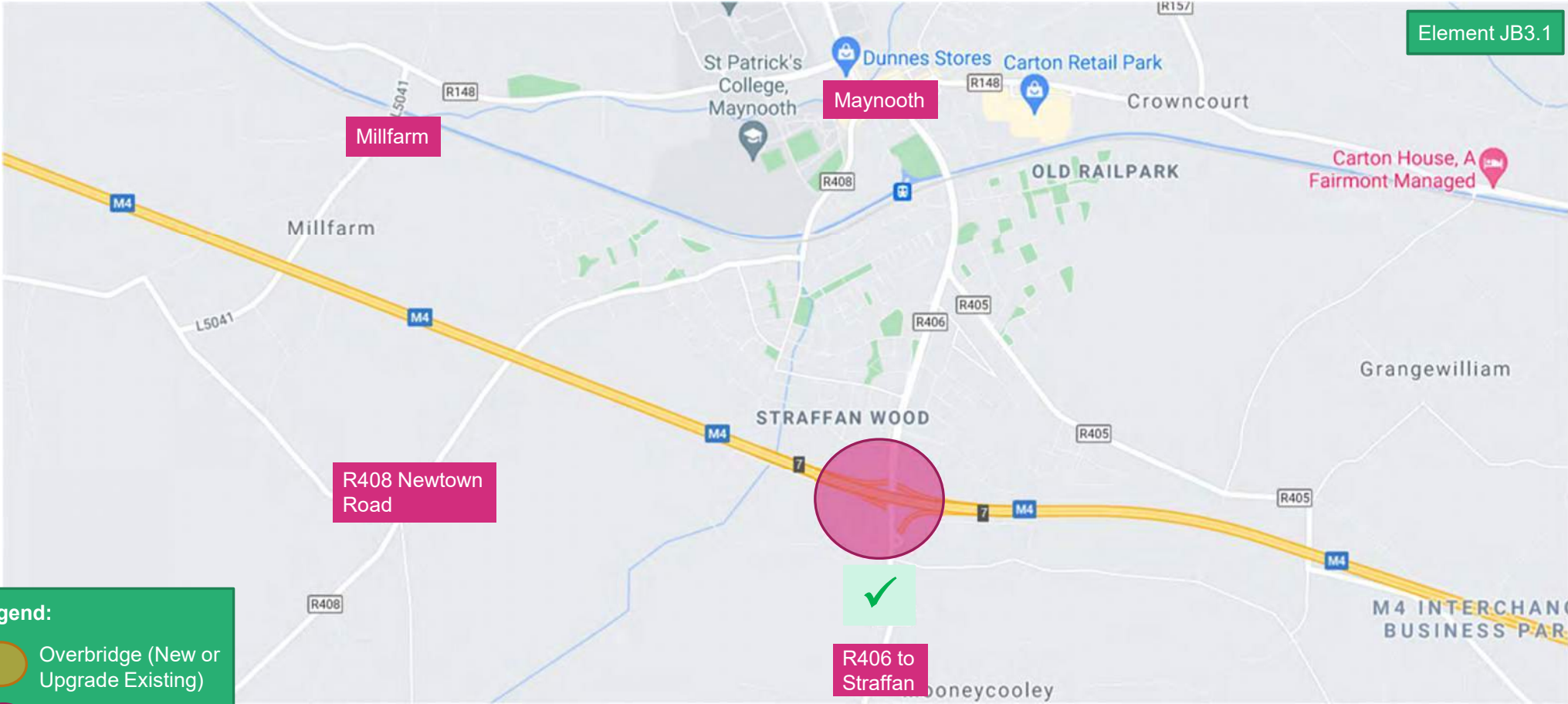
1 No. – Upgrade Existing Junction

2 No. – Upgrade Existing Junction & Provide 2nd Junction



4 No. – Provide 2 New Junctions & Convert Existing to Overbridge

1 No. – Provide 1 New Junction & Convert Existing to Overbridge

J7 – Option 1 – Upgrade Existing Junction



Legend:

-  Overbridge (New or Upgrade Existing)
-  Junction (New or Upgrade Existing)

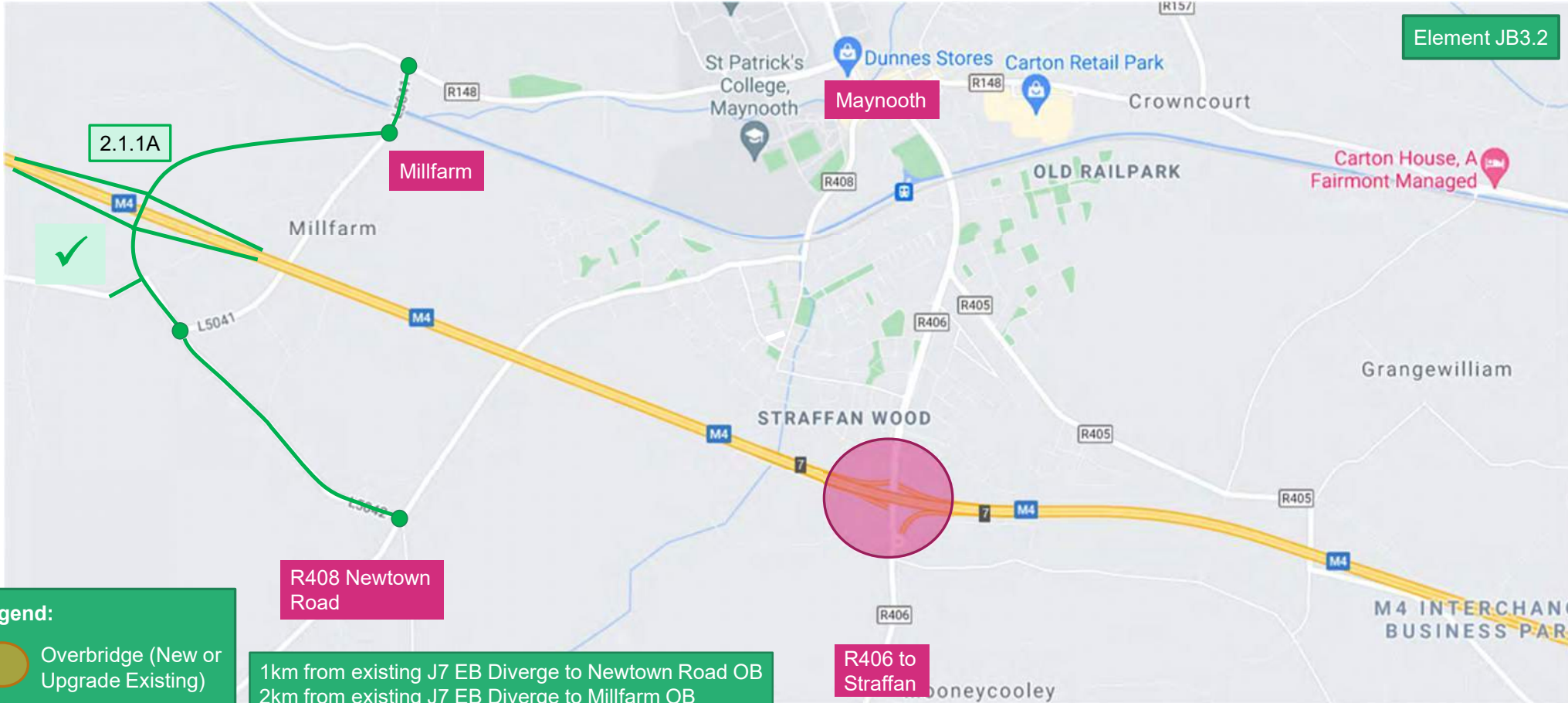
1 No. – Upgrade Existing Junction

2 No. – Upgrade Existing Junction & Provide 2nd Junction

4 No. – Provide 2 New Junctions & Convert Existing to Overbridge

1 No. – Provide 1 New Junction & Convert Existing to Overbridge

J7 - Option 2.1.1 – Upgrade Existing Junction & Provide 2nd Junction (Standard 2km)



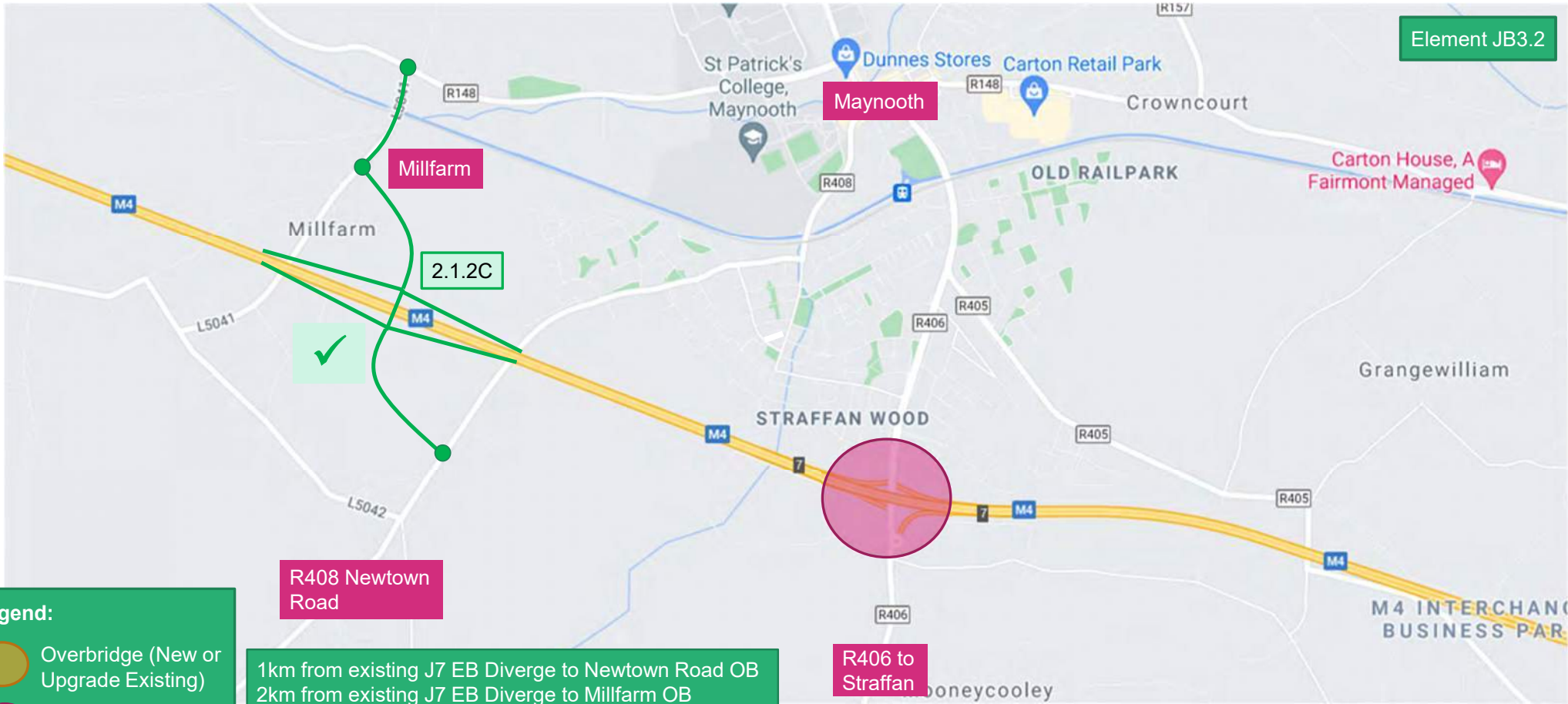
Legend:

- Overbridge (New or Upgrade Existing)
- Junction (New or Upgrade Existing)

R408 Newtown Road

- 1km from existing J7 EB Diverge to Newtown Road OB
- 2km from existing J7 EB Diverge to Millfarm OB
- 1km from existing J7 EB Merge to R405 Ballygoran OB
- 1.8km from existing J6 EB Diverge to R405 OB

J7 - Option 2.1.2 – Upgrade Existing Junction & Provide 2nd Junction (Relaxation 1km)



Legend:

- Overbridge (New or Upgrade Existing)
- Junction (New or Upgrade Existing)

- 1km from existing J7 EB Diverge to Newtown Road OB
- 2km from existing J7 EB Diverge to Millfarm OB
- 1km from existing J7 EB Merge to R405 Ballygoran OB
- 1.8km from existing J6 EB Diverge to R405 OB

1 No. – Upgrade Existing Junction

2 No. – Upgrade Existing Junction & Provide 2nd Junction

4 No. – Provide 2 New Junctions & Convert Existing to Overbridge

1 No. - Provide 1 New Junction & Convert Existing to Overbridge

J7 - Option 3.1.2 - Provide 2 New Junctions & Convert Existing to Overbridge (Relaxation 1km)



J7 - Option 3.2.2 - Provide 2 New Junctions & Convert Existing to Overbridge (Relaxation 1km)



J7 - Option 3.3.1 - Provide 2 New Junctions & Convert Existing to Overbridge (Standard 2km or Relaxation 1km)



J7 - Option 3.4.1 - Provide 2 New Junctions & Convert Existing to Overbridge (Standard 2km or Relaxation 1km)



1 No. – Upgrade Existing Junction

2 No. – Upgrade Existing Junction & Provide 2nd Junction

4 No. – Provide 2 New Junctions & Convert Existing to Overbridge

1 No. - Provide 1 New Junction & Convert Existing to Overbridge

J7 - Option 4.1.1 - Provide 1 New Junction & Convert Existing to Overbridge

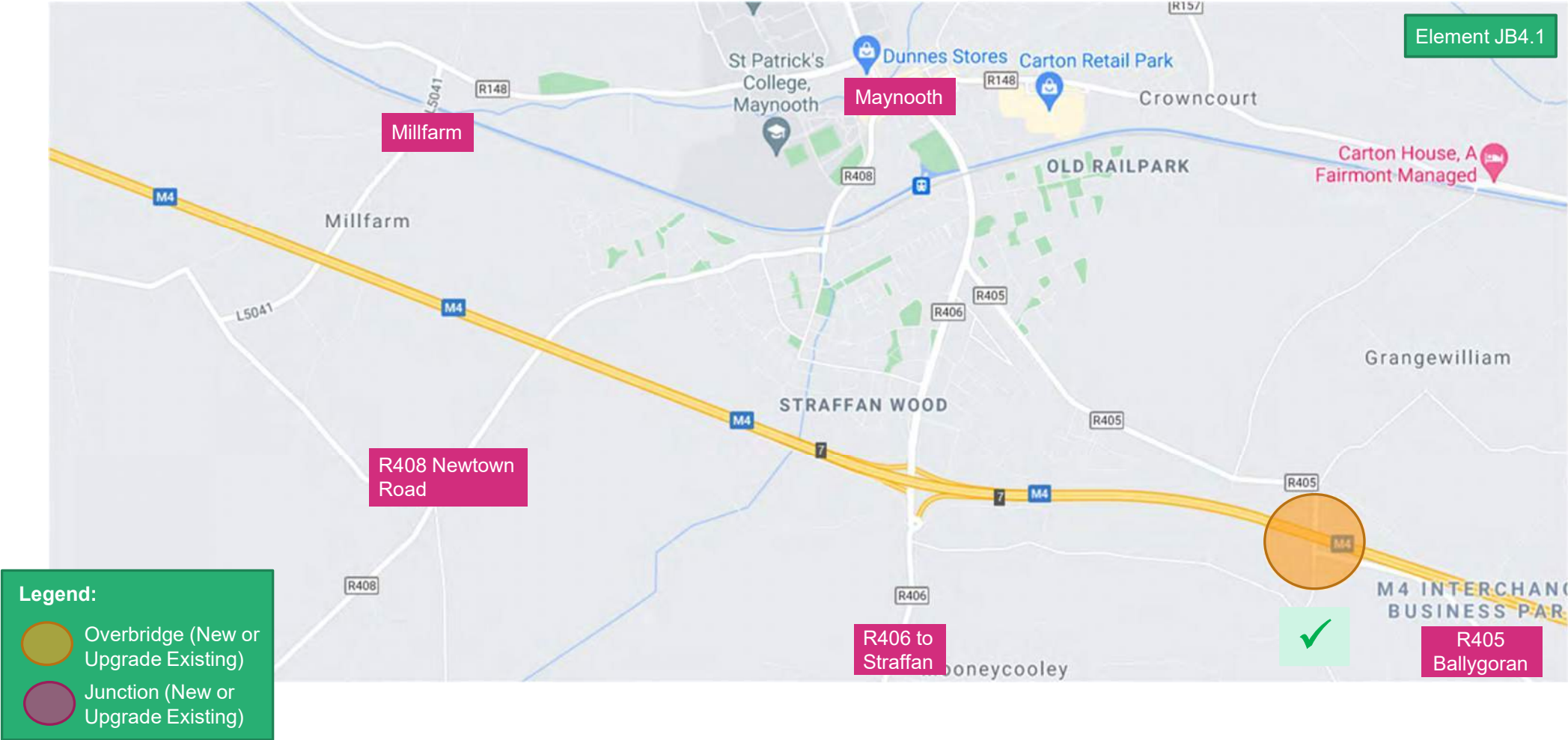


Junctions / Bridges

R405 Ballygoran Overbridge

1 No. Option – Upgrade Existing Overbridge

R405 Ballygoran Overbridge - Option 1 – Upgrade Existing Overbridge



Junctions / Bridges

Junction 6

1 No. Option – Upgrade Existing Junction

Junction 6 - Option 1 – Upgrade Existing Junction



Legend:

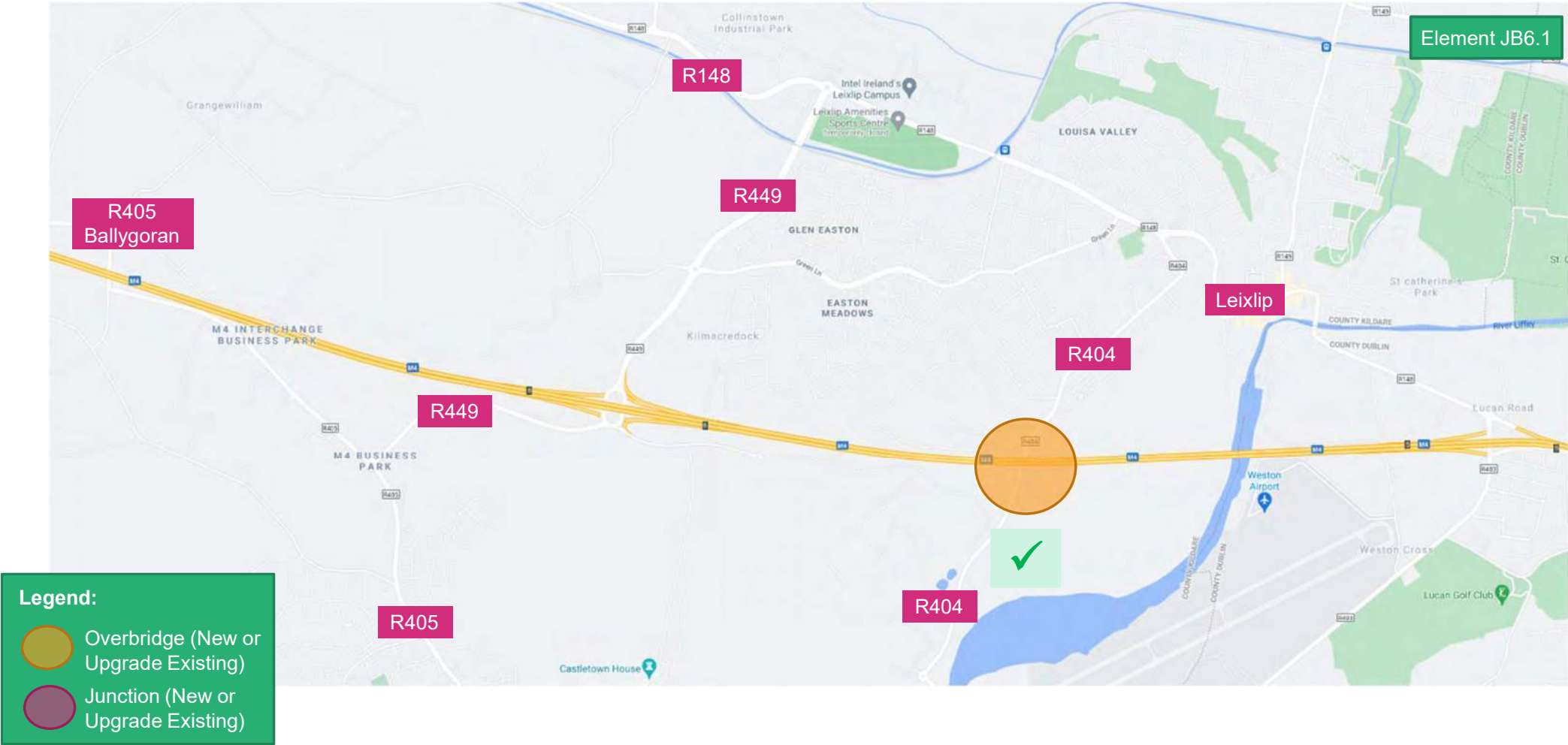
- Overbridge (New or Upgrade Existing)
- Junction (New or Upgrade Existing)

Junctions / Bridges

R404 Overbridge

1 No. Option – Upgrade Existing Overbridge

R404 Overbridge – Option 1 – Upgrade Existing Overbridge



Junctions / Bridges

Junction 5

3 Options (2 Categories):

1 No. – Upgrade Existing Junction

2 No. – Provide 1 New Junction & Convert Existing to Overbridge

Junction 5 – Option 1 – Upgrade Existing Junction



J5 – Option 2 – Provide New Junction & Convert Existing to Overbridge



Demand Management

11 No. Options

Demand Management

Ref No.	Description
DM1.1	Test Transit Oriented Development
DM1.2	Test the mix of Land Uses in close proximity to each other
DM1.4	Alternative Demand Sensitivity Analysis
DM2.1	Road Tolling / Pricing
DM3.2	Reduced Speed Limits
DM3.3	Variable Speed Limits

Ref No.	Description
DM3.4	Ramp Metering/ Junction Access Control Signals
DM7.1	Interchange Facilities
DM7.2	Integrated Ticketing and Fares Structures
DM8.1	Public Realm and Urban Design
DM9.1	Test Existing Orbital Routes for Potential Redistribution from M4/N4 Corridor

Park and Ride

6 Options (3 Categories):

4 No. – Strategic Park and Ride Options

1 No. – Local Hub Option

1 No. – Local Park and Ride Option

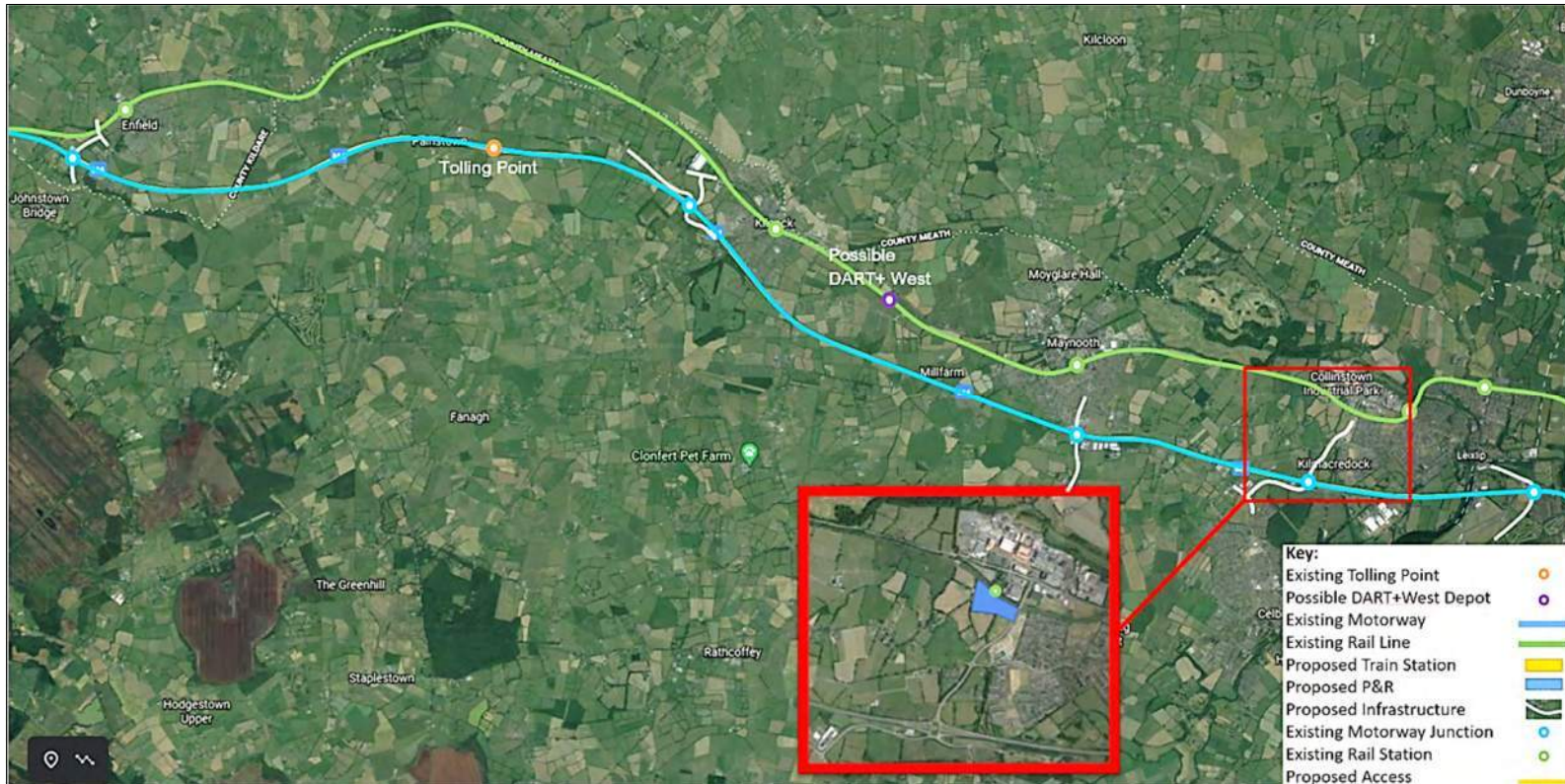
PR 1.4 - Combined Rail and Bus Based P&R (West Maynooth)



Rail Service (assume New Train Station)	Bus Service	Positives	Negatives
<p>Current Rail Frequency** – 15 minutes (peak hour) – requires extending Maynooth service to proposed depot</p> <p>Journey Time to City Centre** - ~50 minutes</p>	<p>Proposed Frequency – 10 minutes (peak hour)</p> <p>Journey Time to City Centre* - ~ 45 minutes</p> <p>Journey Time to Liffey Valley* - ~ 15 minutes</p> <p>Bussing Requirements 9/10 buses</p>	<p>Mixed Mode Opportunities</p> <p>Great Access to New Train Station</p> <p>Good Synergy with Depot proposals and with the need to update the existing Maynooth Interchange</p> <p>Located beyond the current congested zone</p> <p>Access DART+ West Higher frequency and capacity</p>	<p>High Bussing Requirements</p> <p>Significant Infrastructure Required – New Interchange, New local roads, New station</p> <p>Linkage with BusConnects network will need to be reviewed</p>



PR 1.5 - Rail Based P&R (Collinstown)



Rail Service (assume New Train Station)	Bus Service	Positives	Negatives
Current Rail Frequency** – 15 minutes (peak hour) – Journey Time to City Centre** - ~45 minutes	Maynooth BusConnects Services	Great Access to New Train Station	Potential Development Land New Infrastructure Required, including a new train station Parking located within the edge of the current congested zone Limited Bus Services (Maynooth BusConnects services)



PR 1.6 - Bus Based P&R (Junction 6)



Rail Service	Bus Service	Positives	Negatives
No Rail Service proposed	Proposed Frequency – 10 minutes (peak hour) Journey Time to City Centre* - ~ 35 minutes Journey Time to Liffey Valley* - ~ 7 minutes Bussing Requirements 7/8 buses	Good access to the city centre and new interchange hub at Liffey Valley Reduced number of buses	Parking located within the edge of the current congested zone Potential upgrade to the Interchange required



PR1.7 – P&R at Junction 5 (Bus Based)



PR 2.1 – Local Mobility Hubs

Understanding the 3 Categories of Park and Ride



Type	Strategic Park and Ride PR Option 1	Local Mobility Hubs PR Option 2	Local Park and Ride PR Option 3
Function	<p>To facilitate the modal shift of long distance car trips to public transport, at an early opportunity.</p> <p>To serve a wide hinterland of a strategic corridor to an urban centre</p>	<p>To serve urban and suburban areas. They seek to expand the local catchment of public transport services by catering for access to stops / stations for a range of mobility options</p> <p>To provide the opportunity to interchange between the car and public transport modes as well as between sustainable transport modes.</p>	<p>To provide parking facilities at transport nodes such as railway stations and bus stations serving smaller towns and villages on the regional public transport network</p>
Key Characteristics	<p>Located on an interchange between the National Roads Network and high quality high capacity public transport.</p> <p>Large in scale (500 car parking spaces +).</p>	<p>Include car parking, high quality bicycle parking, walking and cycling links to good quality walking and cycling networks and dedicated car club and car sharing facilities.</p>	<p>Small in scale. Local park and ride should also tie into the local walking and cycling networks.</p>
Things to avoid	<p>Should not encourage people who would otherwise access public transport locally, to drive further to access a site, thus adding to congestion.</p> <p>Existing users of the public transport should not be unduly affected by increased patronage associated with park and ride usage.</p>	<p>While mobility hubs include car parking, the site should not be dominated by it.</p> <p>Should not encourage people who would otherwise access public transport locally, to drive further to access a site, thus adding to congestion.</p>	<p>Should not become destination parking for the town or village.</p>



PR 3.1 – Local Park and Ride

Understanding the 3 Categories of Park and Ride



Type	Strategic Park and Ride PR Option 1	Local Mobility Hubs PR Option 2	Local Park and Ride PR Option 3
Function	<p>To facilitate the modal shift of long distance car trips to public transport, at an early opportunity.</p> <p>To serve a wide hinterland of a strategic corridor to an urban centre</p>	<p>To serve urban and suburban areas. They seek to expand the local catchment of public transport services by catering for access to stops / stations for a range of mobility options</p> <p>To provide the opportunity to interchange between the car and public transport modes as well as between sustainable transport modes.</p>	<p>To provide parking facilities at transport nodes such as railway stations and bus stations serving smaller towns and villages on the regional public transport network</p>
Key Characteristics	<p>Located on an interchange between the National Roads Network and high quality high capacity public transport.</p> <p>Large in scale (500 car parking spaces +).</p>	<p>Include car parking, high quality bicycle parking, walking and cycling links to good quality walking and cycling networks and dedicated car club and car sharing facilities.</p>	<p>Small in scale. Local park and ride should also tie into the local walking and cycling networks.</p>
Things to avoid	<p>Should not encourage people who would otherwise access public transport locally, to drive further to access a site, thus adding to congestion.</p> <p>Existing users of the public transport should not be unduly affected by increased patronage associated with park and ride usage.</p>	<p>While mobility hubs include car parking, the site should not be dominated by it.</p> <p>Should not encourage people who would otherwise access public transport locally, to drive further to access a site, thus adding to congestion.</p>	<p>Should not become destination parking for the town or village.</p>



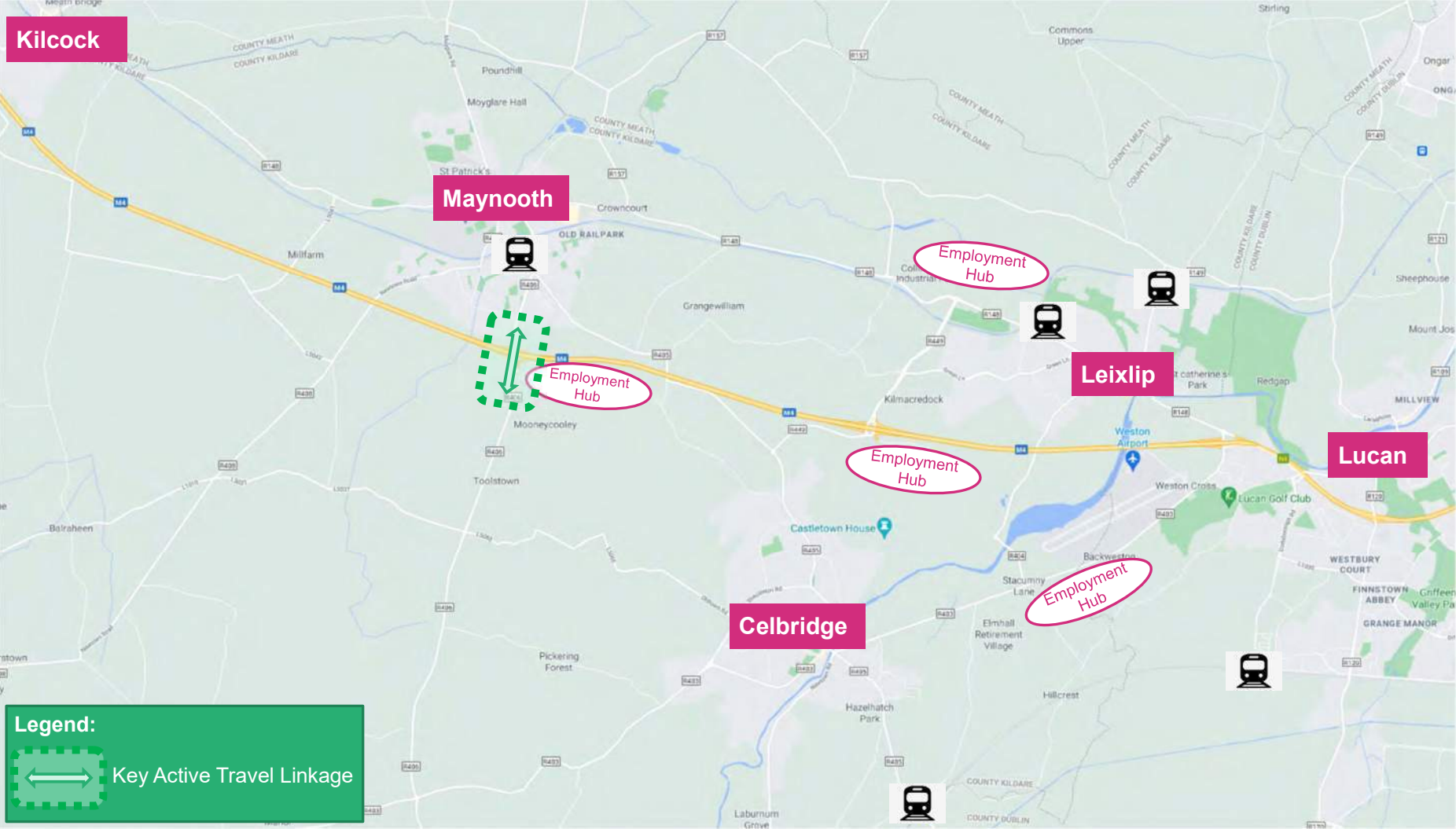
Active Travel

6 Options (2 Categories):

5 No. – Enhancements to Junctions / Overbridges

1 No. – Cycle Parking and Infrastructure at Key Public Transport
Nodes and Destinations

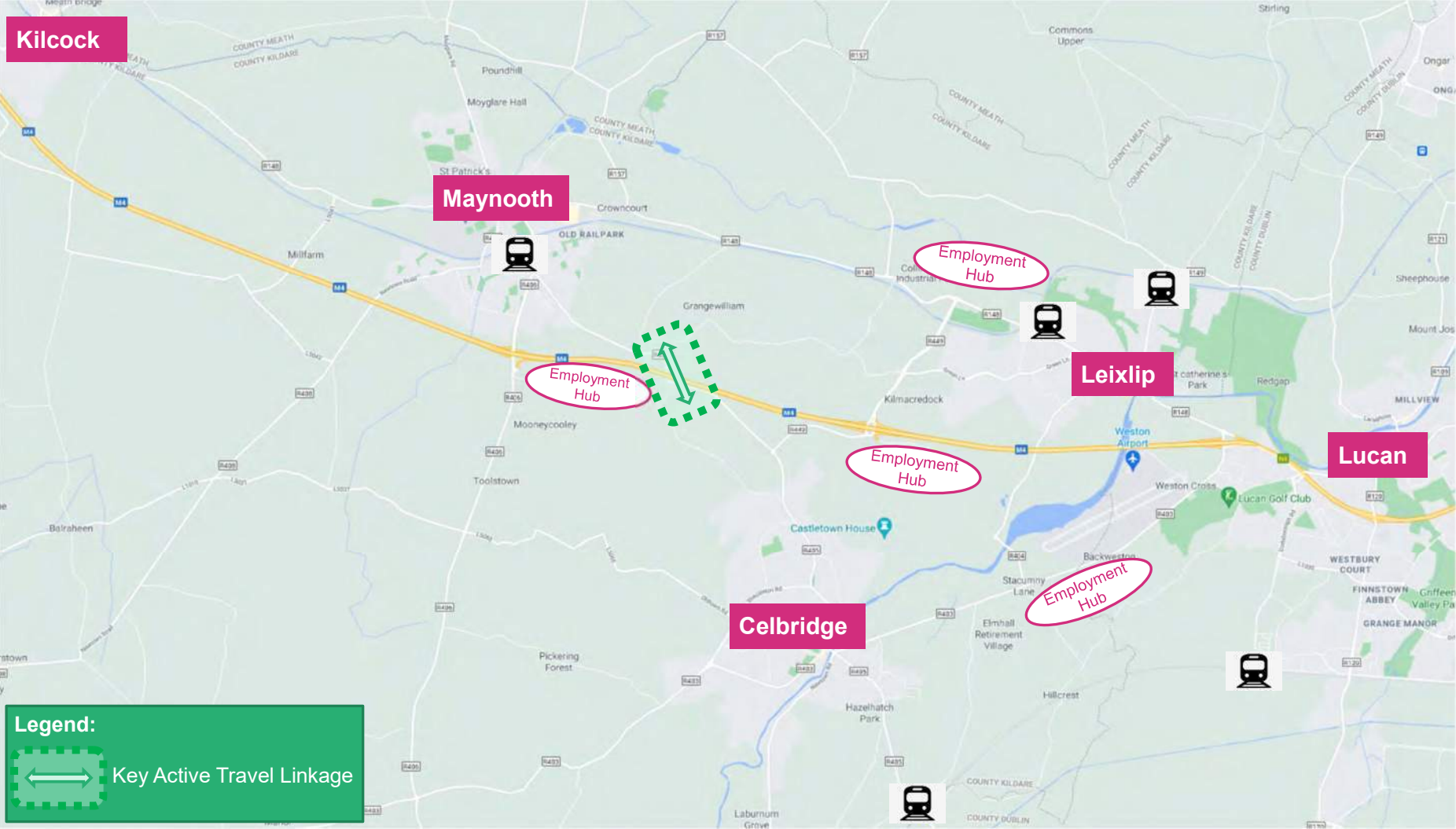
AT1.1 – Active Travel Enhancement at Junction 7 on the R406



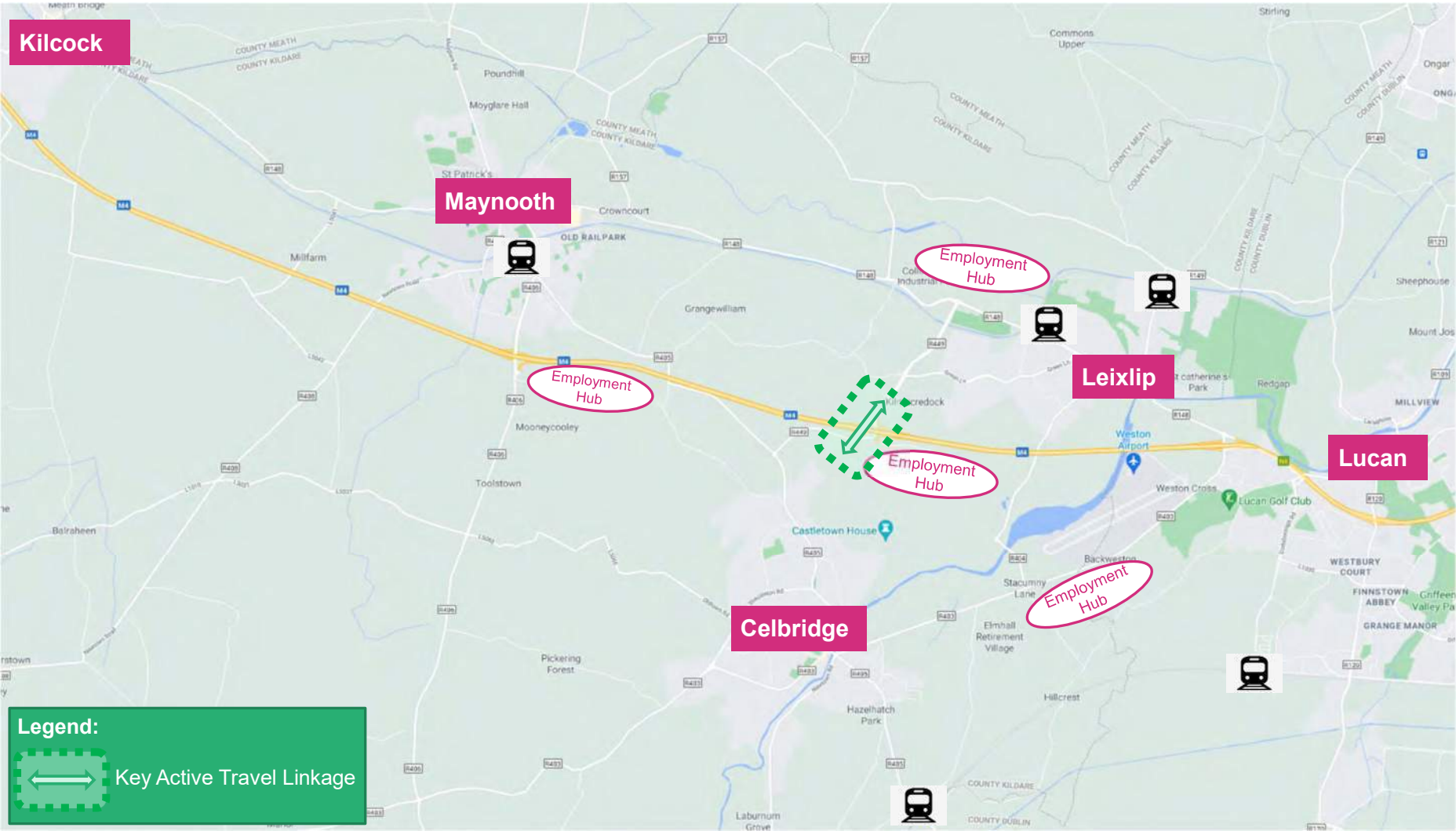
Active Travel

ARUP

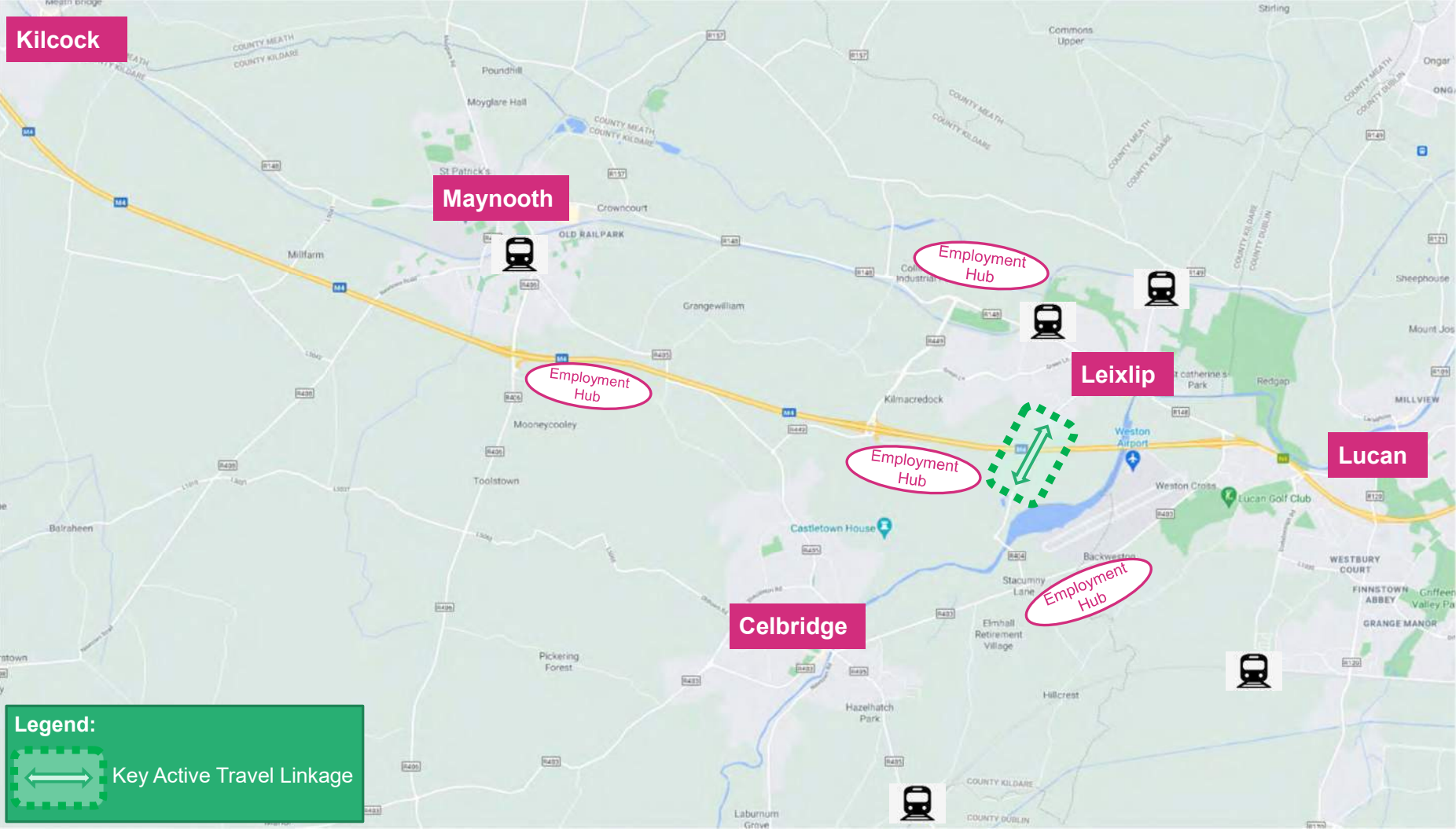
AT1.2 – Active Travel Enhancement on the R405 Overbridge



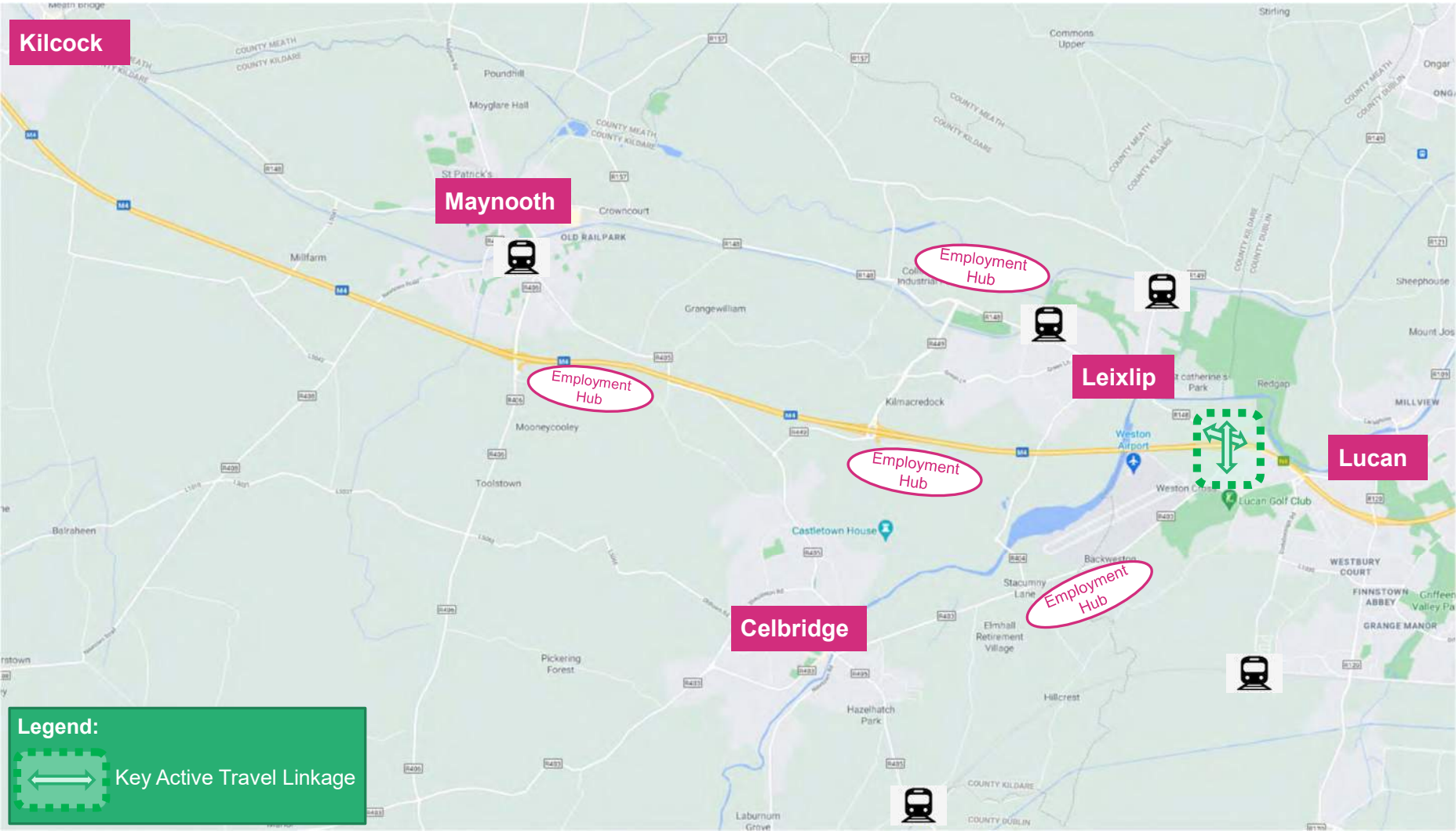
AT1.3 – Active Travel Enhancement at Junction 6 on the R449



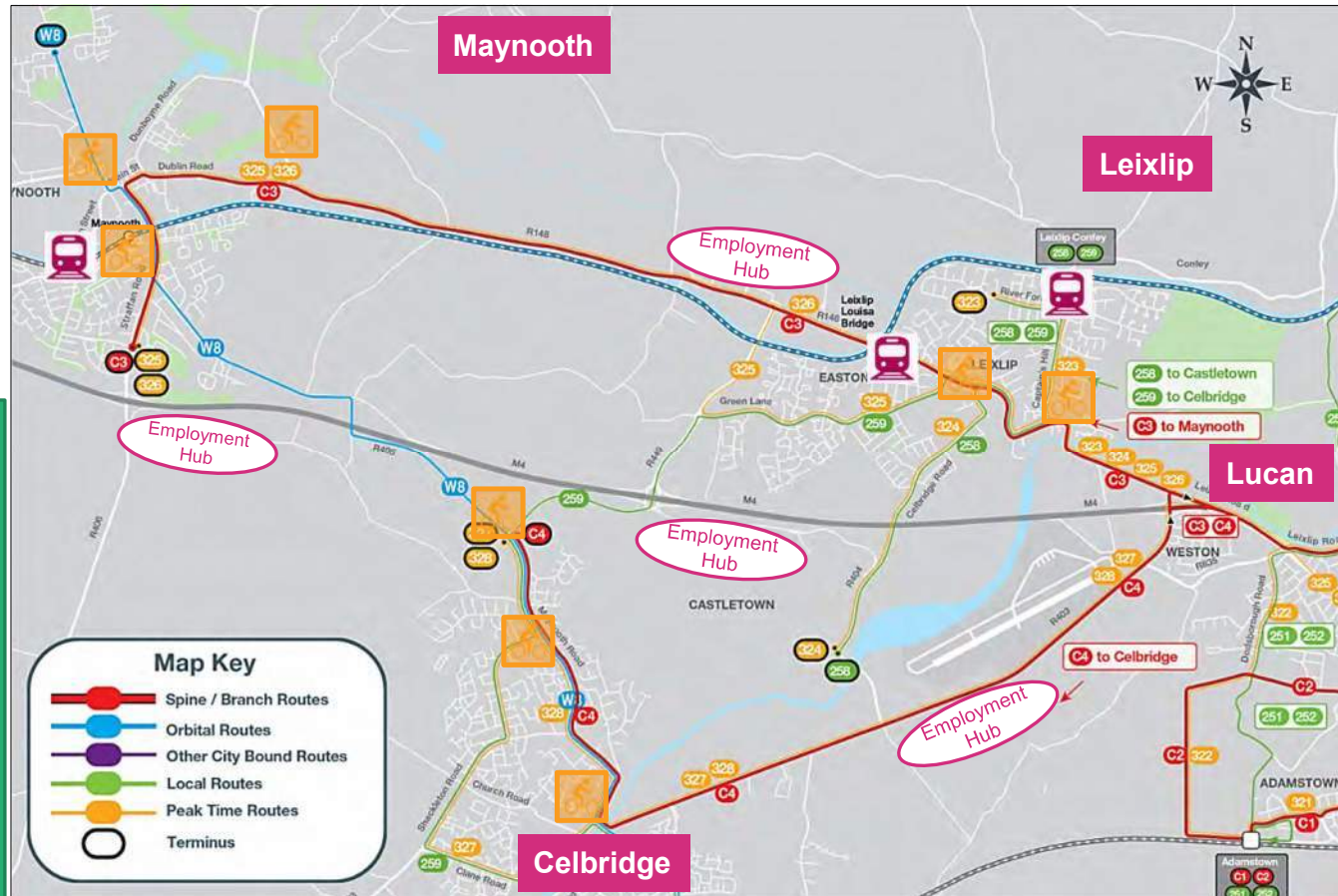
AT1.4 – Active Travel Enhancement on the R404 Overbridge



AT1.5 – Active Travel Enhancement at Junction 5



AT2.1 – Support the Provision for Cycle Parking and Infrastructure at Key Public Transport Nodes and Destinations



Proposed Cycle Parking Survey Locations

Complete cycle parking surveys at key locations, identifying utilisation, barriers to use and recommendations on improvements

Public Transport Hub - Complete cycle parking surveys at key location, identifying utilisation, barriers to use and recommendations on improvements



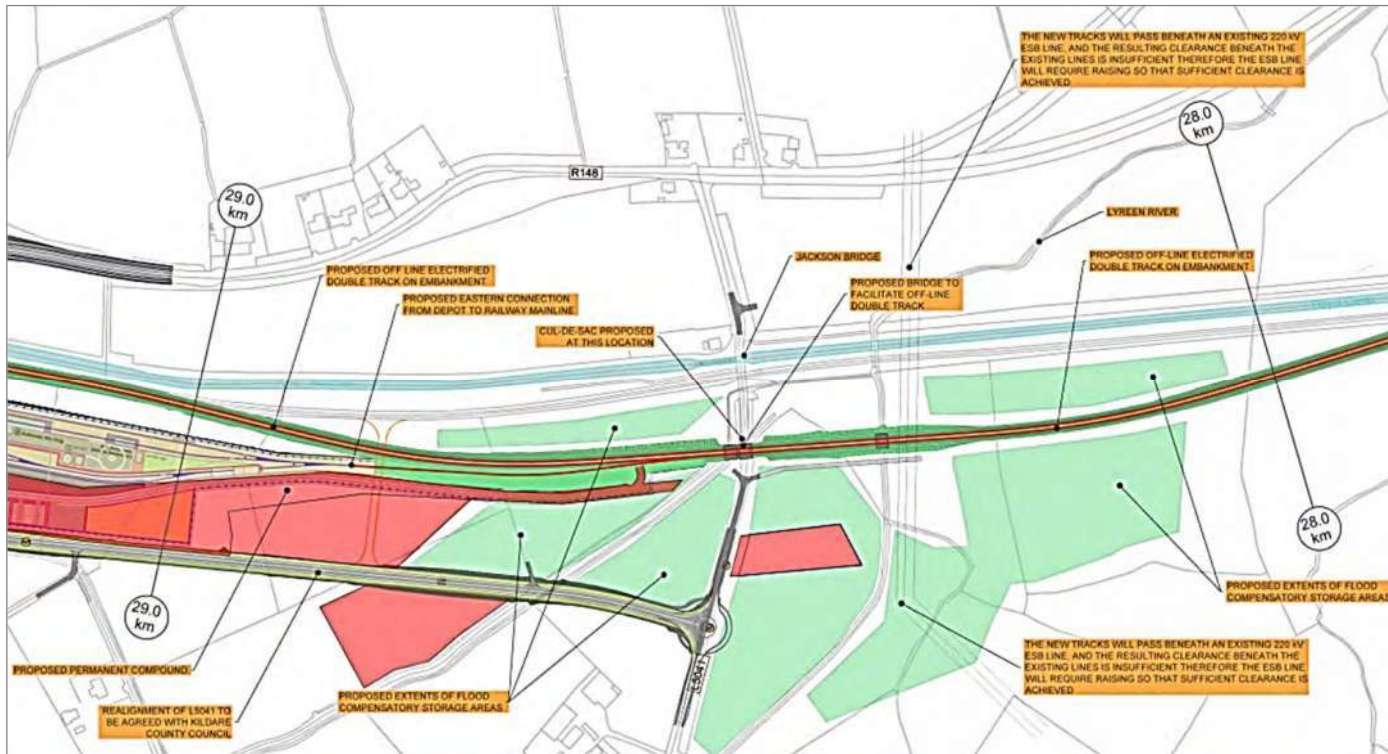
Rail

2 Options:

1 No. – DART+West Programme (Committed Project)

1 No. – Regional Rail Improvements

RL1 - Benefit Analysis of DART+West Programme on the M4/N4 Corridor



- Includes proposals for up to 12 trains per hour per direction during peak periods, doubling the existing frequencies.
- Also includes plans to remove several level crossings which will result in journey time savings.
- Included in Do-Min Transport Model.

This figure represents a current draft proposal which is subject to change



RL2 – Test Regional Rail Improvements

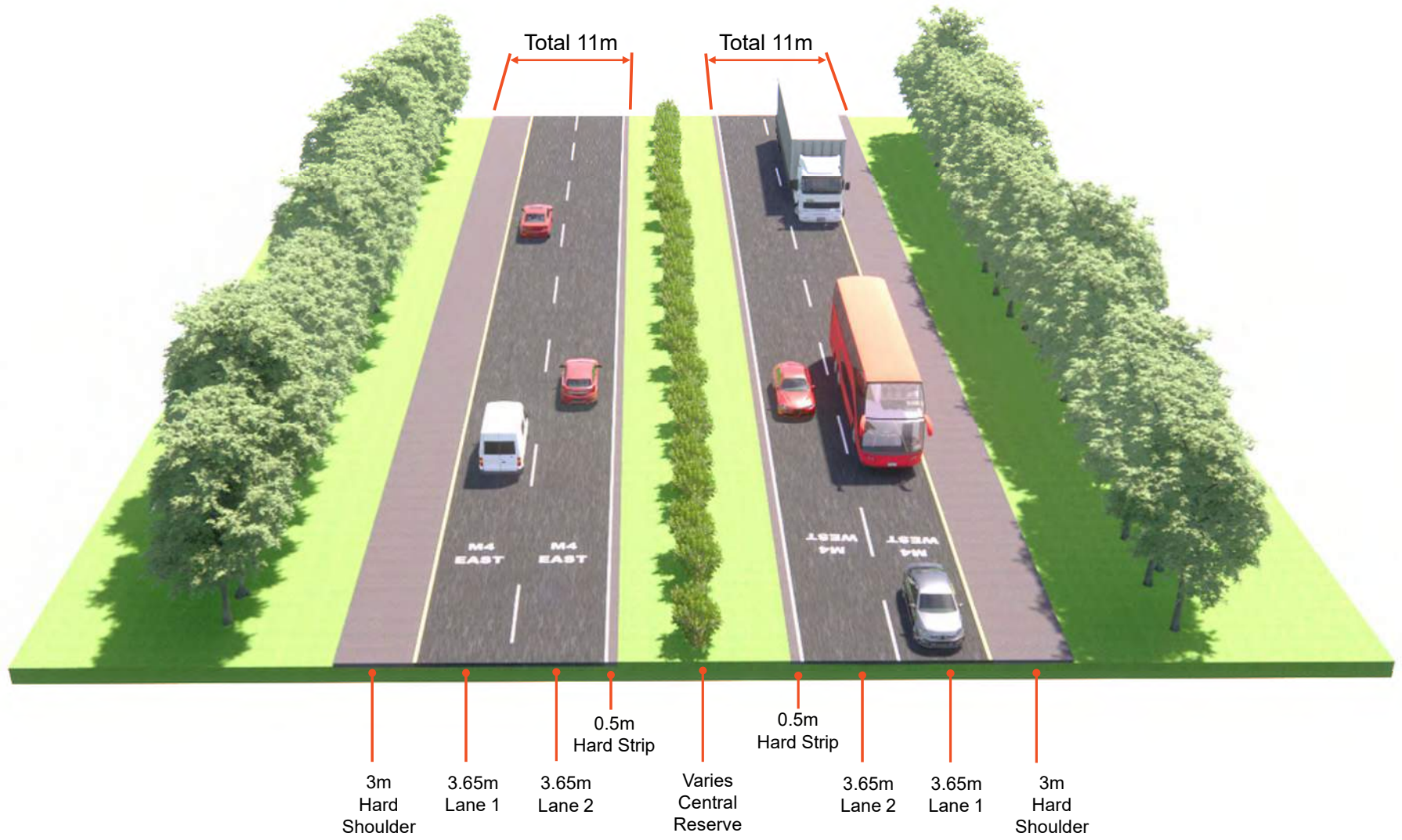
- Items to be assessed to provide enhanced strategic rail services would include:
 - Frequency
 - Speed
 - Reliability
- The above items would be enhanced and included in a improved Regional Rail element. This represents a practicable Regional Rail Improvement within the existing rail corridor constraints.
- This would be in addition to the scope of the Dart + West Project
- Limitations of the improvement:
 - Services would operate within the current rail corridor boundary, meaning using the existing track and provision for new track or overtaking bays only where space within the existing rail corridor boundary permits.
 - Operate at a speed possible on the existing track
 - Operate at a frequency that is practical based on the existing/proposed services on the rail line.





MAYNOOTH TO LEIXLIP PROJECT

Appendix 5.2
Stage 1 Sift 3 POA
Graphics (Detailed)



Total 11m

Total 11m

3m
Hard
Shoulder

3.65m
Lane 1

3.65m
Lane 2

0.5m
Hard Strip

Varies
Central
Reserve

0.5m
Hard Strip

3.65m
Lane 2

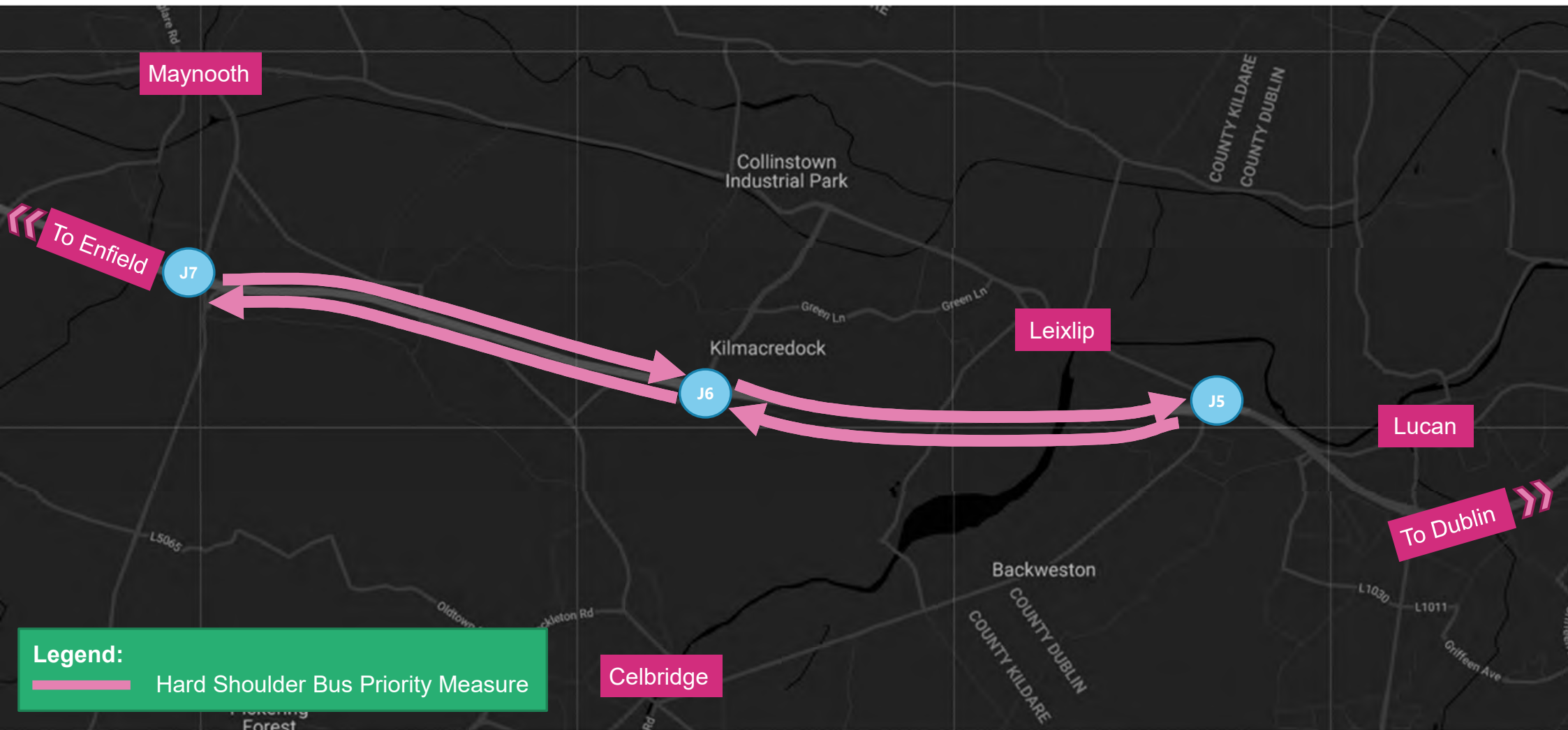
3.65m
Lane 1

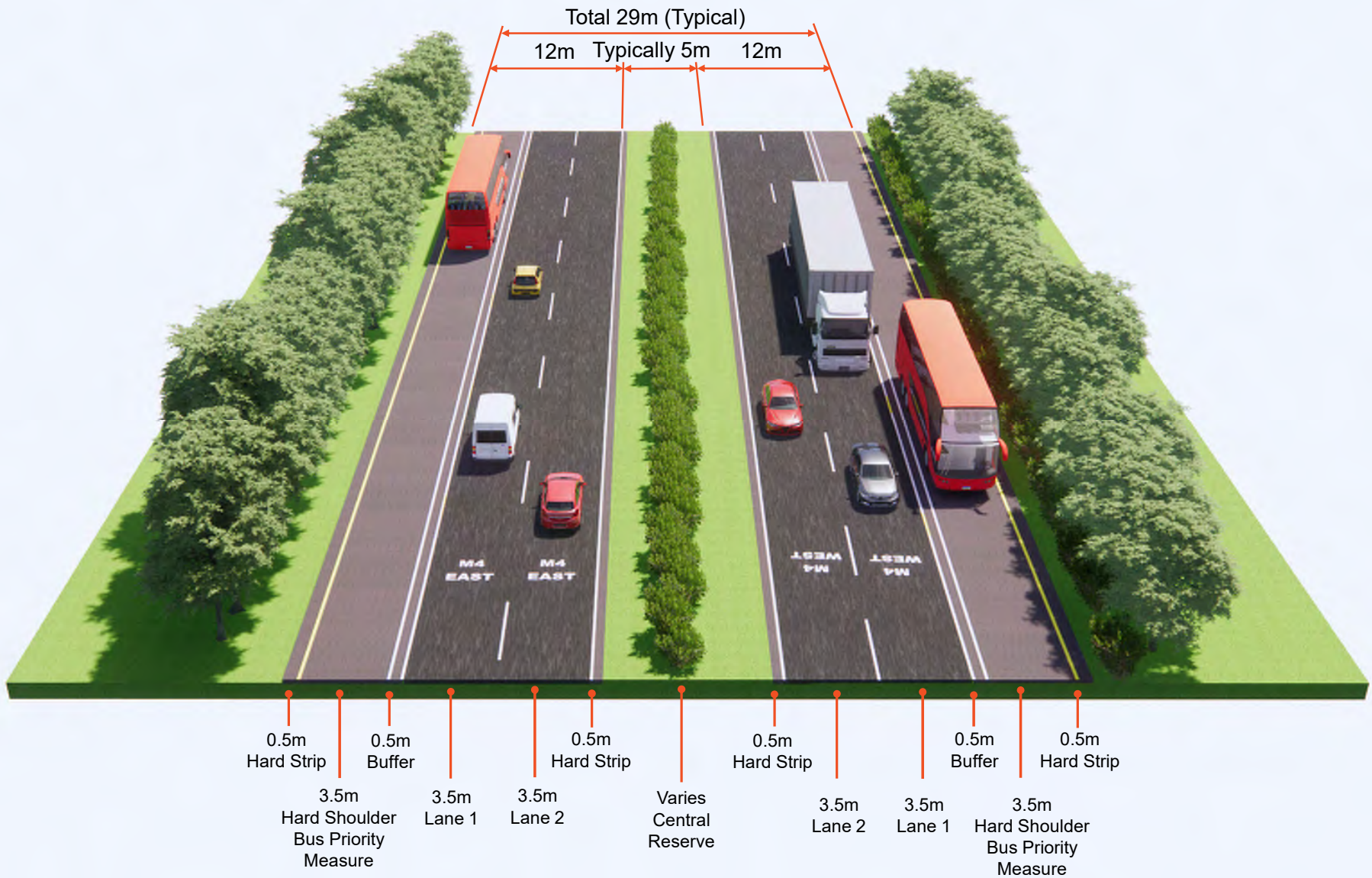
3m
Hard
Shoulder

M4
EAST

M4
WEST

Corridor Option 1





Total 29m (Typical)

12m Typically 5m 12m

0.5m
Hard Strip

0.5m
Buffer

3.5m
Hard Shoulder
Bus Priority
Measure

3.5m
Lane 1

3.5m
Lane 2

0.5m
Hard Strip

Varies
Central
Reserve

0.5m
Hard Strip

3.5m
Lane 2

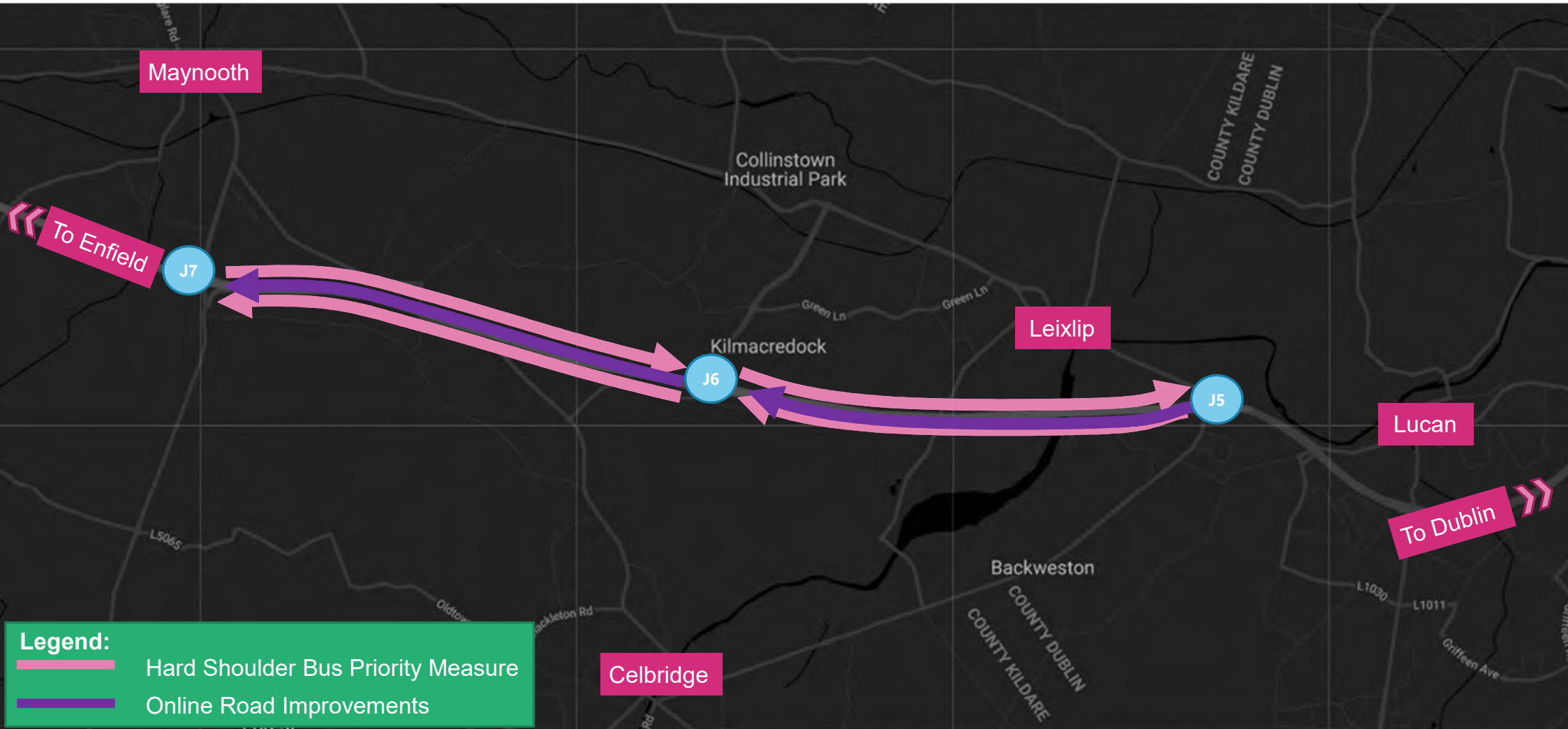
3.5m
Lane 1

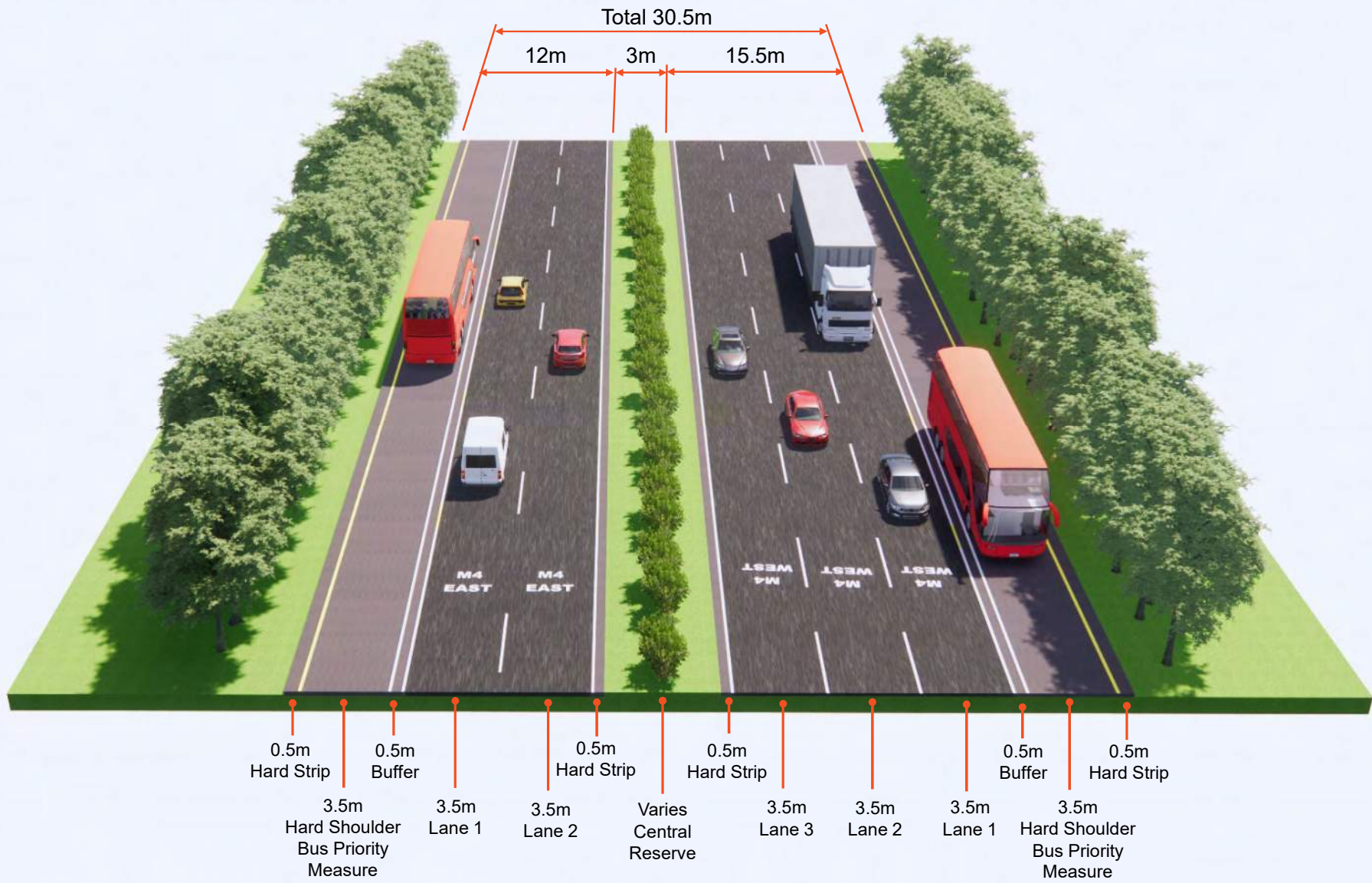
0.5m
Buffer

3.5m
Hard Shoulder
Bus Priority
Measure

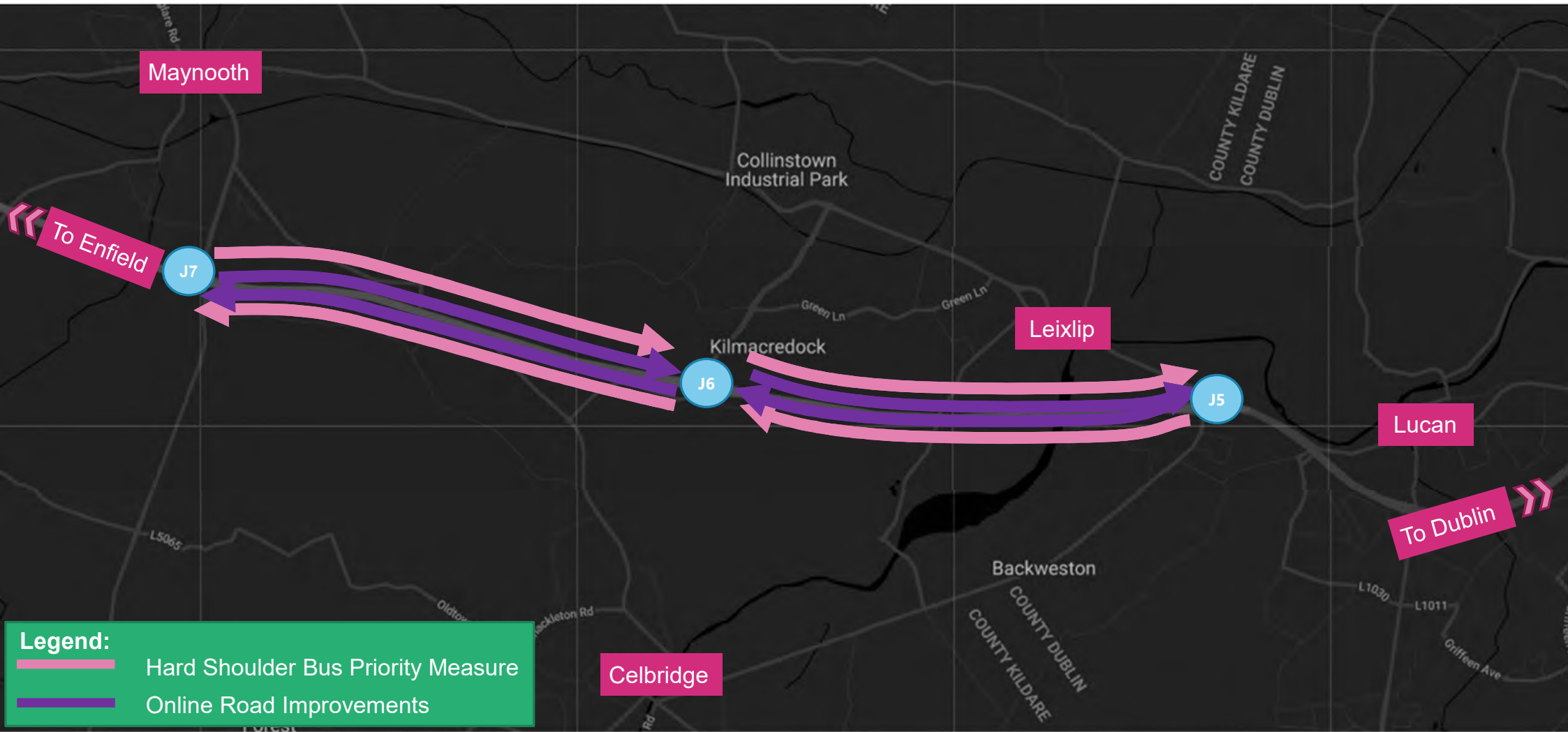
0.5m
Hard Strip

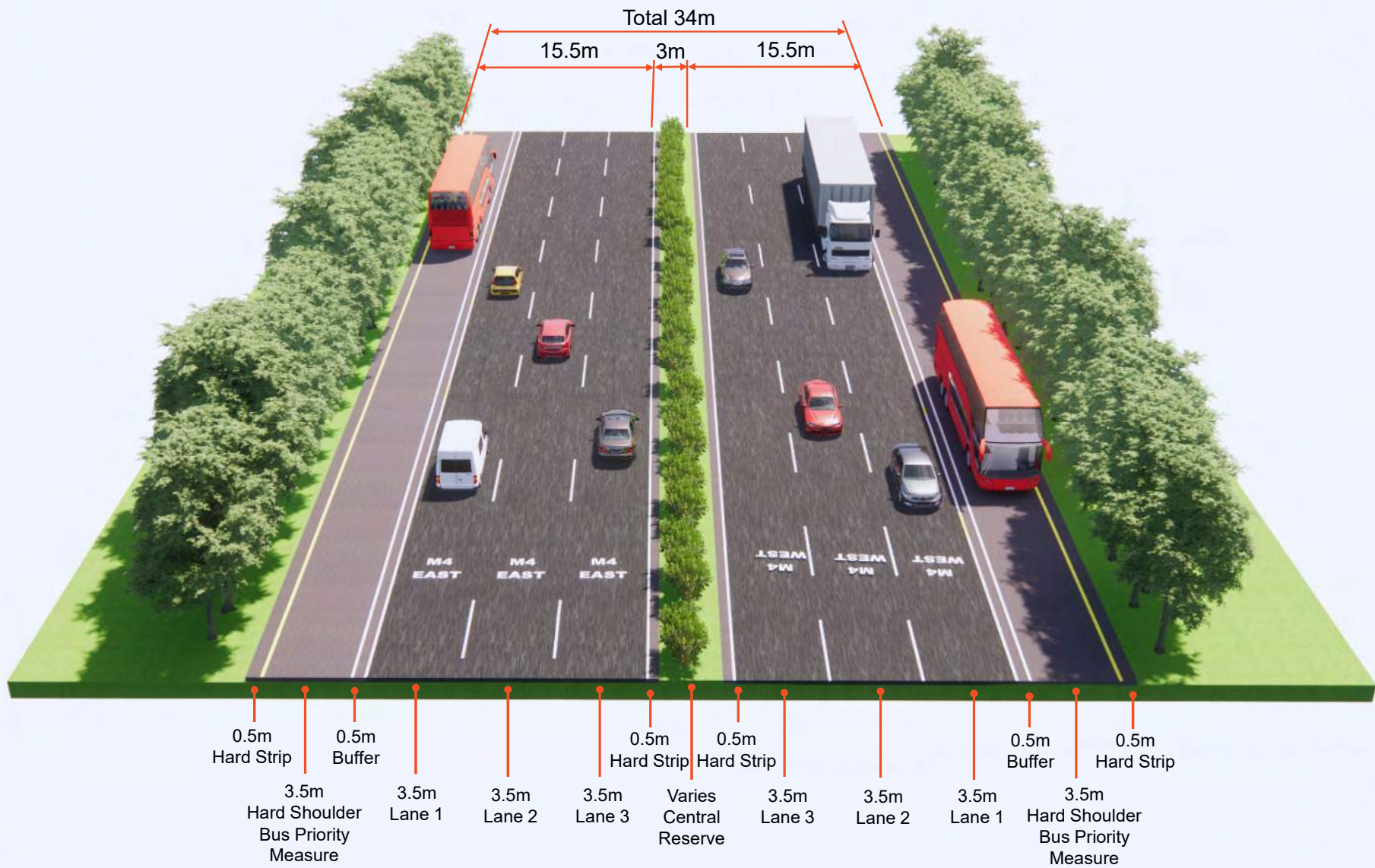
Corridor Option 2





Corridor Option 3

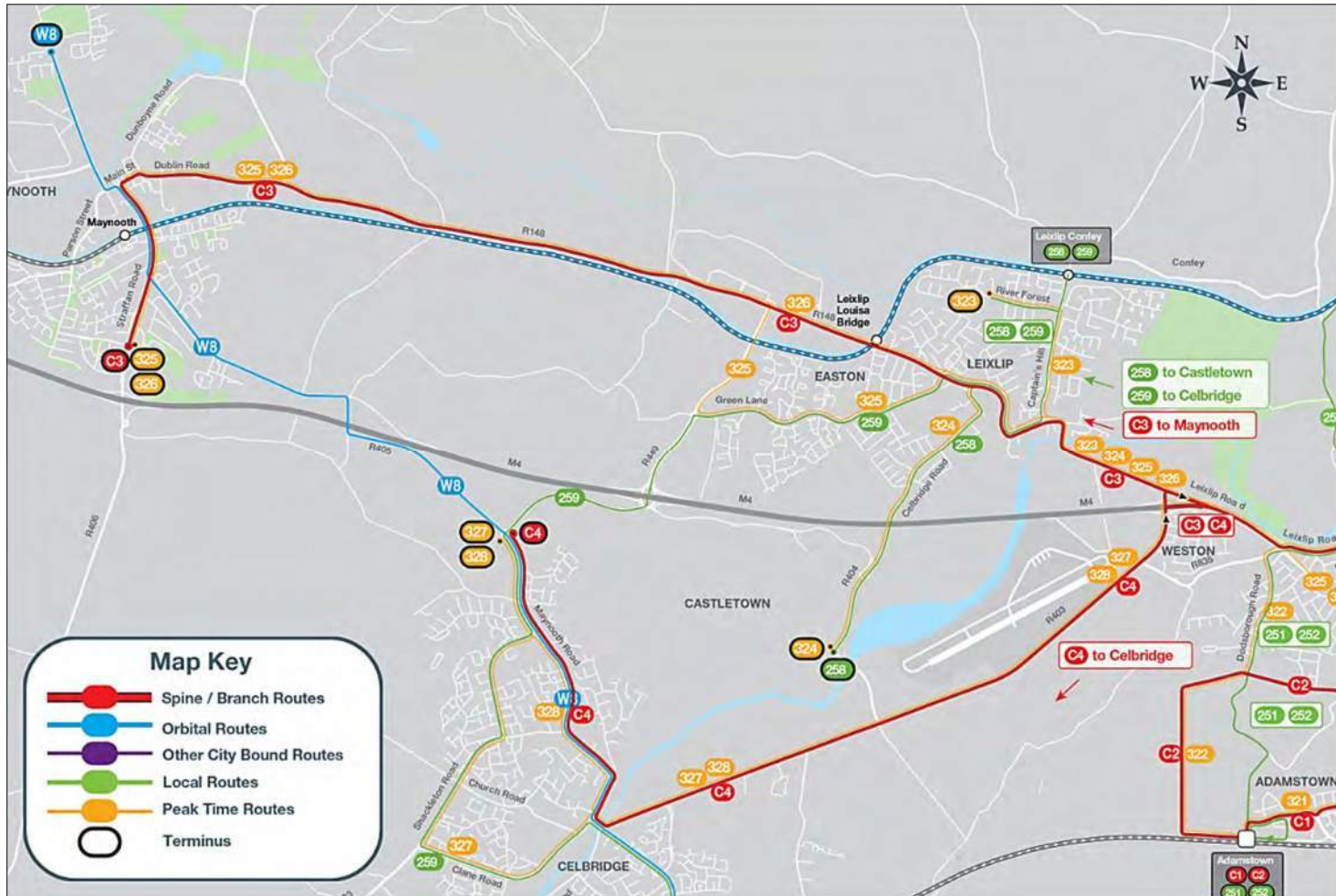




Enhanced Bus Infrastructure

1 No. 1 Option - Enhanced Bus Infrastructure

B6.1 – Enhanced Bus Infrastructure



This element would include enhancements to the existing bus infrastructure. Map shows proposed BusConnects network.

Enhanced Bus Infrastructure

Junctions / Bridges

14 Options

8 No. at Junction 7 environs

1 No. at R405 Ballygoran Overbridge

1 No. at Junction 6

1 No. at R404 Overbridge

3 No. at Junction 5 environs

Junction 7

8 Options (4 Categories):

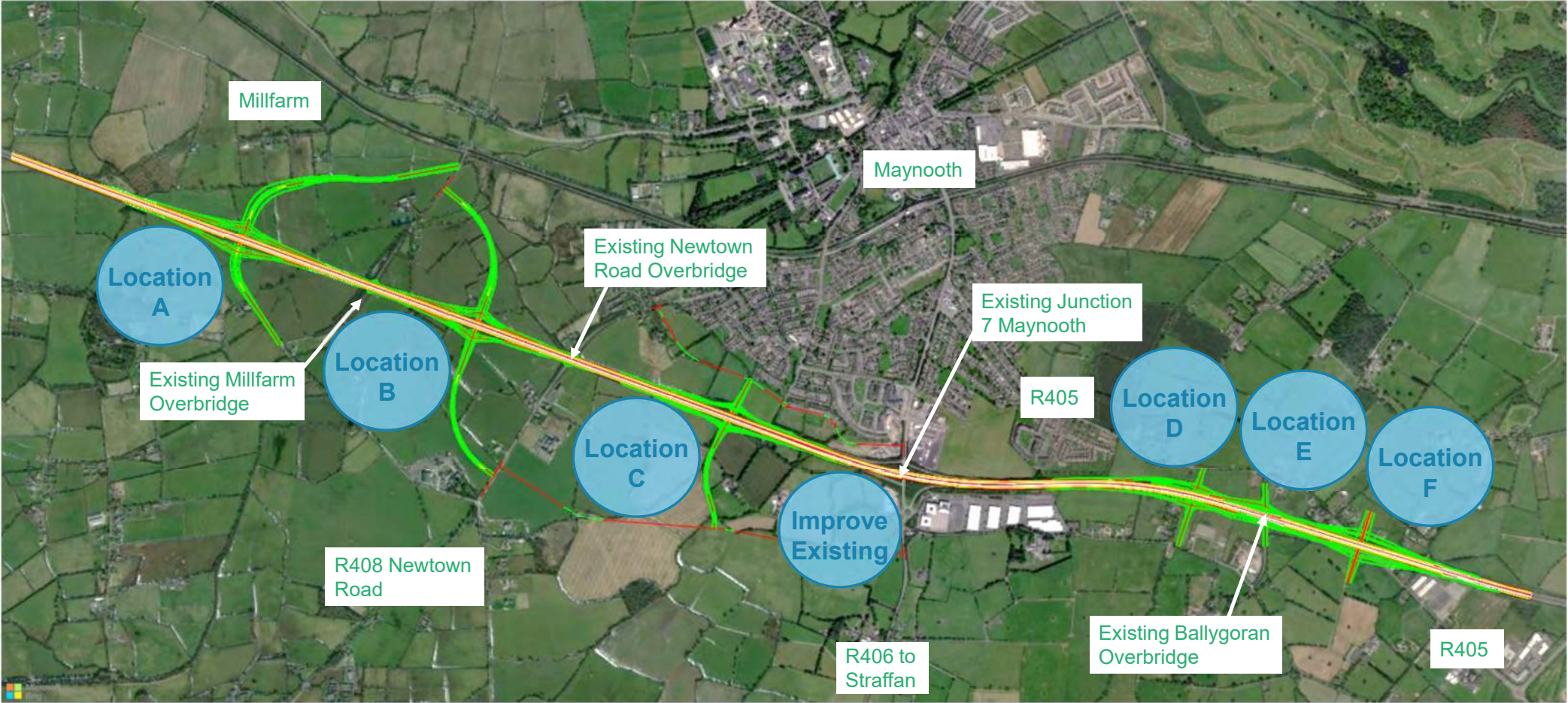
1 No. – Upgrade Existing Junction

1 No. – Provide 1 New Junction & Convert Existing to Overbridge

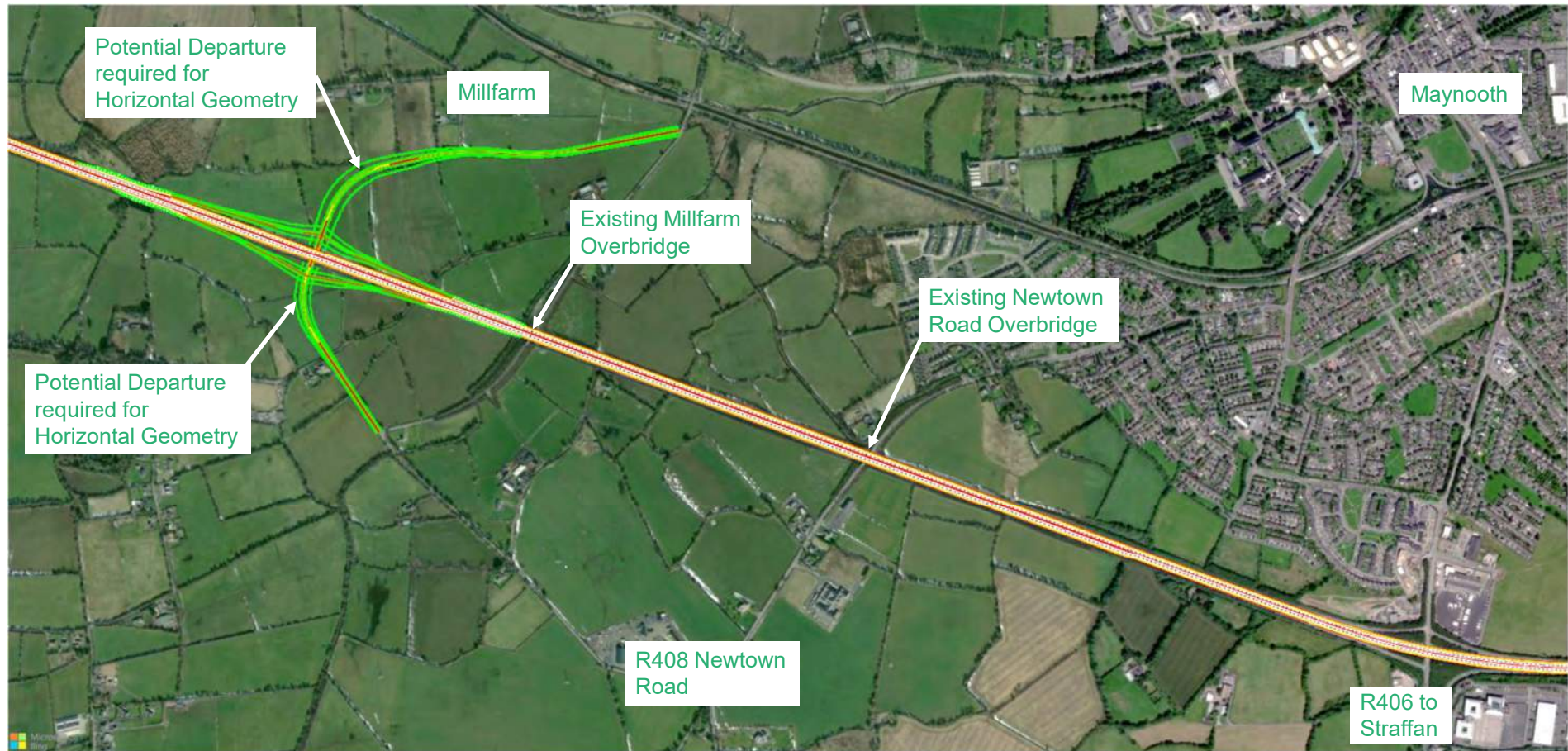
2 No. – Upgrade Existing Junction & Provide 2nd Junction

4 No. – Provide 2 New Junctions & Convert Existing to Overbridge

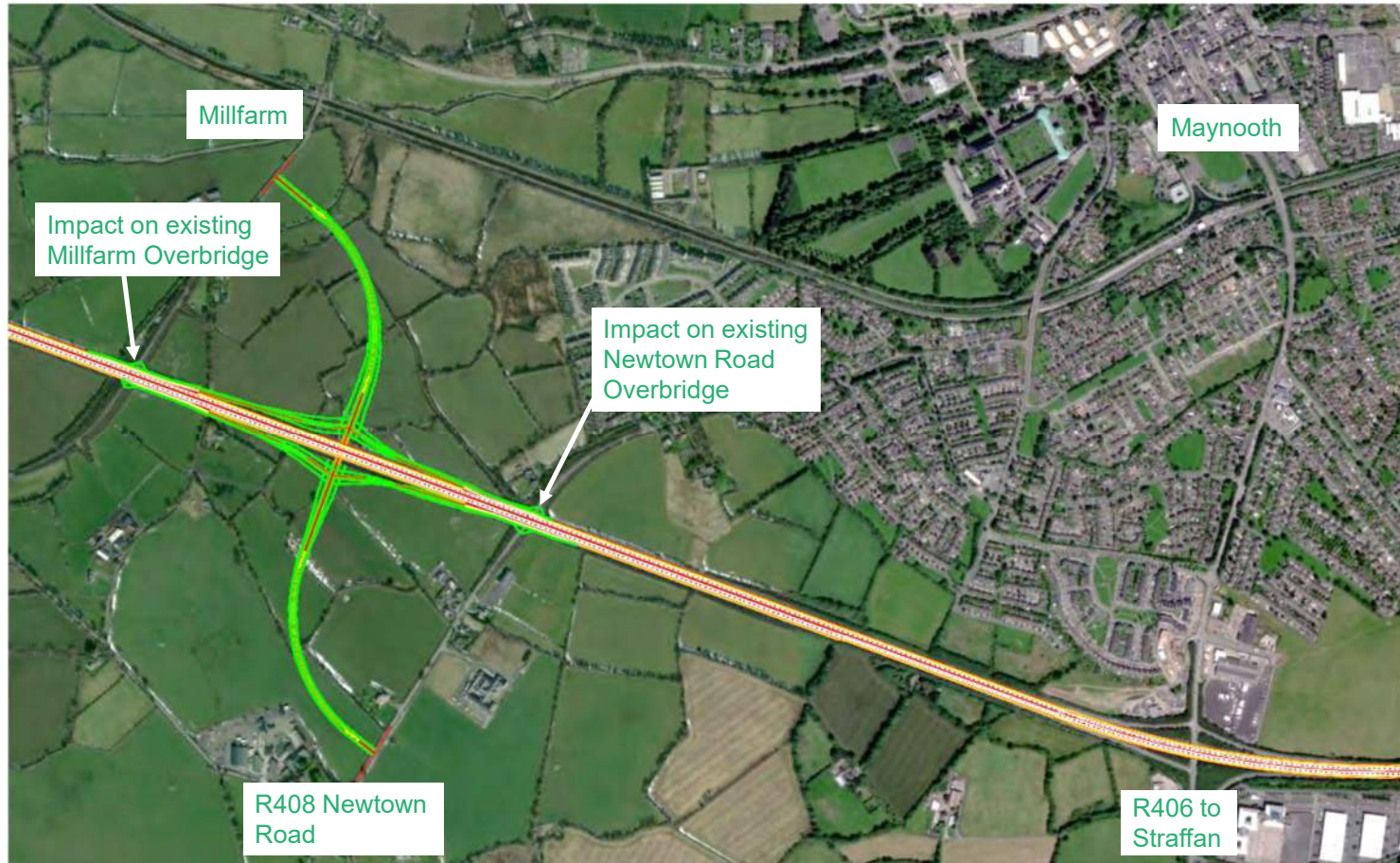
Junction 7 Options Summary



Location A – Junction West of Millfarm



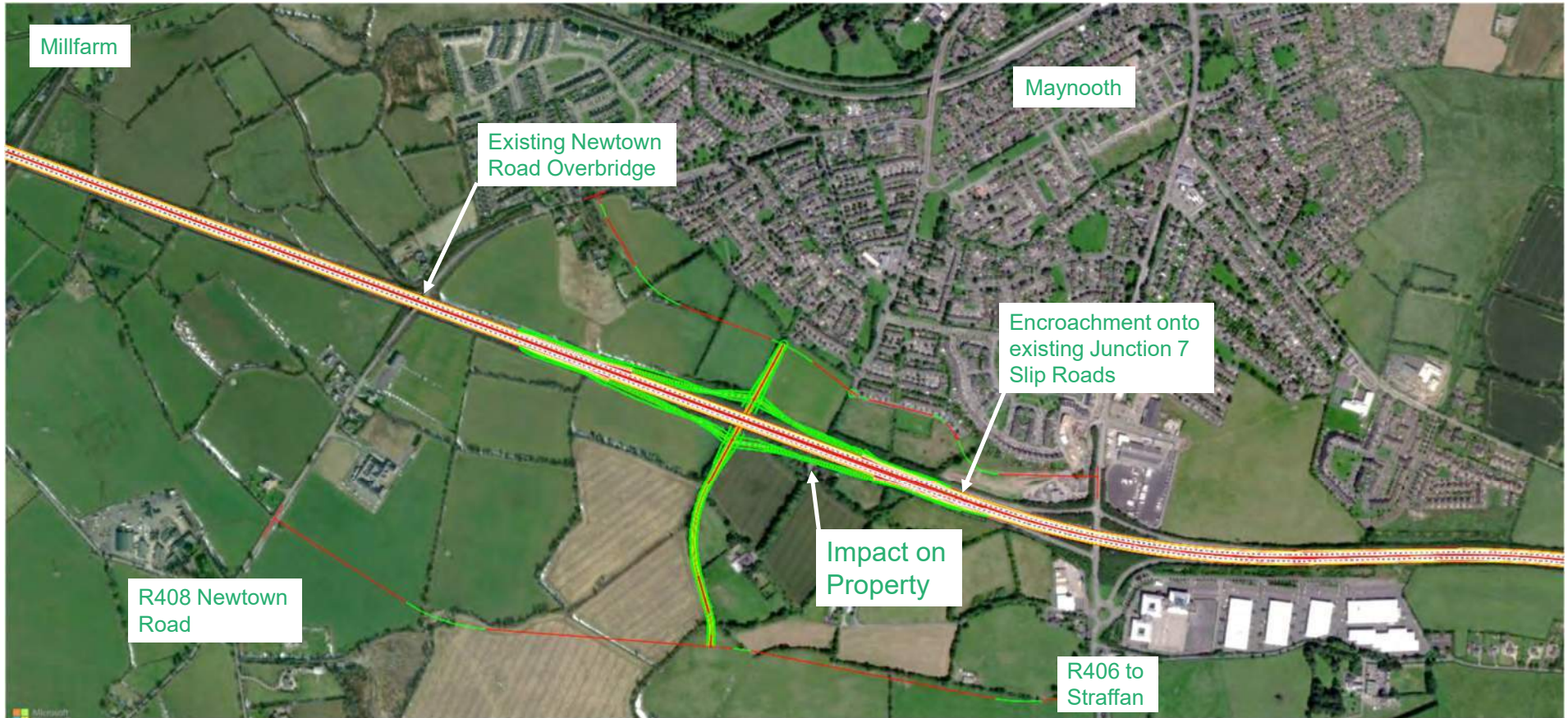
Location B – Junction between Millfarm and Newtown Road



Location C

ARUP

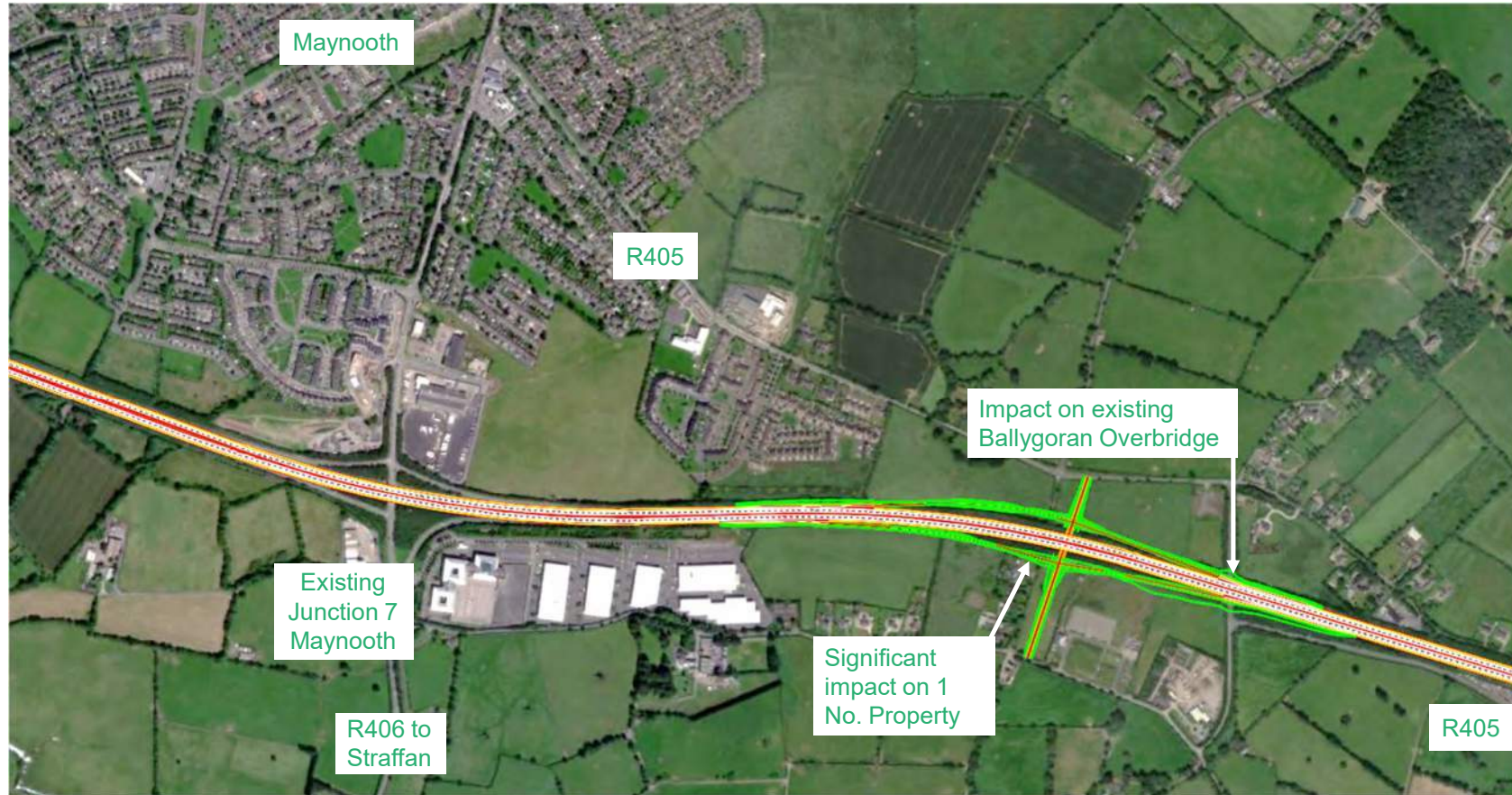
Location C– Junction between Newtown Road and R406 Straffan Road



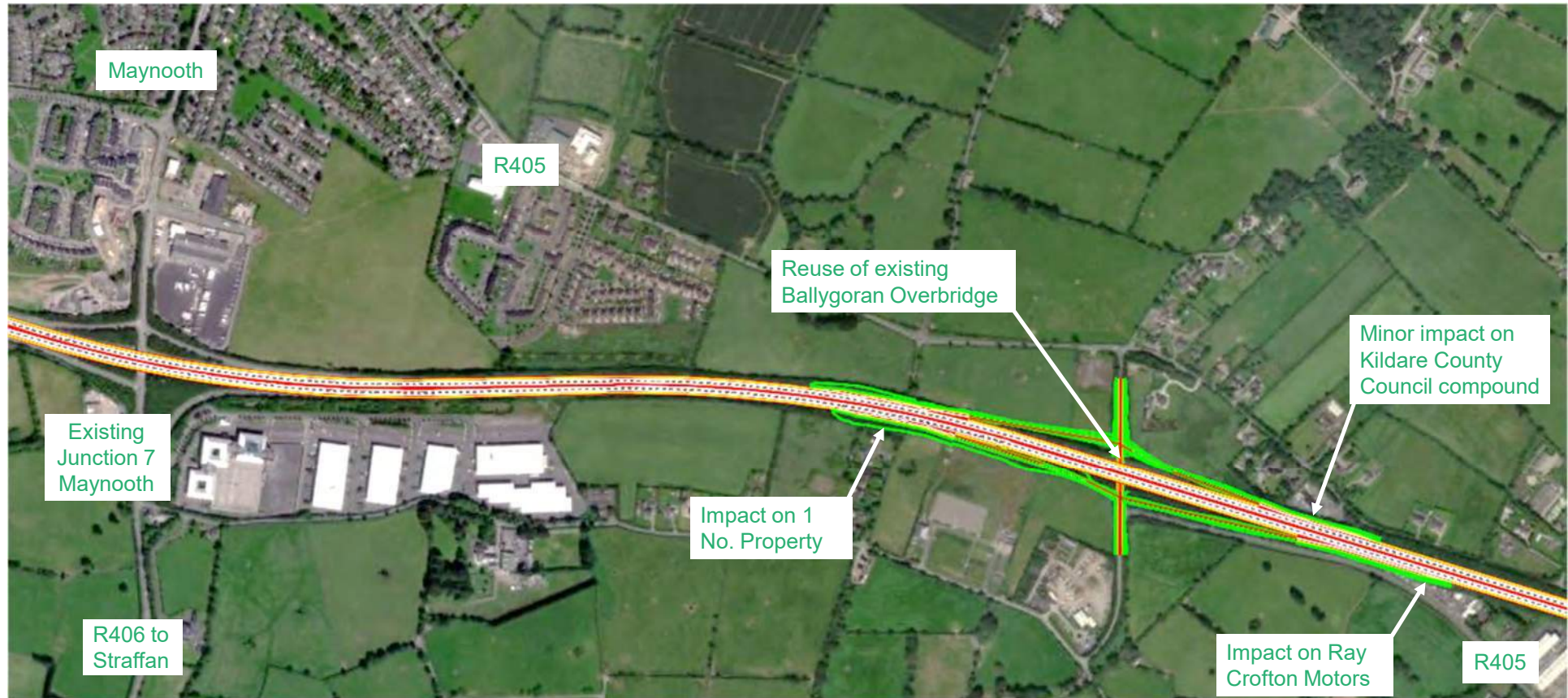
Location B

ARUP

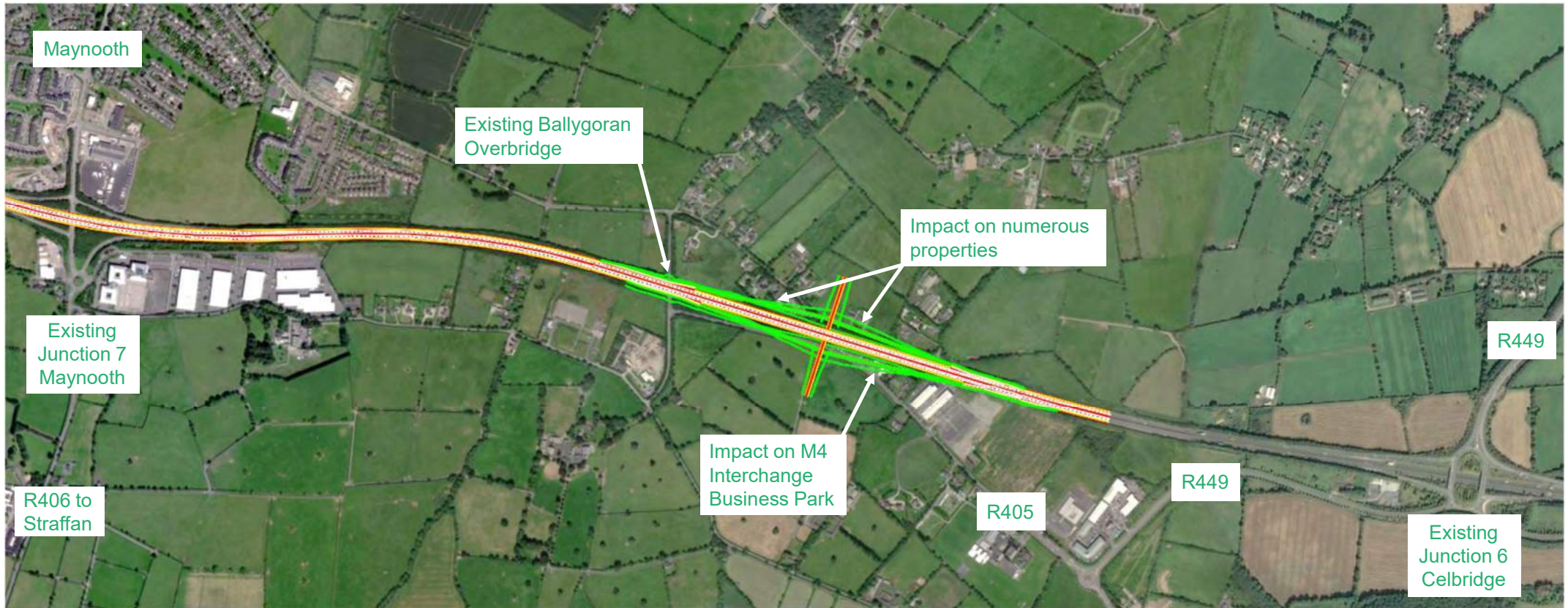
Location D – Junction West of Existing Ballygoran Overbridge



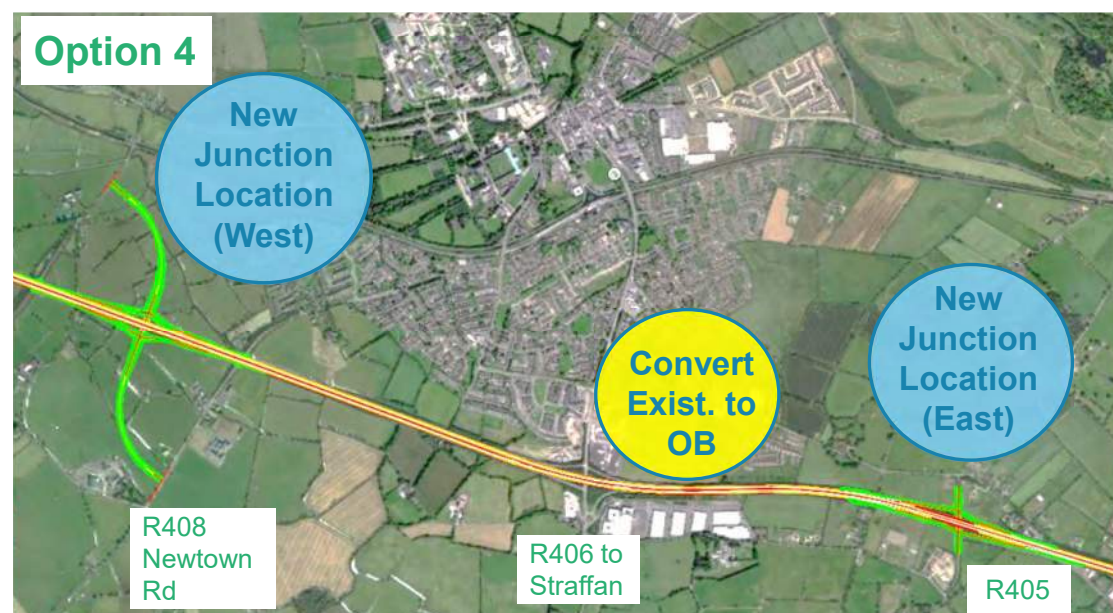
Location E – Junction reusing Existing Ballygoran Overbridge



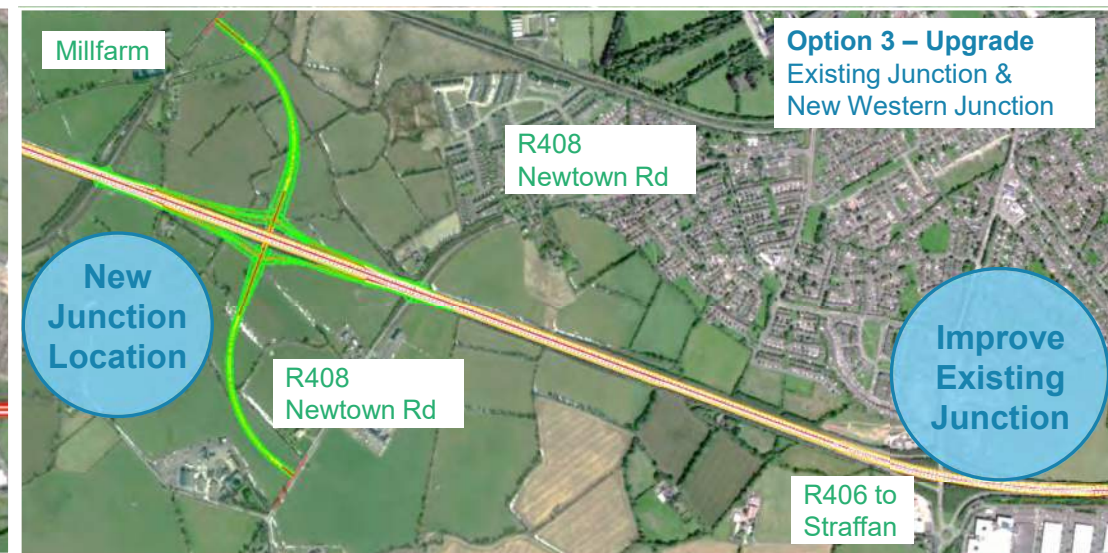
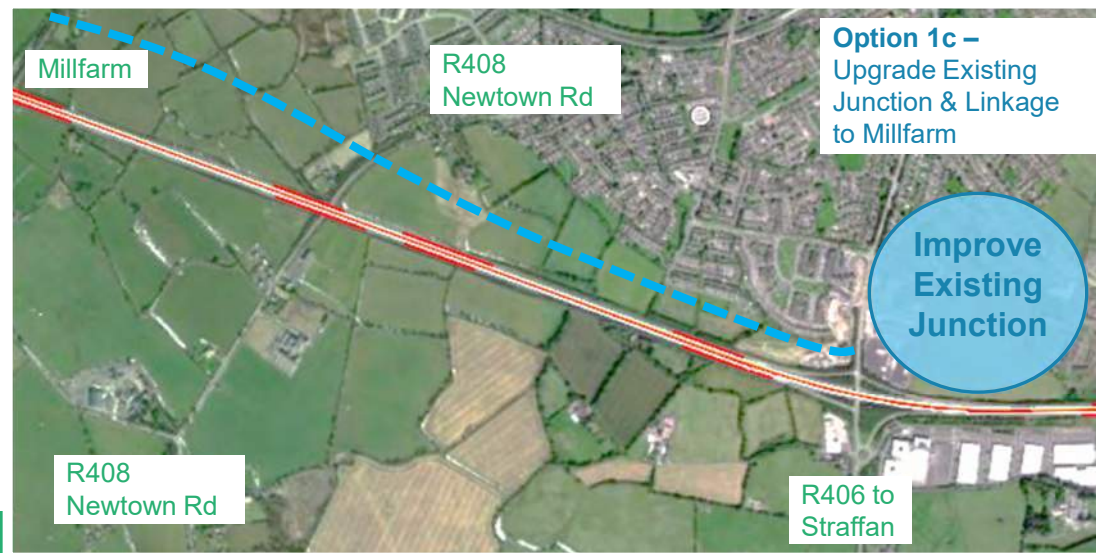
Location F – Junction East of Existing Ballygoran Overbridge



Junction 7- 2 Options for 1 Junction and 2 Options for 2 Junctions



Junction 7- Options for Modelling



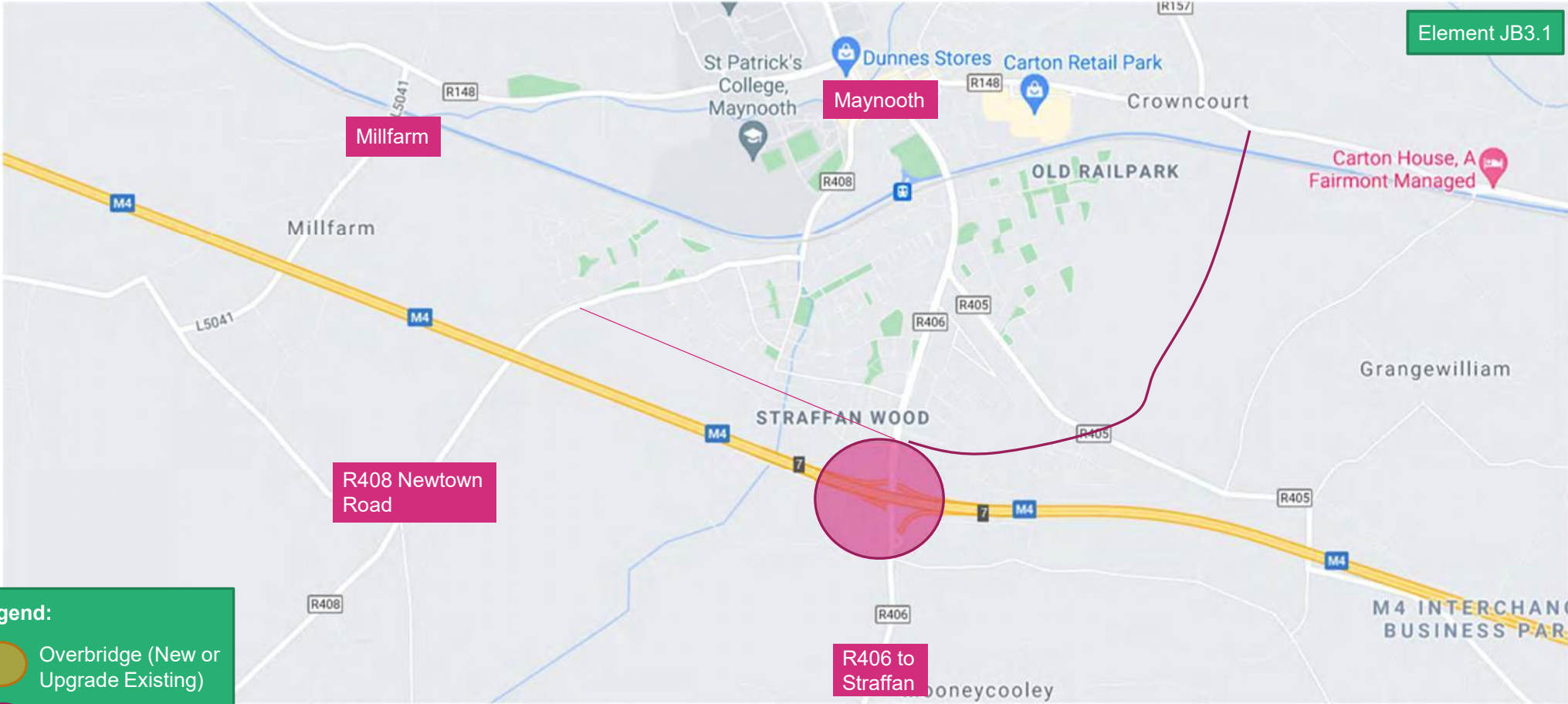
1 No. – Upgrade Existing Junction

1 No. – Provide 1 New Junction & Convert Existing to Overbridge



2 No. – Upgrade Existing Junction & Provide 2nd Junction

4 No. – Provide 2 New Junctions & Convert Existing to Overbridge

J7 – Option 1 – Upgrade Existing Junction



Legend:

-  Overbridge (New or Upgrade Existing)
-  Junction (New or Upgrade Existing)

1 No. – Upgrade Existing Junction

1 No. - Provide 1 New Junction & Convert Existing to Overbridge

2 No. – Upgrade Existing Junction & Provide 2nd Junction

4 No. – Provide 2 New Junctions & Convert Existing to Overbridge

J7 - Option 4.1.1 - Provide 1 New Junction & Convert Existing to Overbridge



Legend:

- Overbridge (New or Upgrade Existing)
- Junction (New or Upgrade Existing)

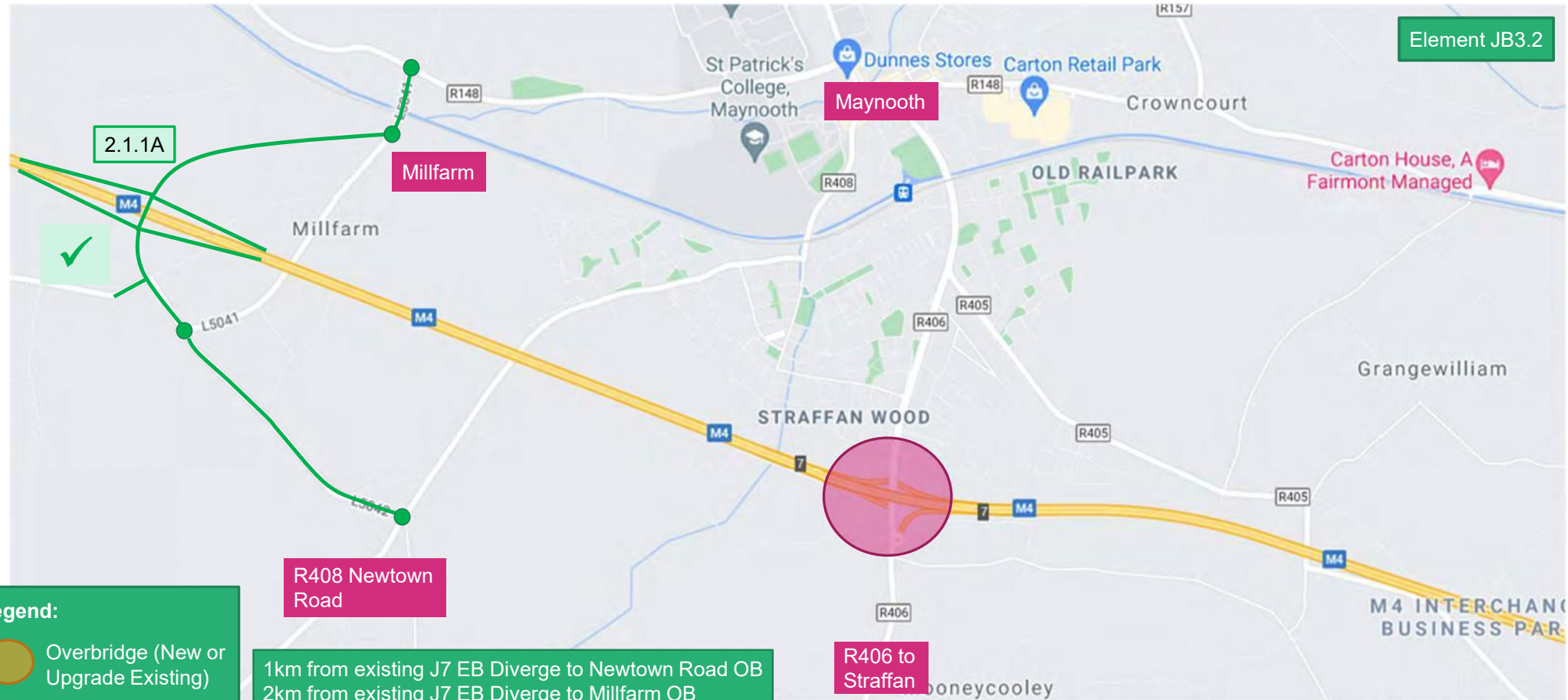
1 No. – Upgrade Existing Junction

1 No. – Provide 1 New Junction & Convert Existing to Overbridge

2 No. – Upgrade Existing Junction & Provide 2nd Junction

4 No. – Provide 2 New Junctions & Convert Existing to Overbridge

J7 - Option 2.1.1 – Upgrade Existing Junction & Provide 2nd Junction (Standard 2km)



Element JB3.2

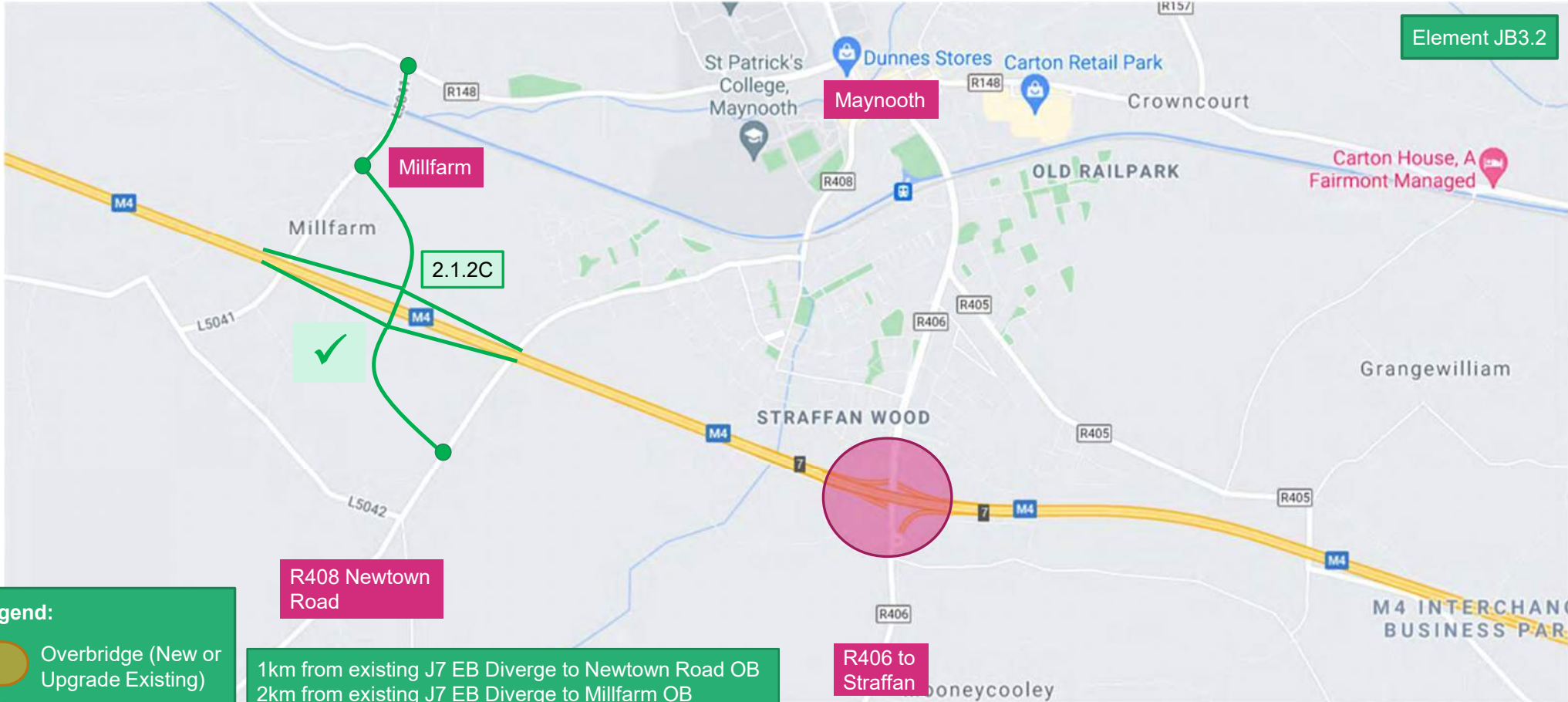
Legend:

- Overbridge (New or Upgrade Existing)
- Junction (New or Upgrade Existing)

R408 Newtown Road

- 1km from existing J7 EB Diverge to Newtown Road OB
- 2km from existing J7 EB Diverge to Millfarm OB
- 1km from existing J7 EB Merge to R405 Ballygoran OB
- 1.8km from existing J6 EB Diverge to R405 OB

J7 - Option 2.1.2 – Upgrade Existing Junction & Provide 2nd Junction (Relaxation 1km)



Legend:

- Overbridge (New or Upgrade Existing)
- Junction (New or Upgrade Existing)

R408 Newtown Road

- 1km from existing J7 EB Diverge to Newtown Road OB
- 2km from existing J7 EB Diverge to Millfarm OB
- 1km from existing J7 EB Merge to R405 Ballygoran OB
- 1.8km from existing J6 EB Diverge to R405 OB

1 No. – Upgrade Existing Junction

1 No. - Provide 1 New Junction & Convert Existing to Overbridge

2 No. – Upgrade Existing Junction & Provide 2nd Junction

4 No. – Provide 2 New Junctions & Convert Existing to Overbridge

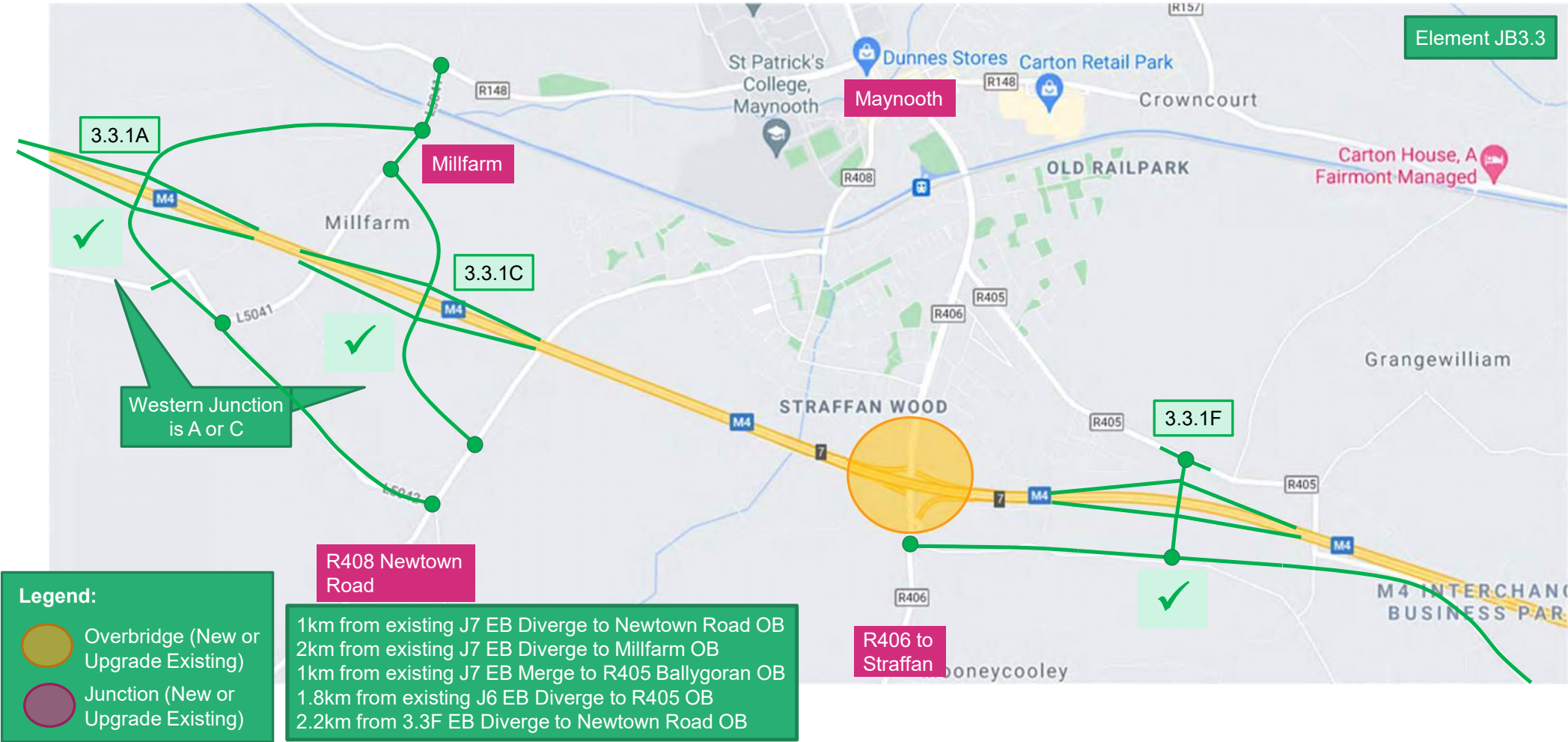
J7 - Option 3.1.2 - Provide 2 New Junctions & Convert Existing to Overbridge (Relaxation 1km)



J7 - Option 3.2.2 - Provide 2 New Junctions & Convert Existing to Overbridge (Relaxation 1km)



J7 - Option 3.3.1 - Provide 2 New Junctions & Convert Existing to Overbridge (Standard 2km or Relaxation 1km)



J7 - Option 3.4.1 - Provide 2 New Junctions & Convert Existing to Overbridge (Standard 2km or Relaxation 1km)



Junctions / Bridges

R405 Ballygoran Overbridge

1 No. Option – Upgrade Existing Overbridge

R405 Ballygoran Overbridge - Option 1 – Upgrade Existing Overbridge



Junctions / Bridges

Junction 6

1 No. Option – Upgrade Existing Junction

Junction 6 - Option 1 – Upgrade Existing Junction



Junctions / Bridges

R404 Overbridge

1 No. Option – Upgrade Existing Overbridge

R404 Overbridge – Option 1 – Upgrade Existing Overbridge



Junctions / Bridges

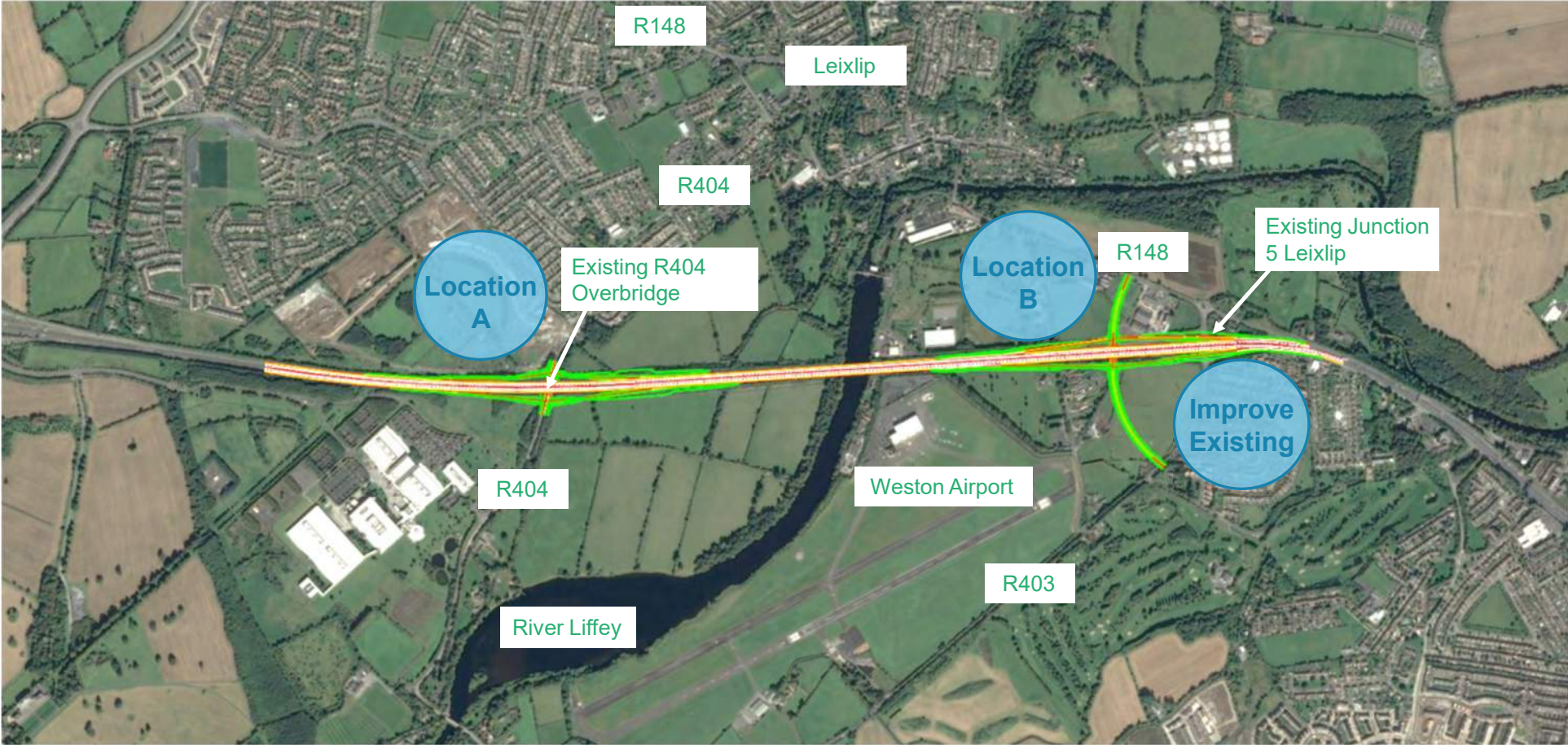
Junction 5

3 Options (2 Categories):

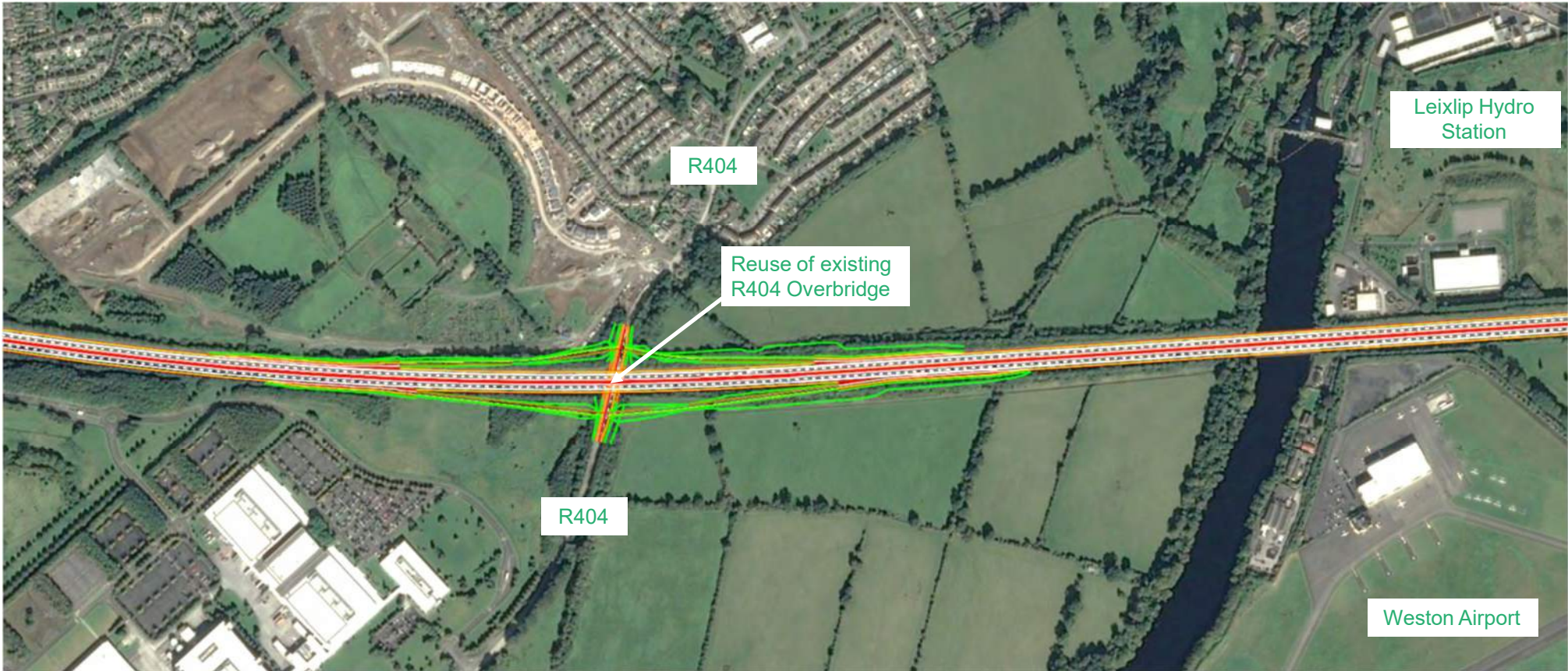
1 No. – Upgrade Existing Junction

2 No. – Provide 1 New Junction & Convert Existing to Overbridge

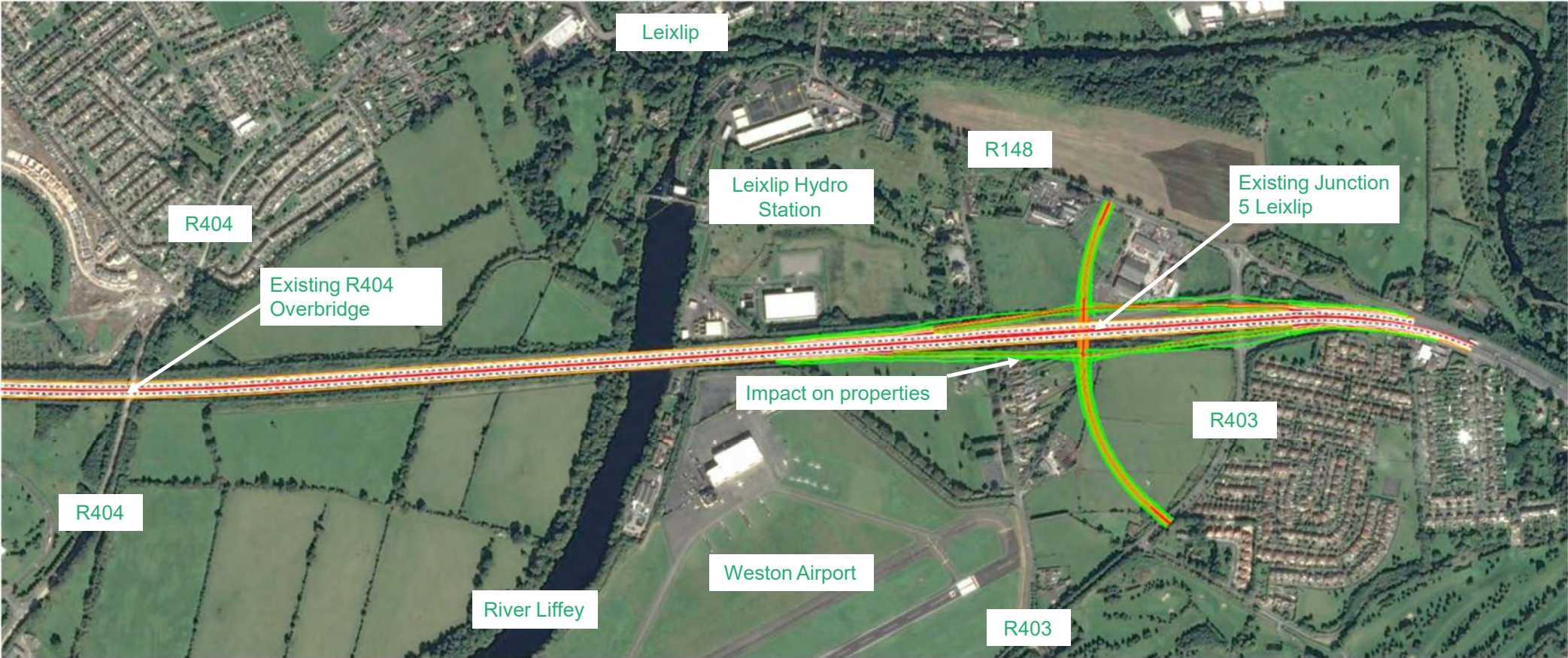
Junction 5 Options Summary



Option A – New Junction located on the R404



Option B – New Junction between Liffey River Bridge and Existing Junction 5



Demand Management

11 No. Options

Demand Management

Ref No.	Description
DM1.1	Test Transit Oriented Development
DM1.2	Test the mix of Land Uses in close proximity to each other
DM1.4	Alternative Demand Sensitivity Analysis
DM2.1	Road Tolling / Pricing
DM3.2	Reduced Speed Limits
DM3.3	Variable Speed Limits

Ref No.	Description
DM3.4	Ramp Metering/ Junction Access Control Signals
DM7.1	Interchange Facilities
DM7.2	Integrated Ticketing and Fares Structures
DM8.1	Public Realm and Urban Design
DM9.1	Public Realm and Urban Design

Park and Ride

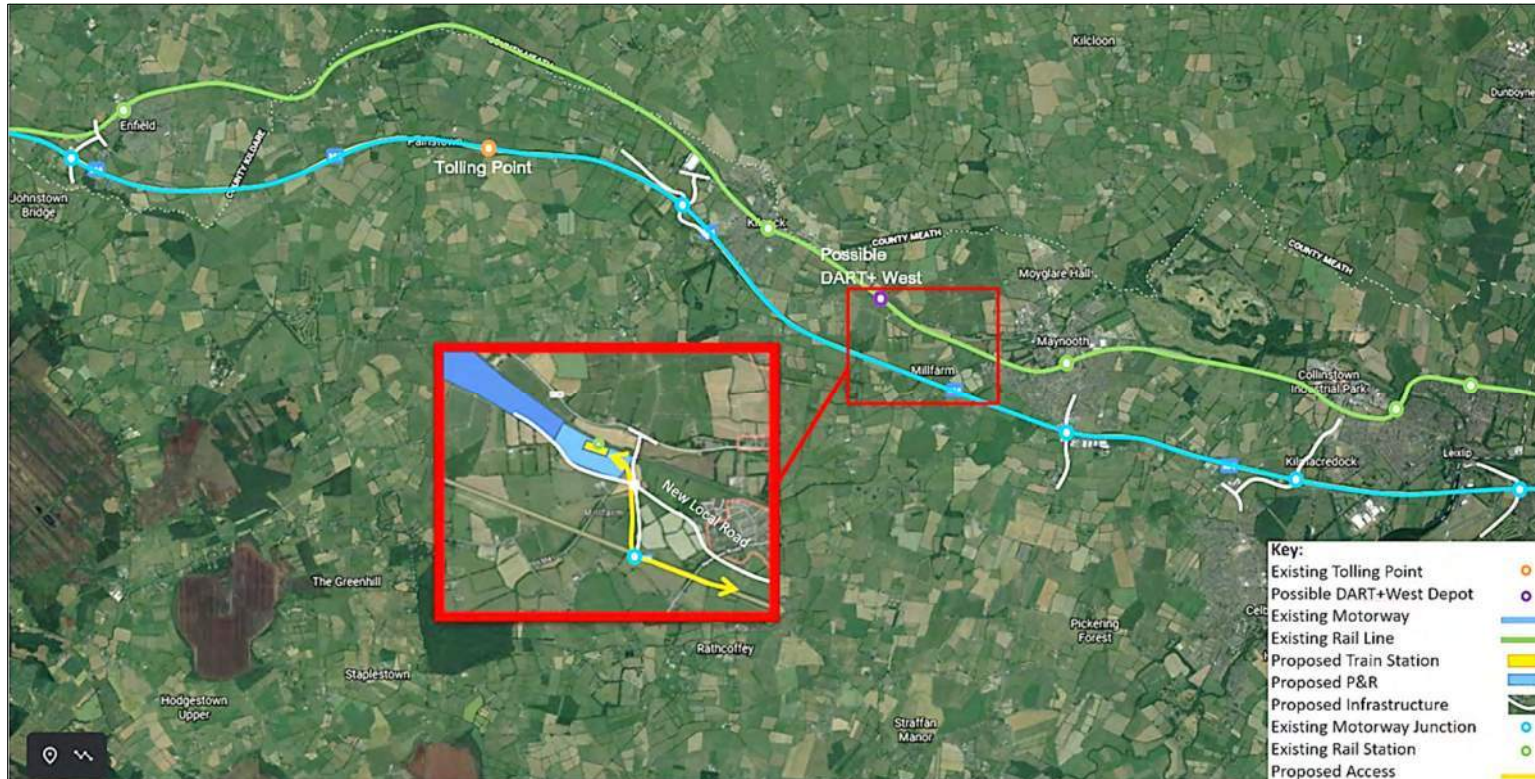
6 Options (3 Categories):

4 No. – Strategic Park and Ride Options

1 No. – Local Hub Option

1 No. – Local Park and Ride Option

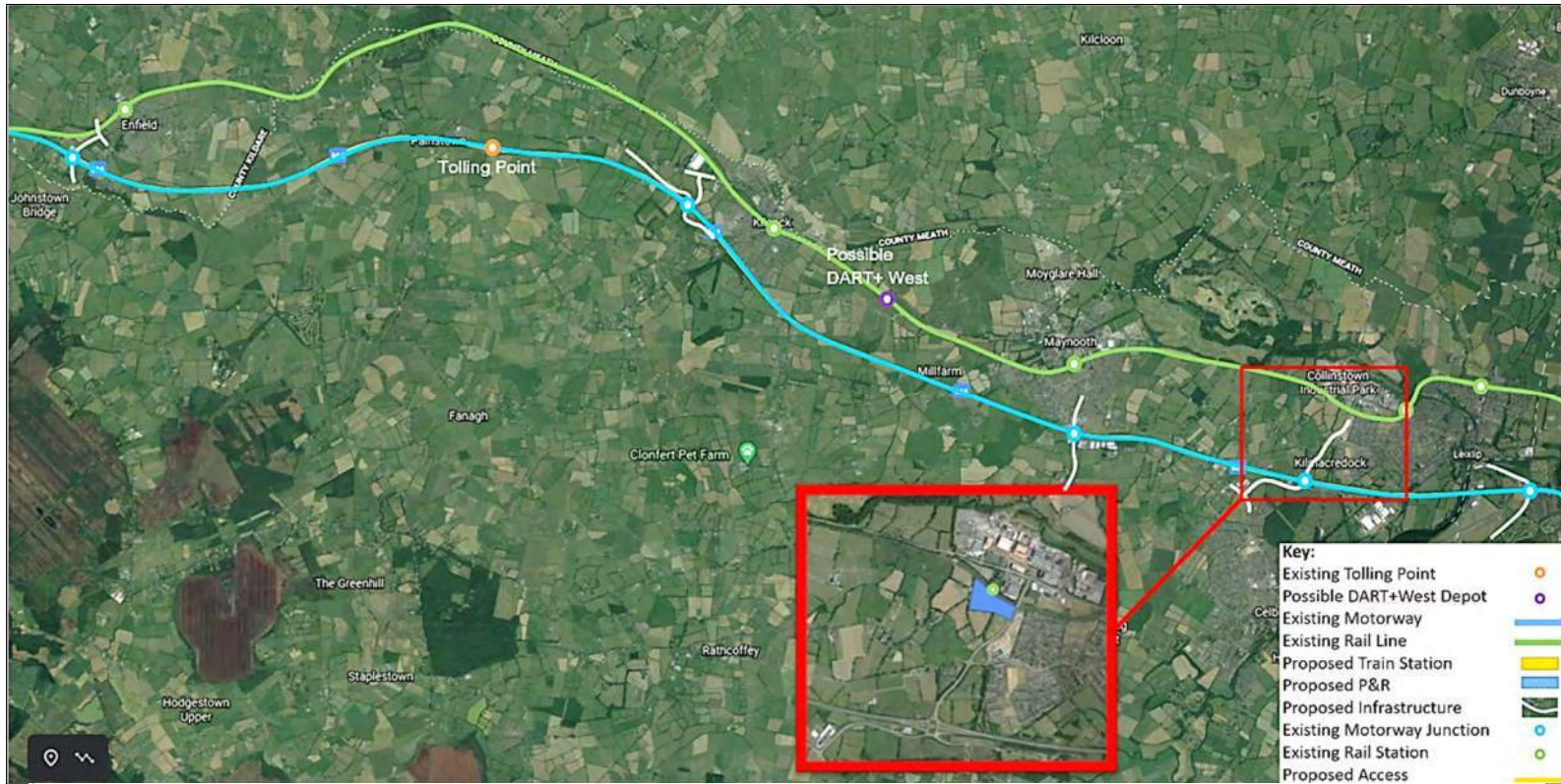
PR 1 - Combined Rail and Bus Based P&R (West Maynooth)



Rail Service (assume New Train Station)	Bus Service	Positives	Negatives
<p>Current Rail Frequency** – 15 minutes (peak hour) – requires extending Maynooth service to proposed depot</p> <p>Journey Time to City Centre** - ~50 minutes</p>	<p>Proposed Frequency – 10 minutes (peak hour)</p> <p>Journey Time to City Centre* - ~ 45 minutes</p> <p>Journey Time to Liffey Valley* - ~ 15 minutes</p> <p>Bussing Requirements 9/10 buses</p>	<p>Mixed Mode Opportunities</p> <p>Great Access to New Train Station</p> <p>Good Synergy with Depot proposals and with the need to update the existing Maynooth Interchange</p> <p>Located beyond the current congested zone</p> <p>Access DART+ West Higher frequency and capacity</p>	<p>High Bussing Requirements</p> <p>Significant Infrastructure Required – New Interchange, New local roads, New station</p> <p>Linkage with BusConnects network will need to be reviewed</p>



PR 2 - Rail Based P&R (Collinstown)



Rail Service (assume New Train Station)	Bus Service	Positives	Negatives
Current Rail Frequency** – 15 minutes (peak hour) – Journey Time to City Centre** - ~45 minutes	Maynooth BusConnects Services	Great Access to New Train Station	Potential Development Land New Infrastructure Required, including a new train station Parking located within the edge of the current congested zone Limited Bus Services (Maynooth BusConnects services)



PR 3 - Bus Based P&R (Junction 6)



Rail Service	Bus Service	Positives	Negatives
No Rail Service proposed	Proposed Frequency – 10 minutes (peak hour) Journey Time to City Centre* - ~ 35 minutes Journey Time to Liffey Valley* - ~ 7 minutes Bussing Requirements 7/8 buses	Good access to the city centre and new interchange hub at Liffey Valley Reduced number of buses	Parking located within the edge of the current congested zone Potential upgrade to the Interchange required



PR 4 – P&R at Junction 5 (Bus Based)



PR 5 – Local Mobility Hubs

Understanding the 3 Categories of Park and Ride



Type	Strategic Park and Ride PR Option 1	Local Mobility Hubs PR Option 2	Local Park and Ride PR Option 3
Function	<p>To facilitate the modal shift of long distance car trips to public transport, at an early opportunity.</p> <p>To serve a wide hinterland of a strategic corridor to an urban centre</p>	<p>To serve urban and suburban areas. They seek to expand the local catchment of public transport services by catering for access to stops / stations for a range of mobility options</p> <p>To provide the opportunity to interchange between the car and public transport modes as well as between sustainable transport modes.</p>	<p>To provide parking facilities at transport nodes such as railway stations and bus stations serving smaller towns and villages on the regional public transport network</p>
Key Characteristics	<p>Located on an interchange between the National Roads Network and high quality high capacity public transport.</p> <p>Large in scale (500 car parking spaces +).</p>	<p>Include car parking, high quality bicycle parking, walking and cycling links to good quality walking and cycling networks and dedicated car club and car sharing facilities.</p>	<p>Small in scale. Local park and ride should also tie into the local walking and cycling networks.</p>
Things to avoid	<p>Should not encourage people who would otherwise access public transport locally, to drive further to access a site, thus adding to congestion.</p> <p>Existing users of the public transport should not be unduly affected by increased patronage associated with park and ride usage.</p>	<p>While mobility hubs include car parking, the site should not be dominated by it.</p> <p>Should not encourage people who would otherwise access public transport locally, to drive further to access a site, thus adding to congestion.</p>	<p>Should not become destination parking for the town or village.</p>

PR 6 – Local Park and Ride

Understanding the 3 Categories of Park and Ride



Type	Strategic Park and Ride PR Option 1	Local Mobility Hubs PR Option 2	Local Park and Ride PR Option 3
Function	<p>To facilitate the modal shift of long distance car trips to public transport, at an early opportunity.</p> <p>To serve a wide hinterland of a strategic corridor to an urban centre</p>	<p>To serve urban and suburban areas. They seek to expand the local catchment of public transport services by catering for access to stops / stations for a range of mobility options</p> <p>To provide the opportunity to interchange between the car and public transport modes as well as between sustainable transport modes.</p>	<p>To provide parking facilities at transport nodes such as railway stations and bus stations serving smaller towns and villages on the regional public transport network</p>
Key Characteristics	<p>Located on an interchange between the National Roads Network and high quality high capacity public transport.</p> <p>Large in scale (500 car parking spaces +).</p>	<p>Include car parking, high quality bicycle parking, walking and cycling links to good quality walking and cycling networks and dedicated car club and car sharing facilities.</p>	<p>Small in scale. Local park and ride should also tie into the local walking and cycling networks.</p>
Things to avoid	<p>Should not encourage people who would otherwise access public transport locally, to drive further to access a site, thus adding to congestion.</p> <p>Existing users of the public transport should not be unduly affected by increased patronage associated with park and ride usage.</p>	<p>While mobility hubs include car parking, the site should not be dominated by it.</p> <p>Should not encourage people who would otherwise access public transport locally, to drive further to access a site, thus adding to congestion.</p>	<p>Should not become destination parking for the town or village.</p>

Active Travel

6 Options (2 Categories):

5 No. – Enhancements to Junctions / Overbridges

1 No. – Cycle Parking and Infrastructure at Key Public Transport
Nodes and Destinations

AT 1 – Active Travel Enhancement at Junction 7 on the R406



AT 2 – Active Travel Enhancement on the R405 Overbridge



AT 3 – Active Travel Enhancement at Junction 6 on the R449



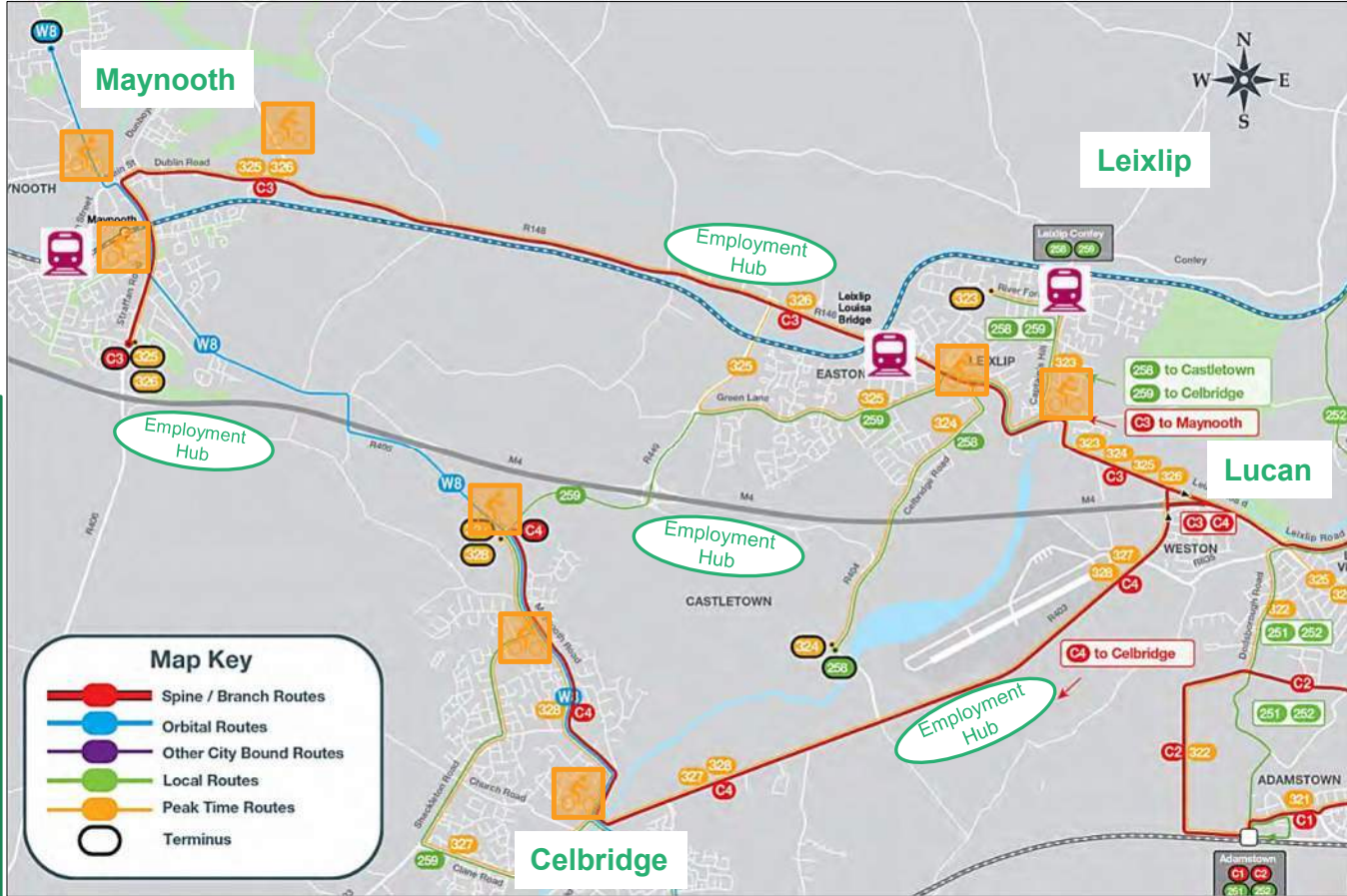
AT 4 – Active Travel Enhancement on the R404 Overbridge



AT 5 – Active Travel Enhancement at Junction 5



AT 6 – Support the Provision for Cycle Parking and Infrastructure at Key Public Transport Nodes and Destinations



Proposed Cycle Parking Survey Locations

Complete cycle parking surveys at key locations, identifying utilisation, barriers to use and recommendations on improvements

Public Transport Hub - Complete cycle parking surveys at key location, identifying utilisation, barriers to use and recommendations on improvements

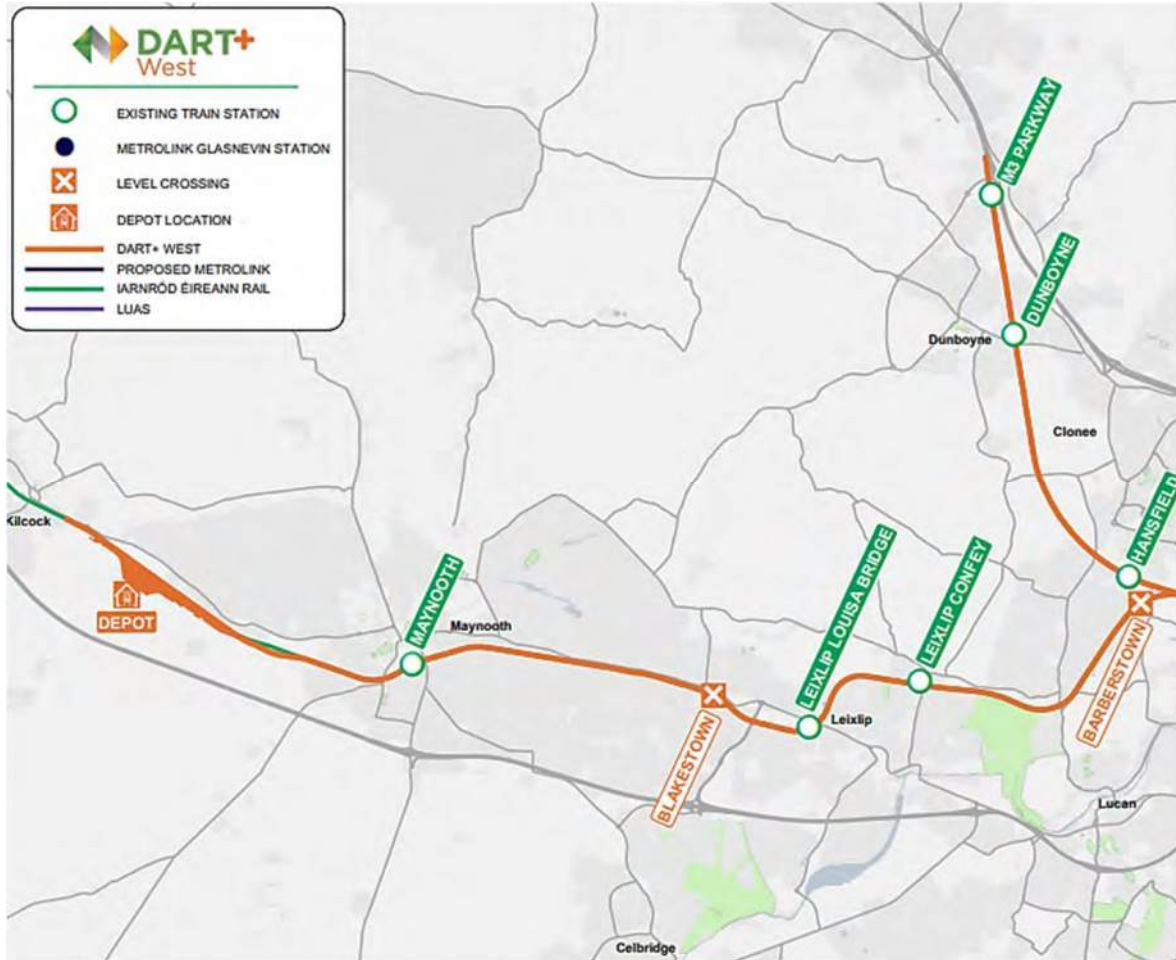
Rail

2 Options:

1 No. – DART+West Programme (Committed Project)

1 No. – Regional Rail Improvements

RL 1 - Benefit Analysis of DART+West on the M4/N4 Corridor



- Includes proposals for up to 12 trains per hour per direction during peak periods, doubling the existing frequencies.
- Also includes plans to remove several level crossings which will result in journey time savings.
- Included in Do-Min Transport Model.



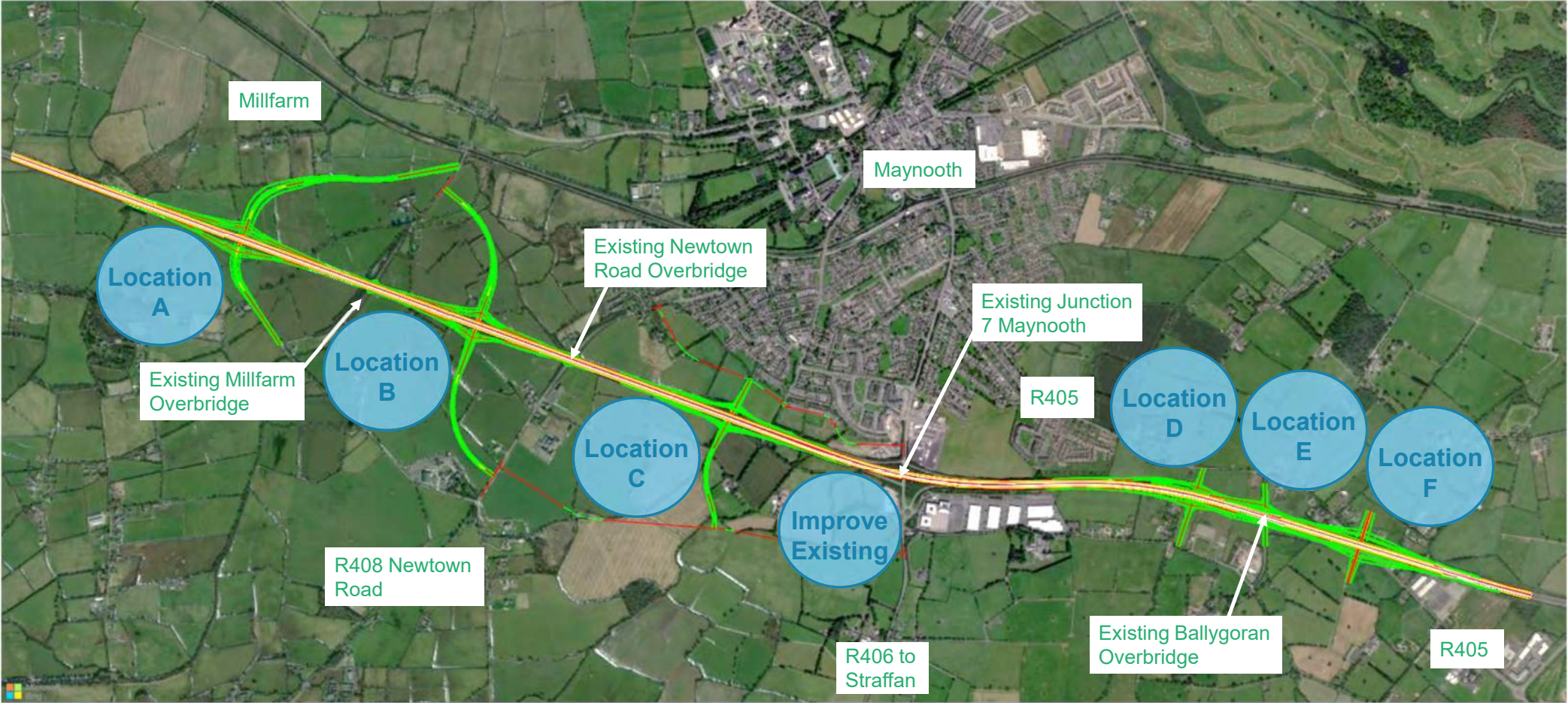
This figure represents a current draft proposal which is subject to change

RL 2 – Test Regional Rail Improvements

- Items to be assessed to provide enhanced strategic rail services would include:
 - Frequency
 - Speed
 - Reliability
- The above items would be enhanced and included in a improved Regional Rail element. This represents a practicable Regional Rail Improvement within the existing rail corridor constraints.
- This would be in addition to the scope of the Dart + West Project
- Limitations of the improvement:
 - Services would operate within the current rail corridor boundary, meaning using the existing track and provision for new track or overtaking bays only where space within the existing rail corridor boundary permits.
 - Operate at a speed possible on the existing track
 - Operate at a frequency that is practical based on the existing/proposed services on the rail line.



Junction 7 Options Summary





MAYNOOTH TO LEIXLIP PROJECT

Appendix 5.3
Stage 1 Sift 3 POA
Regional Rail Improvements Report

RAIL ALTERNATIVE ASSESSMENT REPORT



SYSTRA

MAYNOOTH TO LEIXLIP PROJECT

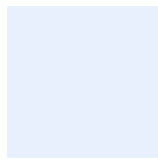
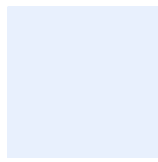
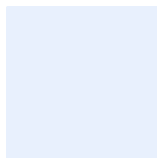
RAIL ALTERNATIVE ASSESSMENT

IDENTIFICATION TABLE

Client/Project owner	Arup
Project	Maynooth to Leixlip Project
Study	Rail Alternative Assessment Report
Type of document	Report
Date	21/09/2023
Number of pages	20

APPROVAL

Version	Name		Position	Date	Modifications
1	Author	Josh Noon	Principal Consultant	13/10/2022	
	Checked by	Andrew Archer	Director	13/10/2022	
	Approved by				
	Checked by				
	Approved by				

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1.3	PURPOSE OF THIS REPORT	7
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2.1	INTRODUCTION	8
2.2	EXISTING RAIL SERVICES AND DEMAND	8
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2.4	COMPETITION ANALYSIS – M6/M4 CORRIDOR	11
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2.7	ACHIEVABLE RAIL MODE SHARE	18
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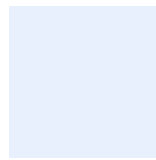
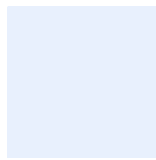
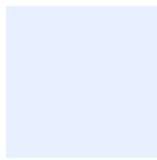
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INTRODUCTION

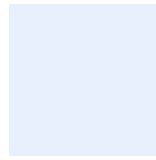
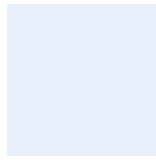
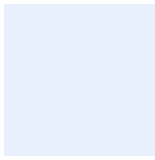
- 1.1.1 This report has been prepared to document the assessment undertaken to determine the feasibility of providing a rail-based intervention (focusing on passenger rail) using the Sligo to Dublin Connolly and Galway to Dublin Heuston railway lines to assist in resolving the existing and forecasted transport issues along the M4/N4 corridor between Maynooth and Leixlip.



Figure 1 Map of Irish Rail's Network

1.2 Overview and Project Background

- 1.2.1 The N4/M4 corridor between Maynooth and Leixlip falls within the Dublin commuter belt and as such attracts a substantial number of vehicles during peak hours. It is expected to experience capacity issues as the towns along the corridor expand in coming decades in keeping with forecast growth as set out under the National Planning Framework.
- 1.2.2 Kildare County Council and Transport Infrastructure Ireland (TII) have commissioned a project looking into potential transport interventions along the M4/N4 corridor between Maynooth and Leixlip to accommodate future growth. As part of this project, potential to upgrade rail services to improve



connectivity has been explored as a potential option to address the project objectives.

- 1.2.3 Localised rail services, between Maynooth, Leixlip and Dublin have been explored previously resulting in the DART+ West program. This program aims to electrify and modernise the existing line between Maynooth and Dublin Connolly, allowing for a more frequent, reliable and resilient service.
- 1.2.4 As such this report looks at potential for improvement to the west of Maynooth on intercity rail lines that run parallel to the regional road network feeding the M4/N4 corridor at a regional level.
- 1.2.5 The primary route feeding the corridor in the study area is the M4, which diverges at Kinnegad into the M6 and N4 routes.
- 1.2.6 The N4 primary road continues from Kinnegad to Sligo passing through Mullingar, Longford and Carrick-On-Shannon. This route is the primary route between Dublin and counties Sligo, Mayo, Longford and Leitrim in addition to serving the northern parts of Roscommon and Westmeath.
- 1.2.7 The Dublin to Sligo rail line runs parallel to the M4/N4 from the M50 to Sligo with stops in most mid to large size towns along the route as indicated on Figure 1 above.
- 1.2.8 The M6 motorway is the primary connection between Dublin and Galway City. As well as serving the city, the M6 also serves as the primary connection to Dublin from Galway County, in addition to parts of Counties Roscommon and Westmeath.
- 1.2.9 The Dublin to Galway rail line runs parallel to the M6 from Galway to Tullamore, where it diverges from the M6. As a result of this, the Galway to Dublin Rail corridor is included in this study for the sections between Galway and Tullamore where there is competition between the rail and road.
- 1.2.10 These corridors, with towns served by Irish Rail, are shown in Figure 2 below.
- 1.2.11 For the purpose of this study it is assumed that the improvements would bring the two rail lines up to a similar standard of service as that of the Dundalk to Dublin line with improved reliability and frequency.

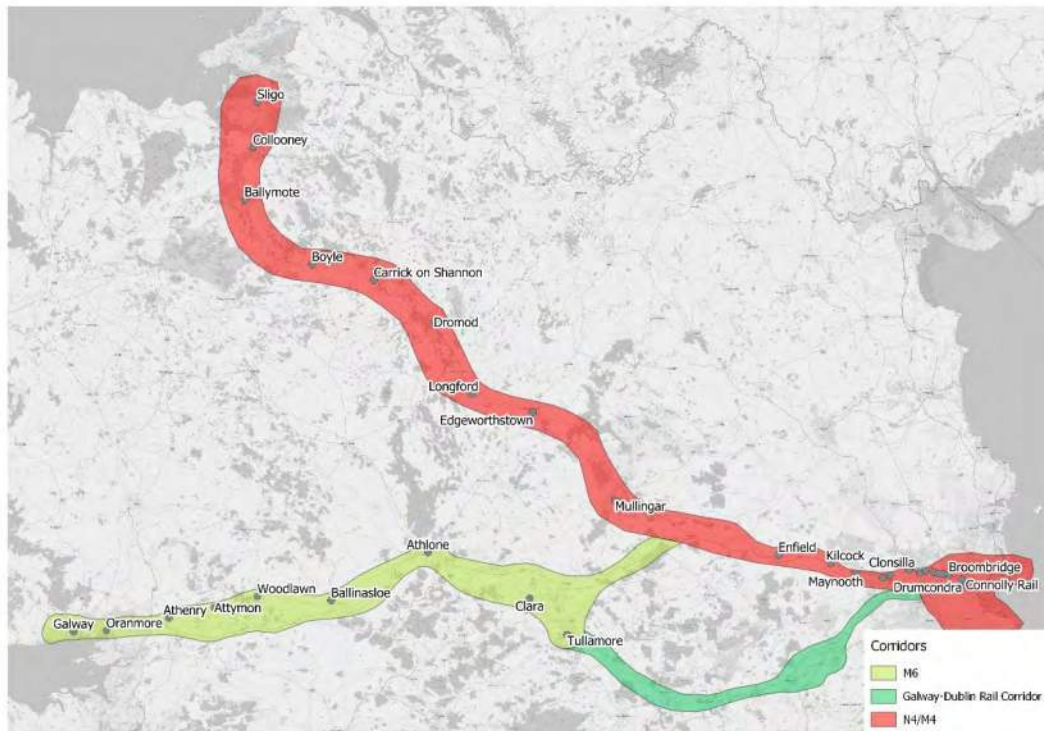
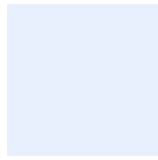
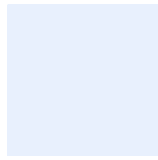
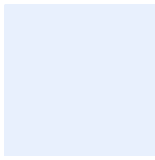


Figure 2 M4/N4 and M6 Corridors

1.3 Purpose of this Report

- 1.3.1 The purpose of the report is to determine, at a high level, if there is a demand for improved passenger rail services between Dublin and Sligo and Dublin and Galway and if the implementation of such improvements would reduce the demand for car-based travel on the M4/N4 between Maynooth and Leixlip.
- 1.3.2 The methodology applied to assess the feasibility of passenger rail alternatives uses a high-level demand analysis for rail within the corridor, using census and modelling commuting data to examine the potential catchments that could be served by rail along the M4/N4 and M6 corridors.
- 1.3.3 The focus of this report is on the rail corridors west of Maynooth as rail travel east of Maynooth is already considered under the DART + West program.



DEMAND ANALYSIS

2.1 Introduction

2.1.1 This section provides an overview of existing rail services and rail use along the N4/M4 and M6 corridors and presents details of the high-level demand analysis of the likely demand for an improved rail service along the corridor.

2.1.2 This demand analysis is based upon population catchments, trip origin-destination patterns and observed rail mode share on comparable rail corridors.

2.2 Existing Rail Services and Demand

2.2.1 Existing rail data has been taken from the National Transport Authority (NTA) National Rail Census 2019¹. Further rail data is not available for 2020 or 2021 due to the COVID-19 pandemic.

2.2.2 Iarnród Éireann operated 14 daily services (Monday to Friday) to/from Dublin and Sligo, 20 daily services to/from Galway, and 79 daily services to/from Maynooth in 2019.

2.2.3 In 2019, there was an increase in services to/ from Maynooth with an additional early morning service and six additional off-peak services.

2.2.4 The Sligo to Dublin line received two additional services, one in the morning and one in the evening, and two service times changed to better suit demand.

2.2.5 The NTA's National Rail Census provides data on the number of daily rail passengers boarding and alighting at each station. Table 1 and Table 2 show the daily passenger figures for each station on the Dublin to Sligo Line west of the Study Area and including M4/N4 study area.

¹ The annual National Rail Census captures the number of individuals boarding and alighting at each station in the country on one day of the year. It provides a snapshot of usage and patronage across the country at all stations and on all services on this one date. It is not intended to represent an accurate picture of overall rail service usage, which instead is recorded in Iarnród Éireann's patronage data.

Table 1. Daily Railway Passenger Data 2019 Sligo Line

STATION	BOARDING		ALIGHTING	
	Away from Dublin	Toward Dublin	Away from Dublin	Toward Dublin
Sligo	0	512	401	0
Collooney	11	56	75	7
Ballymote	51	44	52	63
Boyle	24	57	74	30
Carrick on Shannon	37	83	143	36
Dromod	19	67	82	32
Longford	52	236	291	76
Edgeworthstown	11	85	110	20
Mullingar	77	464	563	88
Enfield	9	253	250	16
Kilcock	29	395	337	35
Maynooth	339	3445	3183	251
Leixlip Confey	187	489	461	164
Leixlip Lousia Bridge	102	1184	1082	113

2.2.6 The usage figures presented illuminate the very low demand for stations west of Maynooth on the Regional Line.

2.2.7 This is reflective of the limited number of services available, excessive journey times by rail and dispersed population within the study area.

Table 2. Daily Railway Passenger Data 2019 Galway Line

STATION	BOARDING		ALIGHTING	
	Away from Dublin	Toward Dublin	Away from Dublin	Toward Dublin
Galway	0	1563	1502	0
Oranmore	131	30	32	112
Athenry	177	137	202	226
Attymon	10	3	1	9
Woodlawn	44	11	9	54
Ballinasloe	122	68	99	144
Athlone	366	415	488	471
Clara	32	98	91	37
Tullamore	128	490	454	155

2.3 Competition Analysis – N4/M4 Corridor

- 2.3.1 The M4 motorway and N4 national primary road runs, for the most part, parallel to the Sligo railway line and provides relatively fast in comparison to existing rail services journey times for cars and buses traveling between the towns.
- 2.3.2 Table 3 and Table 4 below detail the journey times by rail, based on existing (2021) journey time between stations on the regional line west of Maynooth and Dublin (assuming the provision of a direct service with no interchange) and journey times by car for same, as calculated using Google Maps, (via the M4/N4) respectively.

Table 3. Rail Journey Times (minutes - assumes no interchange required)

From\To	Dublin	Maynooth
SLIGO	188	153
CARRICK-ON-SHANNON	168	130
LONGFORD	117	82
MULLINGAR	72	39
ENFIELD	54	21

Table 4. Car Journey Times (minutes)

From\To	Dublin	Maynooth
SLIGO	162	135
CARRICK-ON-SHANNON	118	90
LONGFORD	92	67
MULLINGAR	66	39
ENFIELD	46	18

2.3.3 Table 3 and Table 4 show that the service between Dublin and Sligo is substantially slower than car, with the slowest portion of the journey West of Mullingar.

2.3.4 This journey time analysis only considers in-vehicle travel time from point A to B. When travel time to the departure train station, wait time and travel time from terminus station to final destination are factored in, rail will become even less competitive relative to private car. Location of car parking relative to actual origin/ destination would also need to be considered.

2.3.5 It is clear from the data shown in these tables that regional rail west of Mullingar does not compete favourably with the option of travelling by car. However, trips from Mullingar and Enfield benefit from a much closer journey time between the two modes, however both still are slower than the option of travelling by car, this is before wait and interchange times are considered.

2.4 Competition Analysis – M6/M4 Corridor

2.4.1 The M4 motorway runs, for the most part, parallel to the Sligo - Connolly railway line as far as Kinnegad where the M4 branches into the N4 toward

Sligo and the M6 toward Galway. Between Galway and Athlone the M6 motorway runs mostly parallel to the Galway – Heuston Rail Line.

2.4.2 Table 5 and Table 6 below detail the journey times by rail based on existing (2021) journey time between stations on the regional Galway line and Dublin, and journey times by car, as calculated using Google Maps, (via the M6/M4) respectively.

Table 5. Rail Journey Times (minutes - assumes no interchange required)

From\To	Dublin
TULLAMORE	67
ATHLONE	99
ATHENRY	150
GALWAY	163

Table 6. Car Journey Times (minutes)

From\To	Dublin
TULLAMORE	78
ATHLONE	86
ATHENRY	122
GALWAY	147

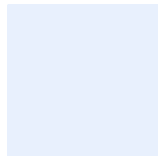
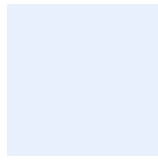
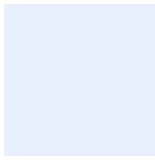
2.4.3 Table 5 and Table 6 show a much closer result between rail and car journey times than the Sligo line, however car is still predominantly the quicker mode with only Tullamore being the exception.

2.4.4 As was discussed in the previous section, this journey time analysis only considers in-vehicle travel time from point A to B. When travel time to the departure train station, wait time and travel time from terminus station to final destination are factored in, rail will become even less competitive relative to private car. Location of car parking relative to actual origin/destination would also need to be considered.

2.4.5 While the rail line between Heuston and Galway is more competitive with the M6/M4 corridor, overall it is still slower for all locations west of Tullamore.

2.5 Likely Catchment for Rail

2.5.1 In order to estimate the potential demand for an upgraded rail service between Sligo and Maynooth, a catchment area for likely rail passengers in



each of the towns along the railway line which currently has a train station was defined. These catchment areas have been defined as all electoral divisions (ED) within 1km of the train station. ED boundaries of the catchments selected are illustrated in Figure 3.

- 2.5.2 In order to use the train to commute from population centres outside of these catchments it would be necessary to travel to one of the train stations, most likely by car given the dispersed nature of the population outside these catchments. Whilst it is acknowledged that most train stations along the corridor facilitate park and ride, it is likely that the majority of commuters with access to a car would continue and complete the commute by car given the journey time advantage offered by this mode. Therefore, the catchment areas presented in Figure 3 represent the most likely catchment areas for rail along the corridor.



Figure 3 Rail Stop Catchments

2.5.3 The resulting catchment population for each rail stop is detailed in Table 7 below.

Table 7. Train Station Catchment Population Sligo Line

STATION	POPULATION IN 2016
Sligo	9,509
Collooney	2,170
Ballymote	2,402
Boyle	2,122
Carrick on Shannon	1,674
Dromod	2,212
Longford	15,555
Edgeworthstown	3,433
Mullingar	18,653
Enfield	3,989
TOTAL	61,718

Table 8. Train Station Catchment Population Galway Line

STATION	POPULATION IN 2016
Galway	10,734
Oranmore	2,969
Athenry	5,651
Attymon	575
Woodlawn	527
Ballinasloe	2,177
Athlone	18,042
Clara	6,180

STATION	POPULATION IN 2016
Tullamore	12,507
TOTAL	59,363

2.5.4 On the Sligo line, 68% of the catchment population are on the eastern portion from Longford to Dublin. This highlights the lower density of population along the western half of the line out to Sligo. This lower density results in less catchment for the rail service.

2.5.5 Longford and Mullingar have the highest catchment and therefore potential to use rail options.

2.5.6 On the Galway line, the population while similar in size to the Sligo Line, is more concentrated in three main locations; Galway, Athlone and Tullamore.

2.6 Demand for Travel along Rail Corridor

2.6.1 Using information from the 2016 Census, the Central Statistics Office (CSO) has developed a set of aggregate commuting counts. The Census data from the CSO is only available for the AM commuting period. These counts are presented at ED and county level and provide the total number of trips which take place between each ED. The counts are based on origin and destination EDs for workers and students who are usually resident in Ireland. The counts include persons who work from home and persons who have no fixed place of work. It is emphasised that these figures only represent person trips (i.e. cumulative total of all modes) to work and education and excludes other trip purposes.

2.6.2 The 2016 AM period commuting data has been processed and analysed to establish the total quantity and direction of trips which take place between the towns included in the rail catchment analysis above.

2.6.3 Mode share data for each town along the route has been calculated from 2016 census data to determine the proportion of longer distance trips (excluding active modes) that are completed by road. This can be used to estimate the proportion of commute trips in the AM completed by road that could potentially be moved to rail.

2.6.4 The results of this analysis are shown in Table 9 below.

Table 9. 2016 AM Commuting Period travel demand (trips)

From\To	Dublin	M4 Corridor	ROAD MODE SHARE	DUBLIN ROAD TRIPS	M4 CORRIDOR ROAD TRIPS
Sligo	30	14	94.1%	28	13
Collooney	16	4	92.8%	15	4
Ballymote	2	1	96.3%	2	1
Boyle	15	2	95.4%	14	2
Carrick on Shannon	30	13	93.6%	28	12
Dromod	16	6	89.4%	14	5
Longford	36	20	90.2%	32	18
Edgeworthstown	14	17	75.6%	11	13
Mullingar	290	230	92.3%	268	212
Enfield	166	441	76.7%	127	338
TOTAL	615	748		540	619

Table 10. 2016 AM Commuting Period travel demand (trips)

From\To	Dublin	M4 Corridor	ROAD MODE SHARE	DUBLIN ROAD TRIPS	M4 CORRIDOR ROAD TRIPS
Galway	13	2	85.1%	11	2
Oranmore	40	3	94.0%	38	3
Athenry	12	1	91.9%	11	1
Attymon	2	2	89.4%	2	2
Woodlawn	2	0	89.4%	2	0
Ballinasloe	22	8	89.4%	20	7
Athlone	59	23	86.4%	51	20
Clara	23	21	87.2%	20	18

From\To	Dublin	M4 Corridor	ROAD MODE SHARE	DUBLIN ROAD TRIPS	M4 CORRIDOR ROAD TRIPS
Tullamore	96	50	88.6%	85	44
TOTAL	269	110		239	97

2.6.5 Summing all eastbound movements along the M4/N4 corridor gives a total demand of **1,363** trips in the AM commuting period (06:00 – 09:30) travelling from west of the M4 study area to either the study area or Dublin.

2.6.6 90% of these trips are from Enfield and Mullingar, with the remaining 10% from further west.

2.6.7 On the M6 corridor, there are a total of 379 trips to the M4 study area and Dublin.

2.6.8 The above total trip numbers are used to analyse the potential demand for rail travel between these towns during the morning commuting period in the following section.

2.7 Achievable Rail Mode Share

2.7.1 This analysis looked at existing towns in Ireland which are connected to one of the regional cities via rail and have regular train services between the town and regional city.

2.7.2 Dundalk was selected as an appropriate town to use as a comparator as it has the following characteristics:

- 4 trains during the morning peak period, 07:00-10:00. This would be a substantial increase to the level of service potentially envisaged for the Sligo to Dublin railway line as part of this demand analysis.
- Dundalk is approximately the same distance from Dublin as Mullingar which is the edge of the catchment for inbound Dublin trips.
- Like the Sligo to Dublin and Galway to Dublin railway lines, the Dundalk to Dublin railway line also has a National Primary Route (M1) running parallel which provides reliable journey times for competing modes (Bus and Private Car)
- Journey times from Dundalk to Dublin by Car and Rail are comparable for the Enterprise (Dublin-Belfast service) at approx. 1hr each. It should be noted however that the Commuter service is slower at 1hr 30min.

2.7.3 Using the Eastern Regional Model, mode shares for trips from Dundalk Town Centre, within 1km of the train station, to Dublin City Centre, within 1 km of Connolly Station, in 2019 were extracted. This gave a public transport mode share of 85% for movements between these catchment areas. This mode share includes both rail and bus trips. Using boarding data from the model, an estimate of Rail mode share was calculated as 49% of trips between Dundalk town centre, within 1km of the train station, and Dublin City Centre, within 1km of Connolly Station, were undertaken by Rail in the AM.

2.7.4 Applying a 49% rail mode share to the trips that travel from catchment areas along the Sligo Line to Dublin City Centre and the M4/N4 Corridor study area results in a shift of 568 trips toward Dublin from settlements with a rail station along the M4 corridor in the AM period. Applying the same rail mode share assumption to the Galway to Dublin rail corridor (for the section between Galway and Tullamore) would result in a shift of cars to rail of 165 trips in the AM period. The total trips that could potentially be removed from the M4 corridor is 732 trips across the AM period (07:00-10:00).

- 2.7.5 Data from TII traffic counters for May 2016 (chosen to correspond with census commuting data) provide an average weekday AM period flow of 12,391 vehicles. As such, the reduction in traffic, with an enhanced rail service, would remove approximately 5.9% of the total traffic across the AM peak period.
- 2.7.6 TII traffic counters for the same period in 2022 provide an AM period flow of 12,785, or 3.2% increase on 2016 figures. Assuming the same level of growth in commuters travelling from within the rail station catchments this provides a shift of 756 trips in the AM period for 2022.
- 2.7.7 64% of AM commute trips from the N4 corridor to Dublin and the M4/N4 study area, come from Mullingar and Enfield. The rail link from Mullingar to Dublin, with the inclusion of Enfield, are identified for enhancement in the national development plan.

SUMMARY AND CONCLUSION

- 3.1.1 The high-level assessment described in this document looks at the potential mode shift for trips travelling along the M4 corridor between Maynooth and Leixlip when an enhanced regional rail service is provided along the Sligo to Dublin and Galway to Dublin lines.
- 3.1.2 The key findings of this report are;
- A total of 1,363 commuting trips are made along the M4/N4 corridor west of Kilcock, toward Dublin and the study area in the AM period;
 - A total of 379 commuting trips are made along the M4/N4 corridor and the M6 corridor, toward Dublin and the study area in the AM period;
 - Enhanced rail would remove 732 trips at most from the M4 corridor in the AM period; and
 - This reduction is equivalent to 5.9% of total traffic.
- 3.1.3 The assessment shows that given the potential low demand for rail, dispersed nature of population in the rail catchment areas and the competitive advantage of road-based travel, it is unlikely that the delivery of an enhanced regional rail service would attract sufficient additional passengers to substantially impact traffic flows along the M4/N4 between Maynooth and Leixlip.
- 3.1.4 The estimated volumes of traffic removed from the road network during the AM peak period (max 5.9%), as a result of the introduction of an improved rail service, will not be sufficient to noticeably improve the operational efficiency of the existing M4/N4.
- 3.1.5 Based on this analysis, it would not be feasible to achieve the required mode shift through regional rail enhancements alone to alleviate capacity issues on the M4/N4 corridor between Maynooth and Leixlip.

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The SYSTRA logo is displayed in a bold, red, sans-serif font. The letters are thick and closely spaced, with a slight shadow effect behind them, giving it a three-dimensional appearance. The logo is centered at the bottom of the page.



MAYNOOTH TO LEIXLIP PROJECT

Appendix 5.4
Stage 1 Sift 3 POA
Costs (OCE's)

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File reference

4-03-03-7-2

Prepared by Gerard Hall

Date

25 May 2022

Subject Phase 2 Stage 1 Corridor Option Comparison Estimates

1 Introduction

Arup has been appointed by Kildare County Council to provide multi-disciplinary technical consultancy services for the delivery of the Maynooth to Leixlip Project, on behalf of Kildare County Council and South Dublin County Council.

The Maynooth to Leixlip Project is being progressed in accordance with Transport Infrastructure Ireland's Project Management Guidelines (PMGs). These guidelines provide a framework for the management, development and delivery of national road and public transport capital projects. The PMGs divide the evolution and progression of a project into an eight-phase process (Phase 0 – 7 inclusive). Arup has been appointed to progress the delivery of the project through Phases 1 to 4 of the PMGs.

The purpose of this assessment is to assess the likely costs for all corridor and junction options. An order of magnitude estimate has been developed using the feasibility design as a basis, which is deemed appropriate for Phase 2 Stage 1 of the project.

The purpose of this Technical Note is to present the findings of this assessment.

2 Overview

2.1 Corridors

Six corridor options have been examined as part of this Stage 1 Preliminary Options Assessment, namely:

- Corridor Option 1A – Hard Shoulder Bus Priority Measure in both the eastbound and westbound directions;

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- Corridor Option 1B – Hard Shoulder Bus Priority Measure in both the eastbound and westbound directions and parallel road with existing road upgrades;
- Corridor Option 2A – Hard Shoulder Bus Priority Measure in both the eastbound and westbound directions and an additional third traffic lane in the westbound direction;
- Corridor Option 2B – Hard Shoulder Bus Priority Measure in both the eastbound and westbound directions, additional third traffic lane in the westbound direction and parallel road with existing road upgrades;
- Corridor Option 3A – Hard Shoulder Bus Priority Measure in both the eastbound and westbound directions and additional third traffic lane in both the eastbound and westbound directions; and
- Corridor Option 3B – Hard Shoulder Bus Priority Measure in both the eastbound and westbound directions, additional third traffic lane in both the eastbound and westbound directions and parallel road with existing road upgrades.

2.2 Junctions

Eight junction locations have been examined as part of this Stage 1 Preliminary Options Assessment, six at Junction 7 and two at Junction 5.

2.2.1 Junction 7

- Location A – Junction West of Millfarm – new grade separated junction located west of the existing Millfarm Overbridge. To the south, it will connect to the R408 Newtown Road via the L5042 local road. To the north, it will connect to the R148 via the L5041 local road, in the vicinity of Jackson’s Bridge;
- Location B – Junction between Millfarm and Newtown Road - new grade separated junction located between the existing Millfarm Overbridge and the R408 Newtown Road Overbridge. To the south, it will connect directly to the R408 Newtown Road. To the north, it will connect to the R148 via the L5041 local road, in the vicinity of Jackson’s Bridge;
- Location C – Junction between Newtown Road and R406 Straffan Road - new grade separated junction located between the R408 Newtown Road and the R406 Straffan Road. To the south, it will connect to the R408 Newtown Road south of Maynooth Lodge Nursing Home and the R406 Straffan Road south of the Straffan Road Roundabout via a new connector road, as part of a potential western orbital (LAP). To the north, it will connect to the R408 Newtown Road near Newtown Crescent Housing Estate and the R406 Straffan Road near Barton’s Transport via a new connector road, as part of a potential western orbital (LAP);
- Location D – Junction West of Existing Ballygoran Overbridge - new grade separated junction located west of the existing Ballygoran Overbridge. To the south, it will connect to the Ballygoran Road via a new link adjacent to the Ballygoran Reservoir. To the north, it will connect to the R405 Ballygoran Road;
- Location E – Junction reusing Existing Ballygoran Overbridge - new grade separated junction whereby the existing overbridge is reused, utilising existing infrastructure. To the south, it will connect to the Ballygoran View. To the north, it will connect directly to the R405 Ballygoran Road; and

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- Location F – Junction East of Existing Ballygoran Overbridge - new grade separated junction located east of the existing Ballygoran Overbridge. To the south, it will connect to Ballygoran View and the R405 Ballygoran Road via a new link.

2.2.2 Junction 5

- Location A – Junction reusing Existing R404 Overbridge - new grade separated junction whereby the existing overbridge is reused, utilising existing infrastructure. It will connect to the R404 to the north and south; and
- Location B – Junction between Liffey River Bridge and the existing Junction 5 - new grade separated junction located between the Liffey River Bridge and the existing Junction 5. To the south, it will connect directly to the R403. To the north, it will connect to the R148.

3 Assumptions and Methodology

This section details the assumptions and methodology applied in developing the Phase 2 Stage 1 Option Comparison Estimates. The Option Comparison Estimates are presented in full in **Appendix A**.

Rates have been sourced and benchmarked against the following:

- Estimate costs for the M7 Naas to Newbridge Upgrade project, using cost information supplied by Kildare National Roads Office (KNRO);
- Estimate costs prepared for other TII projects, including the N11/M11 and N40; and
- TII Schedule of Rates (2019)¹ with 20% inflation on unit rates to bring costs in line with 2022.

4 Construction Cost Estimate - Corridors

4.1 Overview

The methodology of developing the quantities and rates for each discipline are outlined in the following sections.

4.2 Site Clearance

A site clearance area was determined using the following approach:

- An offset of 3m at each verge and a 7m wide strip accounting for the central reserve was utilised in determining an approximate area to be considered for site clearance. A 20% contingency was applied to this number.
- A rate of €2,400/ha has been applied for site clearance for all corridor options. The TII Schedule of Rates provides a range of €250 to €2,000/ha for site clearance and it is assumed that €2,000

¹ Transport Infrastructure Ireland, TII Schedule of Rates (CC-GMP-00054), October 2019

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with a 20% inflation providing a 2022 rate of €2,400 is more appropriate due to the constrained nature of the corridor.

4.3 Fencing

- It has been assumed that new boundary fencing would be required where there were gaps in the existing fencing. It is assumed that some additional fencing will be required at each junction.
- A rate of €36/m has been applied for fencing for all corridor options. This rate is consistent with the TII Schedule of Rates 2019 with 20% inflation to bring unit costs to 2022 levels.

4.4 Safety Barriers

Based on a desktop review, many of the road restraint systems (safety barriers and bridge parapets) in-situ on the existing M4/N4 would appear not to be compliant with current TII standards. Due to the proposed works and sub-standard in-situ VRS, new safety barriers would typically be required on both the central reserve and the verge side. The following assumptions were made for safety barrier provision in compliance with the design of safety barriers as set out in *DN-REQ-03034 The Design of Road Restraint Systems (Vehicle and Pedestrian) for Roads and Bridges*:

- A vertical concrete barrier (VCB) is typically required along the full length of the central reserve. For the purposes of the high-level cost estimation for Option 1 (Widening), a VCB was priced for areas where the existing barrier was being impacted due to the widening of the carriageway. These VCB will provide a working width of W2 and achieve a minimum H2 level of containment. All corridor options will require amendments to the existing central reserve barrier.
- Additionally, for all corridor options on the nearside verge side, a VRS (steel/VCB) is required at locations where hazards such as bridge piers / gantry supports / slopes require protection. A length of 65m with containment level H2 has been assumed for each such major hazard within the verge along the corridor. This allows for an approach length of 30m, departure length of 15m, assumed hazard length of 10m and terminal lengths of 5m each.
- A rate of €120/m and €72/m was applied for VCBs in the central reserve and verge, respectively. This rate is consistent with the TII Schedule of Rates 2019 and 2022 inflation.

4.5 Drainage and Service Ducts

The majority of widening required for the corridor options will be into the central reserve. This will reduce the need of drainage intervention in the verge, where the majority of drainage infrastructure currently sits. However, Corridor Options 2A, 2B, 3A and 3B do widen into the verge.

A rate of €300,000/km has been applied for Corridor Options 1A and 1B, €350,000/km has been applied for Corridor Options 2A and 2B and €400,000/km has been applied for Corridor Options 3A and 3B for the provision of new drainage infrastructure. This is developed taking cognisance of drainage costs for the M7 Naas to Newbridge Upgrade project, a widening project located in a constrained environment with a full drainage rebuild in both directions.

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4.6 Earthworks

Cut and fill earthworks quantities have been extracted from the Open Roads Designer (ORD) 3D model. The extent of earthworks for the corridor options are limited and predominantly involves cutting into existing cut slopes to allow for the widened cross section.

The following rates have been applied for the various earthworks elements:

- Excavation of acceptable material – €4.75/m³
- Disposal of acceptable material – €5.09/m³

These are extracted from the upper band rates of the TII Schedule of Rates (2019) and include 20% inflation.

4.7 Pavement

The following approach has been assumed for pavement works:

- Pavement widening associated with each corridor options require new full depth pavement construction (sub-base, base, binder, and surface course). Pavement widening areas have been defined as areas where the proposed pavement edge extends beyond the existing pavement edge.
- For all corridor options, the existing hard shoulder will require full depth pavement construction. An example of pavement widening area is shown in Figure 1.

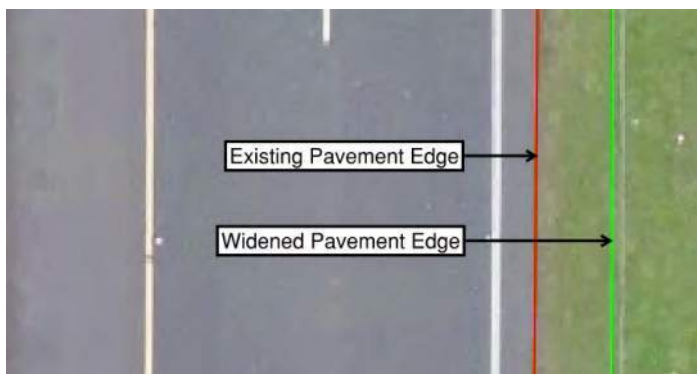


Figure 1: Example of Pavement Widening into the Central Reserve

- Additionally, for all corridor options, it has been assumed that the existing pavement in lane 1 and lane 2 will be rehabilitated. This has been defined as removal and replacement of the surface course and binder course.
- An allowance for regulating course has not been made at this stage.
- The following approximate rates have been applied for the various elements of pavement construction depending on new versus existing pavement:
 - Sub-base, Granular Type B to Clause 804, 150mm thick – €28.20/m³
 - Road Base (AC 32 Dense base 40/60) 2 Layers – €20.40/m² per layer
 - Binder Course (AC 20 Dense bin 55mm) – €9.00/m² - €12/m²
 - Surface Course (SMA 40mm) – €10.20/m²

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These are extracted from the TII Schedule of Rates (2019) and sit between the lower and upper bands of the rates with a 20% uplift for 2022 inflation values.

4.8 Kerbs, Footways and Paved Areas

An allowance of €25,000/km has been applied for the provision of kerbs, footways, and paved areas along the length of the project for all corridor options. This is a per km rate taking cognisance of the costs of the M7 Naas to Newbridge Upgrade project.

4.9 Traffic Signs & Road Markings

An allowance of €68,400/km has been applied for the provision of general traffic signs and road markings for all corridor options. This is a per km rate which has been derived from the costs for the M7 Naas to Newbridge Upgrade project and is expected to cover the relocation of impacted signage, and re-application of line markings to suit the revised alignment for the project.

Associated additional signage for all corridor options has been allocated based on guidance outlined in the emerging TII standard for the implementation of bus facilities on motorways and dual carriageways. The standard calls for signage at entry points – including all merges, exit points – including all diverges and at 1km intervals. Signage should be positioned in the nearside verge and display full operational speeds. A rate of €20,000/km has been allocated for the specific hard shoulder bus priority measure signage based on a desktop review of the sign sizes adopted on the M1 Belfast project. The rate represents the upper bound of the TII Schedule of Rates for a sign approximately 10m² supported by three tubular posts. It is noted that this is based on information currently available and may need to be amended during future design development.

4.10 Lighting and Electrical

An allowance of €16,560/km for lighting and electrical has been applied for all corridor options. This is a per km rate taking cognisance of the costs of the M7 Naas to Newbridge Upgrade project and is expected to cover the relocation of any impacted lighting columns. An allowance for permanent ITS equipment to monitor the safe operations of the bus priority measures has been included under this heading.

4.11 Landscaping and Environmental

An allowance of €27,600/km has been applied for landscaping and environmental works for both all corridor options. This is a per km rate which has been derived from the costs for the M7 Naas to Newbridge Upgrade project.

4.12 Structures

Allowances for remedial works to the River Liffey Bridge have been made based on the extent of works on the bridges.

A rate of €300/m² has been applied for all corridor options which is expected to cover remedial works including removal existing concrete verges, widening of trafficable areas, replacement of parapets etc.

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A rate of €4,000/m² has been applied for a new structure to carry the hard shoulder bus priority measure over the River Liffey.

4.13 Accommodation Works

At this stage, accommodation works are not envisaged to impact greatly on any corridor options. A rate of €10,000/km has been applied for Corridor 1A and 1B, €30,000/km for Corridor 2A and 2B and €50,000 for Corridor 3A and 3B.

4.14 Parallel Road

A fixed rate has been applied to account for the addition of a parallel road in the “B” corridor options. A rate of €600,000/km for online upgrade works along with a rate of €3,000,000/km for a new parallel road have been applied. The proposed parallel road is envisaged to be approximately 2.2km in length with 1.5km assigned to upgrade works and 0.7km assigned to new parallel road construction.

4.15 Statutory Authorities & Utilities

The high-level cost estimate has been developed prior to the undertaking of site investigation works, therefore the impacts on utilities and utility diversions may need to be amended during future design development. Considering the above, the following approach has been taken:

- A general allowance of €100,000/km for all corridor options has been made for costs associated with statutory authorities and utilities. This allowance has been made based on an estimated proportion of total contract cost only, and these costs are subject to change during future design development.

4.16 Preliminaries

A 20% rate has been applied for Preliminaries for all corridor options including traffic management.

4.17 Risk Contingency

A 20% risk contingency has been allowed for all corridor options which is considered appropriate for this stage of the design development.

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4.18 Main Construction Contract Estimate - Corridors

The Main Construction Contract (MCC) estimate and breakdown for corridors by discipline is presented in Table 1 for the corridor options. These have been developed based on information currently available and are subject to change during future design development. The estimate is provided in further detail in **Appendix A**.

Item Description	Corridor 1A	Corridor 2A	Corridor 3A	Corridor 1B	Corridor 2B	Corridor 3B
Site Clearance	€31,000	€31,000	€31,000	€31,000	€31,000	€31,000
Fencing	€144,000	€144,000	€144,000	€144,000	€144,000	€144,000
Safety Barriers	€898,000	€898,000	€898,000	€898,000	€898,000	€898,000
Drainage and Service Ducts	€2,493,000	€2,908,000	€3,324,000	€2,493,000	€2,908,000	€3,324,000
Earthworks	€167,000	€352,000	€639,000	€161,000	€352,000	€639,000
Pavement	€7,868,000	€9,911,000	€11,954,000	€7,868,000	€9,911,000	€11,954,000
Kerbs, Footways and Paved Areas	€207,000	€207,000	€207,000	€207,000	€207,000	€207,000
Traffic Signs & Road Markings	€734,000	€734,000	€734,000	€734,000	€734,000	€734,000
Lighting and Electrical	€137,000	€137,000	€137,000	€137,000	€137,000	€137,000
Landscaping & Environmental	€229,000	€229,000	€229,000	€229,000	€229,000	€229,000
Structures	€828,000	€3,948,000	€7,068,000	€828,000	€3,948,000	€7,068,000
Accommodation Works	€83,000	€249,000	€415,000	€83,000	€249,000	€415,000
Parallel Road Allowance	-	-	-	€2,997,000	€2,997,000	€2,997,000
Statutory Authorities and Utilities	€831,000	€831,000	€831,000	€831,000	€831,000	€831,000
Any Other Obligations and Liabilities of the Contractor	€831,000	€831,000	€831,000	€831,000	€831,000	€831,000
Preliminaries @ 20% incl. Temporary Traffic Management	€3,063,000	€4,249,000	€5,456,000	€3,663,000	€4,849,000	€6,055,000
Project Specific Risk Contingency @ 20%	€3,676,000	€5,099,000	€6,547,000	€4,396,000	€5,819,000	€5,494,000
MCC Base Cost Total (excl. VAT)	€22,060,000	€30,599,000	€39,284,000	€26,376,000	€34,915,000	€36,334,000
Add VAT @ 13.5%	€2,978,000	€4,130,000	€5,303,000	€3,560,000	€4,713,000	€7,266,000
MCC Base Cost Total	~€25,038,000	~€34,730,000	~€44,587,000	~€29,937,000	~€39,629,000	~€49,487,000

Table 1: Total Main Construction Contract (MCC) Cost Estimate – Corridor Options

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5 Construction Cost Estimate - Junctions

5.1 Overview

The methodology of developing the quantities and rates for each discipline are outlined in the following sections.

5.2 Site Clearance

A site clearance area was determined using the following approach:

- The areas of the junction locations were extracted to obtain an area in hectares (ha).
- A rate of €2,400/ha has been applied for site clearance for all junction locations. The TII Schedule of Rates provides a range of €250 to €2,000/ha for site clearance and it is assumed that €2,000 with a 20% inflation providing a 2022 rate of €2,400 is more appropriate due to the constrained nature of the existing corridor.

5.3 Fencing

- It has been assumed that new boundary fencing would be required along the perimeter of the junction location boundaries.
- A rate of €36/m has been applied for fencing for all junction locations. This rate is consistent with the TII Schedule of Rates 2019 with 20% inflation to bring unit costs to 2022 levels.

5.4 Safety Barriers

- It has been assumed that 75% of the perimeter of each junction location will require VRS.
- A rate of €72/m was applied for VRS at the junction locations. This rate is consistent with the TII Schedule of Rates 2019 and 2022 inflation.

5.5 Drainage and Service Ducts

A rate of €250,000/km has been applied for each junction location.

5.6 Earthworks

Cut and fill earthworks quantities have been extracted from the Open Roads Designer (ORD) 3D model.

The following rates have been applied for the various earthworks elements:

- Excavation of acceptable material – €4.75/m³
- Disposal of acceptable material – €5.09/m³

These are extracted from the upper band rates of the TII Schedule of Rates (2019) and include 20% inflation.

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5.7 Pavement

Pavement layer quantities have been extracted from the Open Roads Designer (ORD) 3D model.

- The following approximate rates have been applied for the various elements of pavement construction depending on new versus existing pavement:
 - Sub-base, Granular Type B to Clause 804, 150mm thick – €28.20/m³
 - Road Base (AC 32 Dense base 40/60) 2 Layers – €20.40/m² per layer
 - Binder Course (AC 20 Dense bin 55mm) – €9.00/m²
 - Surface Course (SMA 40mm) – €10.20/m²

These are extracted from the TII Schedule of Rates (2019) and sit between the lower and upper bands of the rates with a 20% uplift for 2022 inflation values.

5.8 Kerbs, Footways and Paved Areas

An allowance of €50,000/km has been applied for the provision of kerbs, footways, and paved areas for all junction locations. This is a per km rate utilising the junction location perimeter while taking cognisance of the costs of the M7 Naas to Newbridge Upgrade project.

5.9 Traffic Signs & Road Markings

An allowance of €68,400/km has been applied for the provision of general traffic signs and road markings for all junction locations. This is a per km rate utilising the junction location perimeter while which has been derived from the costs for the M7 Naas to Newbridge Upgrade project and is expected to cover the relocation of impacted signage, and re-application of line markings to suit the revised alignment for the project.

5.10 Lighting and Electrical

An allowance of €16,560/km for lighting and electrical has been applied for all junction locations. This is a per km rate utilising the junction location perimeter while taking cognisance of the costs of the M7 Naas to Newbridge Upgrade project and is expected to cover the relocation of any impacted lighting columns. An allowance for permanent ITS equipment to monitor the safe operations of the bus priority measures has been included under this heading.

5.11 Landscaping and Environmental

An allowance of €27,600/km has been applied for landscaping and environmental works on all junction locations. This is a per km rate utilising the junction location perimeter while which has been derived from the costs for the M7 Naas to Newbridge Upgrade project.

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5.12 Structures

An allowance of €1,750/m² has been applied for new bridge structures and any associated works on all junction locations. These are extracted from the TII Schedule of Rates (2019) and sit between the lower and upper bands of the rates with a 20% uplift for 2022 inflation values.

An allowance of €875/m² has been applied for bridge structure amendments and any associated works for all applicable junction locations.

5.13 Accommodation Works

An allowance of €10,000/km has been applied for accommodation works on all junction locations. This is a per km rate utilising the junction location perimeter while which has been derived from the costs for the M7 Naas to Newbridge Upgrade project.

5.14 Statutory Authorities & Utilities

The high-level cost estimate has been developed prior to the undertaking of site investigation works, therefore the impacts on utilities and utility diversions may need to be amended during future design development. Considering the above, the following approach has been taken:

- A general allowance of €100,000/km for all junction locations has been made for costs associated with statutory authorities and utilities. This allowance has been made based on an estimated proportion of total contract cost only, and these costs are subject to change during future design development.

5.15 Preliminaries

A 20% rate has been applied for Preliminaries for all junction locations including traffic management.

5.16 Risk Contingency

A 20% risk contingency has been allowed for all junction locations which is considered appropriate for this stage of the design development.

5.17 Main Construction Contract Estimate - Junctions

The Main Construction Contract (MCC) estimate and breakdown for junctions by discipline is presented in Table 1. These have been developed based on information currently available and are subject to change during future design development. The estimate is provided in further detail in **Appendix A**.

Item Description	Junction 7						Junction 5	
	Location A	Location B	Location C	Location D	Location E	Location F	Location A	Location B
Site Clearance	€21,000	€18,000	€16,000	€18,000	€14,000	€17,000	€14,000	€17,000
Fencing	€209,000	€189,000	€128,000	€114,000	€97,000	€115,000	€89,000	€130,000
Safety Barriers	€314,000	€284,000	€193,000	€172,000	€146,000	€173,000	€134,000	€195,000
Drainage and Service Ducts	€1,093,000	€988,000	€671,000	€598,000	€509,000	€602,000	€467,000	€679,000
Earthworks	€1,239,000	€614,000	€282,000	€276,000	€137,000	€906,000	€254,000	€357,000
Pavement	€1,781,000	€1,570,000	€1,100,000	€1,030,000	€987,000	€1,079,000	€832,000	€1,161,000
Kerbs, Footways and Paved Areas	€291,000	€263,000	€178,000	€159,000	€135,000	€160,000	€124,000	€181,000
Traffic Signs & Road Markings	€398,000	€360,000	€244,000	€218,000	€185,000	€219,000	€170,000	€247,000
Lighting and Electrical	€96,000	€87,000	€59,000	€52,000	€44,000	€53,000	€41,000	€60,000
Landscaping & Environmental	€160,000	€145,000	€98,000	€88,000	€74,000	€88,000	€68,000	€100,000

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Item Description	Junction 7						Junction 5	
	Location A	Location B	Location C	Location D	Location E	Location F	Location A	Location B
Structures	€2,001,000	€2,001,000	€2,001,000	€2,001,000	€1,000,000	€2,001,000	€2,001,000	€2,001,000
Accommodation Works	€58,000	€52,000	€35,000	€31,000	€27,000	€32,000	€24,000	€36,000
Statutory Authorities and Utilities	€583,000	€527,000	€357,000	€319,000	€271,000	€321,000	€249,000	€362,000
Any Other Obligations and Liabilities of the Contractor	€583,000	€527,000	€357,000	€319,000	€271,000	€321,000	€249,000	€362,000
Preliminaries @ 20% incl. Temporary Traffic Management	€3,063,896	€1,526,000	€1,145,000	€1,080,000	€781,000	€1,219,000	€944,000	€1,178,000
Project Specific Risk Contingency @ 20%	€1,767,000	€1,831,000	€1,374,000	€1,296,000	€937,000	€1,462,000	€1,133,000	€1,414,000
MCC Base Cost Total (excl. VAT)	€12,724,000	€10,990,000	€8,247,000	€7,777,000	€5,623,000	€8,777,000	€6,801,000	€8,487,000
Add VAT @ 13.5%	€1,717,000	€1,483,000	€1,113,000	€1,049,000	€759,000	€1,184,000	€918,000	€1,145,000
MCC Base Cost Total	~€14,442,000	~€12,474,000	~€9,361,000	~€8,827,000	~€6,382,000	~€9,962,000	~€7,719,000	~€9,633,000

Table 2: Total Main Construction Contract (MCC) Cost Estimate - Junctions

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6 Total Level 2 Estimate

6.1 Overview

The methodology of developing the Level 2 Estimate is outlined in the following sections.

6.2 Main Construction Contract

Refer to Section 3.

6.3 Land and Property

Land and property costs are not envisaged to be high due to the minimum widening of corridor options. Corridor Options 1A and 1B have no envisaged land and property costs, Corridor Options 2A and 2B have been provided with a lump sum of €1,000,000 while Corridor Options 3A and 3B have been provided with a lump sum of €2,000,000.

For the junction options, land and property costs vary depending on the junction location in question. Costs have been derived based on proposed area of landtake required and land designation.

6.4 Planning and Design

The cost of the Local Authority's fees and the Consultant's fees are included in this item based on a percentage of Main Construction Contract base cost. A 5% rate of the Main Construction Contract base cost has been applied for all corridor and junction options which is deemed appropriate for Phase 2 Stage 1 of the project.

6.5 Archaeology

Corridor Options 1A and 1B have been given a lump sum rate of €200,000, Corridor Options 2A and 2B have a lump sum rate of €400,000 and Corridor Options 3A and 3B have a lump sum of €500,000.

Junction options have been given a lump sum rate of €200,000.

6.6 Advance Works and Other Contracts

A 2.5% rate of the Main Construction Contract base cost has been applied for all corridor and junction options which is deemed appropriate for Phase 2 Stage 1 of the project.

6.7 Main Contract Supervision (Employer's Costs)

A rate of 5% of the Main Construction Contract base cost has been applied for all corridor and junctions options which is deemed appropriate for Phase 2 of the project.

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6.8 Walking/Cycling/Asset Renewal

A rate of 5% of the Main Construction Contract base cost has been applied for all corridor options which is deemed appropriate for Phase 2 of the project.

A rate of 2% of the Main Construction Contract base cost has been applied for all junction options which is deemed appropriate for Phase 2 of the project.

6.9 Summary

The Total Level 2 Estimate and breakdown is presented in Table 2 (corridors) and Table 3 (junctions). These have been developed based on information currently available and are subject to change during future design development. The estimate is provided in further detail in **Appendix A**. Please note the following:

- Figures are inclusive of VAT;
- Figures are inclusive of Project Specific Risk Contingency;
- Figures are inclusive of provision for Inflation; and
- Total base costs include for all qualifying costs under each cost heading.

Description	Corridor 1A	Corridor 2A	Corridor 3A	Corridor 1B	Corridor 2B	Corridor 3B
Main Construction Contract	€25,038,000	€34,730,000	€44,587,000	€29,937,000	€39,629,000	€49,487,000
Land and Property	-	€1,100,000	€2,200,000	-	€1,100,000	€2,200,000
Planning and Design	€1,665,000	€2,309,000	€2,965,000	€1,990,000	€2,635,000	€3,290,000
Archaeology	€256,000	€513,000	€641,000	€256,000	€513,000	€641,000
Advance Works and Other Contracts	€733,000	€1,072,000	€1,376,000	€924,000	€1,223,000	€1,527,000
Main Contract Supervision (Employer's Costs)	€1,665,000	€2,309,000	€2,965,000	€1,990,000	€2,635,000	€3,290,000
Walking/Cycling/Asset Renewal	€1,546,000	€2,144,000	€2,753,000	€1,848,000	€2,447,000	€3,055,000
Total Level 2 Estimate	~€30,943,000	~€44,179,000	~€57,489,000	~€36,948,000	~€50,184,000	~€63,494,000

Table 3: Total Level 2 Estimate - Corridors

Technical Note



Description	Junction 7						Junction 5	
	Location A	Location B	Location C	Location D	Location E	Location F	Location A	Location B
Main Construction Contract	€14,442,000	€12,474,000	€9,361,000	€8,827,000	€6,382,000	€9,962,000	€7,719,000	€9,633,000
Land and Property	€5,500,000	€5,500,000	€8,250,000	€2,200,000	€1,650,000	€2,200,000	€1,100,000	€4,400,000
Planning and Design	€960,000	€829,000	€622,000	€587,000	€424,000	€662,000	€513,000	€640,000
Archaeology	€256,000	€256,000	€256,000	€256,000	€256,000	€256,000	€256,000	€256,000
Advance Works and Other Contracts	€445,000	€385,000	€289,000	€272,000	€197,000	€307,000	€238,000	€297,000
Main Contract Supervision (Employer's Costs)	€960,000	€829,000	€622,000	€587,000	€424,000	€662,000	€516,000	€640,000
Walking/Cycling/Asset Renewal	€356,000	€308,000	€231,000	€218,000	€157,000	€246,000	€190,000	€237,000
Total Level 2 Estimate	~€22,922,000	~€20,582,000	~€19,633,000	~€12,948,000	~€9,492,000	~€14,297,000	~€10,532,000	~€16,106,000

Table 4: Total Level 2 Estimate - Junctions

7 Conclusions

The Total Level 2 Estimates have been determined as follows:

7.1 Corridors

- Corridor Option 1A: ~€31m including VAT;
- Corridor Option 2A: ~€44m including VAT;
- Corridor Option 3A: ~€57m including VAT;
- Corridor Option 1B: ~€37m including VAT;
- Corridor Option 2B: ~€50m including VAT; and
- Corridor Option 3B: ~€63m including VAT.

7.2 Junctions

7.2.1 Junction 7

- Junction 7 Location A: ~€23m including VAT;
- Junction 7 Location B: ~€21m including VAT;
- Junction 7 Location C: ~€20m including VAT;
- Junction 7 Location D: ~€13m including VAT;
- Junction 7 Location E: ~€9m including VAT;
- Junction 7 Location F: ~€14m including VAT;

7.2.2 Junction 5

- Junction 5 Location A: ~€11m including VAT and;
- Junction 5 Location B: ~€16m including VAT.

These costs have been developed based on information currently available and are subject to change during future design development.

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	Gerard Hall	Stephen Barry	Zita Langenbach
Signature			

Technical Note

272691-00

25 May 2022

Appendix A Estimate Breakdown

Technical Note

272691-00

25 May 2022

Maynooth to Leixlip Project		04/03/2022		S3-P01	
Phase 2 Stage 1: Option Comparison Estimates		Corridor 1A			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€31,116
b	Fencing	Various	m	Various	€144,000
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€898,200
d	Drainage and Service Ducts	Various	km	460000	€2,493,300
e	Earthworks	Various	m3	Various	€167,327
f	Pavement	Various	Various	Various	€7,868,964
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€207,775
h	Traffic Signs & Roadmarkings	Various	Various	Various	€568,472
k	Lighting and Electrical	Various	Various	Various	€137,630
l	Landscaping and Environmental	Various	Various	Various	€229,384
m	Structures	Various	Various	Various	€828,000
n	Accommodation Works	Various	Various	Various	€83,110
p	Statutory Authorities & Utilities	Various	Various	Various	€831,100
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€831,100
s	Preliminaries	Various	Various	Various	€3,063,896
Total Base Cost for Main Construction Contract (Excluding VAT)					€18,383,374
Add Project Specific Risk Contingency					20% €3,676,675
Sub-Total exclusive of VAT					€22,060,049
Add VAT at					13.5% €2,978,107
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€25,038,156
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	€0
Total Base Cost for Land and Property					€0
Add Project Specific Risk Contingency					10% €0
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€0
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known				5%	€1,251,908
Add Project Specific Risk Contingency				10%	€125,191
Add VAT at				23%	€287,939
Total P&D Base Cost plus Project Specific Risk Contingency					€1,665,037
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€200,000
Add Project Specific Risk Contingency				10%	€20,000
Add VAT at				18.3%	€36,600
Total Archaeology Base Cost plus Project Specific Risk Contingency					€256,600
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known				2.5%	€625,954
Add Project Specific Risk Contingency				10%	€62,595
Add VAT at				13.5%	€84,504
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€773,053
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known				5%	€1,251,908
Add Project Specific Risk Contingency				10%	€125,191
Add VAT at				23%	€287,939
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€1,665,037
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost				5%	€1,251,908
Add Project Specific Risk Contingency				10%	€125,191
Add VAT at				13.5%	€169,008
Total Residual Network Base Cost plus Project Specific Risk Contingency					€1,546,106
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€30,943,990
Mainline Length		8.3	km	Rate per km	€3,723,257
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project		04/03/2022	
Phase 2 Stage 1: Option Comparison Estimates		Corridor 1A	
Arup		Gerard Hall	
Main Construction Cost - Base Cost Estimate			
Summary			
A	Site Clearance		€31,116
B	Fencing		€144,000
C	Safety Barriers and Pedestrian Guardrails		€898,200
D	Drainage and Service Ducts		€2,493,300
E	Earthworks		€167,327
F	Pavement		€7,868,964
G	Kerbs, Footways and Paved Areas		€207,775
H	Traffic Signs		€568,472
J	Roadmarking		€0
K	Lighting and Electrical		€137,630
L	Landscaping and Environmental		€229,384
M	Structures (Including Tunnels to be separately identified)		€828,000
N	Accommodation Works		€83,110
P	Statutory Authorities & Utilities		€831,100
Q	Any Other Obligations and Liabilities of the Contractor		€831,100
	Sub-Total		€15,319,479
S	Preliminaries		€3,063,896
MCC Base Cost Total excluding Project Specific Risk Contingency			€18,383,374
Add Project Specific Risk Contingency		20 %	€3,676,675
MCC Base Cost Total including Project Specific Risk Contingency			€22,060,049
Add VAT at		13.5 %	€2,978,107
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€25,038,156
Mainline Length		8.3 km	
MCC Cost per km based on Mainline Length Only		€3,012,653	
Schedule of Works			
		Quantity	Unit
			Rate/Prices
			Totals
A	Site Clearance		
A1.1	General Site Clearance (Greenfield)	13.0	Ha
	Site Clearance Total to Summary		€31,116
B	Fencing		
B.1	Permanent Boundary Fencing	4,000	m
	Fencing Total to Summary		€144,000
C	Safety Barrier and Pedestrian Guardrails		
C.1	Safety Barrier (Specify Type)	11,760	m
C.2	Median Barrier (Specify Type e.g. Concrete or Wire)	429	m
	Safety Barrier and Pedestrian Guardrails Total to Summary		€898,200
D	Drainage and Service Ducts		
D.1	Drainage and Service Ducts per km (Mainline)	8.3	km
	Drainage and Service Ducts Total to Summary		€2,493,300
E	Earthworks		

Maynooth to Leixlip Project		04/03/2022			
Phase 2 Stage 1: Option Comparison Estimates		Corridor 1A			
Arup		Gerard Hall			
Mainline					
E.1 Excavation - Acceptable	18,118	m3	€4.75	€86,097	
E.2 Disposal - U1	15,965	m3	€5.09	€81,230	
Earthworks Sub-Total					€167,327
F Pavement					
New Pavement					
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	8,630	m3	€28.20	€243,377	
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	115,072	m2	€20.40	€2,347,469	
F.3 Binder Course (AC 20 Dense bin 55mm)	57,536	m2	€9.00	€517,824	
F.4 Surface Course (SMA 40mm)	57,536	m2	€10.20	€586,867	
F.5 Milling Existing Pavement (100mm including disposal)	57,536	m2	€6.00	€345,216	
Existing Pavement					
F.2 Binder Course (AC 20 Dense bin 55mm)	145,008	m2	€12.00	€1,740,096	
F.3 Surface Course (SMA 40mm)	145,008	m2	€10.20	€1,479,082	
F.4 Milling Existing Pavement (100mm including disposal)	145,008	m2	€4.20	€609,034	
Pavement Total to Summary					€7,868,964
G Kerbs Footways and Paved Areas					
Allowance based on project scope and historical costs	8.3	km	€25,000	€207,775	
					€207,775
H Traffic Signs & Roadmarkings					
Additional Signage for Bus Priority Measures	8.3	km	€20,000	€166,220	
Allowance based on project scope and historical costs	8.3	km	€68,400	€568,472	
					€734,692
J Roadmarkings					
Allowance based on project scope and historical costs	8.3	sum			€0
K Lighting and Electrical					
Allowance based on project scope and historical costs	8.3	sum	€16,560	€137,630	
					€137,630
L Landscaping and Environmental					
Allowance based on project scope and historical costs	8.3	sum	€27,600	€229,384	
					€229,384
M Structures (Including Tunnels to be separately identified)					
Liffey Bridge - Remedial					
M.1 Remedial works to existing bridge	2,760	m2	€300	€828,000	
Structures Total to Summary					€828,000
N Accommodation Works					
Allowance based on project scope and historical costs	8.3	sum	€10,000	€83,110	
					€83,110
P Statutory Authorities & Utilities					
Allowance based on project scope and historical costs	8.3	sum	€100,000	€831,100	
					€831,100
Q Any Other Obligations and Liabilities of the Contractor					
Allowance based on project scope and historical costs	8.3	sum	€100,000	€831,100	
					€831,100
S Preliminaries					
R.2 All Preliminary Items inc. TTM	20%	sum	€3,063,896	€3,063,896	
Preliminaries Total to Summary					€3,063,896
N.B. Figures are exclusive of VAT except where expressly stated above.					
Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.					
Total base costs to include for ALL qualifying costs under each cost heading.					
Refer to the NRA Cost Management Manual for information on coverage and format of back-up.					
See attached Budget Assumptions Sheet for Further Scheme Information.					

Maynooth to Leixlip Project		04/03/2022		S3-P01	
Phase 2 Stage 1: Option Comparison Estimates		Corridor 2A			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€31,116
b	Fencing	Various	m	Various	€144,000
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€898,200
d	Drainage and Service Ducts	Various	km	460000	€2,908,850
e	Earthworks	Various	m3	Various	€352,691
f	Pavement	Various	Various	Various	€9,911,815
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€207,775
h	Traffic Signs & Roadmarkings	Various	Various	Various	€568,472
k	Lighting and Electrical	Various	Various	Various	€137,630
l	Landscaping and Environmental	Various	Various	Various	€229,384
m	Structures	Various	Various	Various	€3,948,000
n	Accommodation Works	Various	Various	Various	€249,330
p	Statutory Authorities & Utilities	Various	Various	Various	€831,100
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€831,100
s	Preliminaries	Various	Various	Various	€4,249,893
Total Base Cost for Main Construction Contract (Excluding VAT)					€25,499,356
Add Project Specific Risk Contingency					20% €5,099,871
Sub-Total exclusive of VAT					€30,599,227
Add VAT at					13.5% €4,130,896
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€34,730,123
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	€1,000,000
Total Base Cost for Land and Property					€1,000,000
Add Project Specific Risk Contingency					10% €100,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€1,100,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €1,736,506
Add Project Specific Risk Contingency					10% €173,651
Add VAT at					23% €399,396
Total P&D Base Cost plus Project Specific Risk Contingency					€2,309,553
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€400,000
Add Project Specific Risk Contingency					10% €40,000
Add VAT at					18.3% €73,200
Total Archaeology Base Cost plus Project Specific Risk Contingency					€513,200
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €868,253
Add Project Specific Risk Contingency					10% €86,825
Add VAT at					13.5% €117,214
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€1,072,293
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €1,736,506
Add Project Specific Risk Contingency					10% €173,651
Add VAT at					23% €399,396
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€2,309,553
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €1,736,506
Add Project Specific Risk Contingency					10% €173,651
Add VAT at					13.5% €234,428
Total Residual Network Base Cost plus Project Specific Risk Contingency					€2,144,585
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€44,179,307
Mainline Length		8.3	km	Rate per km	€5,315,763
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified. Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate. Total base costs to include for ALL qualifying costs under each cost heading. Refer to the NRA Cost Management Manual for information on coverage and format of back-up. See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	04/03/2022
Phase 2 Stage 1: Option Comparison Estimates	Corridor 2A
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€31,116
B	Fencing		€144,000
C	Safety Barriers and Pedestrian Guardrails		€898,200
D	Drainage and Service Ducts		€2,908,850
E	Earthworks		€352,691
F	Pavement		€9,911,815
G	Kerbs, Footways and Paved Areas		€207,775
H	Traffic Signs		€568,472
J	Roadmarking		€0
K	Lighting and Electrical		€137,630
L	Landscaping and Environmental		€229,384
M	Structures (Including Tunnels to be separately identified)		€3,948,000
N	Accommodation Works		€249,330
P	Statutory Authorities & Utilities		€831,100
Q	Any Other Obligations and Liabilities of the Contractor		€831,100
	Sub-Total		€21,249,463
S	Preliminaries		€4,249,893
MCC Base Cost Total excluding Project Specific Risk Contingency			€25,499,356
	Add Project Specific Risk Contingency	20 %	€5,099,871
MCC Base Cost Total including Project Specific Risk Contingency			€30,599,227
	Add VAT at	13.5 %	€4,130,896
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€34,730,123
	Mainline Length	8.3 km	
	MCC Cost per km based on Mainline Length Only	€4,178,814	

Schedule of Works		Quantity	Unit	Rate/Prices	Totals
A Site Clearance					
A1.1	General Site Clearance (Greenfield)	13.0	Ha	€2,400	€31,116
Site Clearance Total to Summary					€31,116
B Fencing					
B.1	Permanent Boundary Fencing	4,000	m	€36	€144,000
Fencing Total to Summary					€144,000

Maynooth to Leixlip Project		04/03/2022		
Phase 2 Stage 1: Option Comparison Estimates		Corridor 2A		
Arup		Gerard Hall		
C Safety Barrier and Pedestrian Guardrails				
C.1 Safety Barrier (Specify Type)	11,760	m	€72	€846,720
C.2 Median Barrier (Specify Type e.g. Concrete or Wire)	429	m	€120	€51,480
Safety Barrier and Pedestrian Guardrails Total to Summary				€898,200
D Drainage and Service Ducts				
D.1 Drainage and Service Ducts per km (Mainline)	8.3	km	€350,000	€2,908,850
Drainage and Service Ducts Total to Summary				€2,908,850
E Earthworks				
Mainline				
E.1 Excavation - Acceptable	37,036	m3	€4.75	€175,995
E.2 Disposal - U1	34,728	m3	€5.09	€176,696
Earthworks Sub-Total				€352,691
F Pavement				
New Pavement				
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	12,994	m3	€28.20	€366,420
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	173,248	m2	€20.40	€3,534,259
F.3 Binder Course (AC 20 Dense bin 55mm)	86,624	m2	€9.00	€779,616
F.4 Surface Course (SMA 40mm)	86,624	m2	€10.20	€883,565
F.5 Milling Existing Pavement (100mm including disposal)	86,624	m2	€6.00	€519,744
Existing Pavement				
F.2 Binder Course (AC 20 Dense bin 55mm)	145,008	m2	€12.00	€1,740,096
F.3 Surface Course (SMA 40mm)	145,008	m2	€10.20	€1,479,082
F.4 Milling Existing Pavement (100mm including disposal)	145,008	m2	€4.20	€609,034
Pavement Total to Summary				€9,911,815
G Kerbs Footways and Paved Areas				
Allowance based on project scope and historical costs	8.3	km	€25,000	€207,775
				€207,775
H Traffic Signs & Roadmarkings				
Additional Signage for Bus Priority Measures	8.3	km	€20,000	€166,220
Allowance based on project scope and historical costs	8.3	km	€68,400	€568,472
				€734,692
J Roadmarkings				
Allowance based on project scope and historical costs	8.3	sum		€0
K Lighting and Electrical				
Allowance based on project scope and historical costs	8.3	sum	€16,560	€137,630
				€137,630
L Landscaping and Environmental				
Allowance based on project scope and historical costs	8.3	sum	€27,600	€229,384
				€229,384
M Structures (Including Tunnels to be seperately identified)				
Liffey Bridge				
M.1 Remedial works to existing bridge	2,760	m2	€300	€828,000
M.2 New Structure in Westbound Direction only	780	m2	€4,000	€3,120,000
Structures Total to Summary				€3,948,000
N Accommodation Works				
Allowance based on project scope and historical costs	8.3	sum	€30,000	€249,330
				€249,330
P Statutory Authorities & Utilities				
Allowance based on project scope and historical costs	8.3	sum	€100,000	€831,100
				€831,100
Q Any Other Obligations and Liabilities of the Contractor				

Maynooth to Leixlip Project	04/03/2022			
Phase 2 Stage 1: Option Comparison Estimates	Corridor 2A			
Arup	Gerard Hall			
Allowance based on project scope and historical costs	8.3	sum	€100,000	€831,100
				€831,100
S Preliminaries				
R.2 All Preliminary Items inc. TTM	20%	sum	€4,249,893	€4,249,893
Preliminaries Total to Summary				€4,249,893
<p>N.B. Figures are exclusive of VAT except where expressly stated above. Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate. Total base costs to include for ALL qualifying costs under each cost heading. Refer to the NRA Cost Management Manual for information on coverage and format of back-up. See attached Budget Assumptions Sheet for Further Scheme Information.</p>				

Maynooth to Leixlip Project		04/03/2022		S3-P01	
Phase 2 Stage 1: Option Comparison Estimates		Corridor 3A			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€31,116
b	Fencing	Various	m	Various	€144,000
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€898,200
d	Drainage and Service Ducts	Various	km	460000	€3,324,400
e	Earthworks	Various	m3	Various	€639,277
f	Pavement	Various	Various	Various	€11,954,735
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€207,775
h	Traffic Signs & Roadmarkings	Various	Various	Various	€568,472
k	Lighting and Electrical	Various	Various	Various	€137,630
l	Landscaping and Environmental	Various	Various	Various	€229,384
m	Structures	Various	Various	Various	€7,068,000
n	Accommodation Works	Various	Various	Various	€415,550
p	Statutory Authorities & Utilities	Various	Various	Various	€831,100
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€831,100
s	Preliminaries	Various	Various	Various	€5,456,148
Total Base Cost for Main Construction Contract (Excluding VAT)					€32,736,888
Add Project Specific Risk Contingency					20% €6,547,378
Sub-Total exclusive of VAT					€39,284,265
Add VAT at					13.5% €5,303,376
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€44,587,641
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	€2,000,000
Total Base Cost for Land and Property					€2,000,000
Add Project Specific Risk Contingency					10% €200,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€2,200,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €2,229,382
Add Project Specific Risk Contingency					10% €222,938
Add VAT at					23% €512,758
Total P&D Base Cost plus Project Specific Risk Contingency					€2,965,078
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€500,000
Add Project Specific Risk Contingency					10% €50,000
Add VAT at					18.3% €91,500
Total Archaeology Base Cost plus Project Specific Risk Contingency					€641,500
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €1,114,691
Add Project Specific Risk Contingency					10% €111,469
Add VAT at					13.5% €150,483
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€1,376,643
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €2,229,382
Add Project Specific Risk Contingency					10% €222,938
Add VAT at					23% €512,758
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€2,965,078
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €2,229,382
Add Project Specific Risk Contingency					10% €222,938
Add VAT at					13.5% €300,967
Total Residual Network Base Cost plus Project Specific Risk Contingency					€2,753,287
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€57,489,228
Mainline Length		8.3	km	Rate per km	€6,917,246
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	04/03/2022
Phase 2 Stage 1: Option Comparison Estimates	Corridor 3A
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€31,116
B	Fencing		€144,000
C	Safety Barriers and Pedestrian Guardrails		€898,200
D	Drainage and Service Ducts		€3,324,400
E	Earthworks		€639,277
F	Pavement		€11,954,735
G	Kerbs, Footways and Paved Areas		€207,775
H	Traffic Signs		€568,472
J	Roadmarking		€0
K	Lighting and Electrical		€137,630
L	Landscaping and Environmental		€229,384
M	Structures (Including Tunnels to be separately identified)		€7,068,000
N	Accommodation Works		€415,550
P	Statutory Authorities & Utilities		€831,100
Q	Any Other Obligations and Liabilities of the Contractor		€831,100
	Sub-Total		€27,280,740
S	Preliminaries		€5,456,148

MCC Base Cost Total excluding Project Specific Risk Contingency		€32,736,888
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Add Project Specific Risk Contingency	20	%	€6,547,378
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MCC Base Cost Total including Project Specific Risk Contingency		€39,284,265
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Add VAT at	13.5	%	€5,303,376
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MCC Base Cost Total including Project Specific Risk Contingency and VAT		€44,587,641
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Mainline Length		8.3	km
MCC Cost per km based on Mainline Length Only		€5,364,895	

Schedule of Works	Quantity	Unit	Rate/Prices	Totals
A Site Clearance				
A1.1 General Site Clearance (Greenfield)	13	Ha	€2,400	€31,116
Site Clearance Total to Summary				€31,116
B Fencing				
B.1 Permanent Boundary Fencing	4,000	m	€36	€144,000
Fencing Total to Summary				€144,000

Maynooth to Leixlip Project		04/03/2022		
Phase 2 Stage 1: Option Comparison Estimates		Corridor 3A		
Arup		Gerard Hall		
C Safety Barrier and Pedestrian Guardrails				
C.1 Safety Barrier (Specify Type)	11,760	m	€72	€846,720
C.2 Median Barrier (Specify Type e.g. Concrete or Wire)	429	m	€120	€51,480
Safety Barrier and Pedestrian Guardrails Total to Summary				€898,200
D Drainage and Service Ducts				
D.1 Drainage and Service Ducts per km (Mainline)	8.3	km	€400,000	€3,324,400
Drainage and Service Ducts Total to Summary				€3,324,400
E Earthworks				
Mainline				
E.1 Excavation - Acceptable	67,748	m3	€4.75	€321,938
E.2 Disposal - U1	62,370	m3	€5.09	€317,339
Earthworks Sub-Total				€639,277
F Pavement				
New Pavement				
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	17,357	m3	€28.20	€489,466
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	231,426	m2	€20.40	€4,721,090
F.3 Binder Course (AC 20 Dense bin 55mm)	115,713	m2	€9.00	€1,041,417
F.4 Surface Course (SMA 40mm)	115,713	m2	€10.20	€1,180,273
F.5 Milling Existing Pavement (100mm including disposal)	115,713	m2	€6.00	€694,278
Existing Pavement				
F.2 Binder Course (AC 20 Dense bin 55mm)	145,008	m2	€12.00	€1,740,096
F.3 Surface Course (SMA 40mm)	145,008	m2	€10.20	€1,479,082
F.4 Milling Existing Pavement (100mm including disposal)	145,008	m2	€4.20	€609,034
Pavement Total to Summary				€11,954,735
G Kerbs Footways and Paved Areas				
Allowance based on project scope and historical costs	8.3	km	€25,000	€207,775
				€207,775
H Traffic Signs & Roadmarkings				
Additional Signage for Bus Priority Measures	8.3	km	€20,000	€166,220
Allowance based on project scope and historical costs	8.3	km	€68,400	€568,472
				€734,692
J Roadmarkings				
Allowance based on project scope and historical costs	8.3	sum		€0
K Lighting and Electrical				
Allowance based on project scope and historical costs	8.3	sum	€16,560	€137,630
				€137,630
L Landscaping and Environmental				
Allowance based on project scope and historical costs	8.3	sum	€27,600	€229,384
				€229,384
M Structures (Including Tunnels to be separately identified)				
Liffey Bridge				
M.1 Remedial works to existing bridge	2,760	m2	€300	€828,000
2 New Structures in Eastbound and Westbound Directions	1,560	m2	€4,000	€6,240,000
Structures Total to Summary				€7,068,000
N Accommodation Works				
Allowance based on project scope and historical costs	8.3	sum	€50,000	€415,550
				€415,550
P Statutory Authorities & Utilities				
Allowance based on project scope and historical costs	8.3	sum	€100,000	€831,100
				€831,100
Q Any Other Obligations and Liabilities of the Contractor				

Maynooth to Leixlip Project				04/03/2022
Phase 2 Stage 1: Option Comparison Estimates				Corridor 3A
Arup				Gerard Hall
Allowance based on project scope and historical costs	8.3	sum	€100,000	€831,100
				€831,100
S Preliminaries				
R.2 All Preliminary Items inc. TTM	20%	sum	€5,456,148	€5,456,148
Preliminaries Total to Summary				€5,456,148
<p>N.B. Figures are exclusive of VAT except where expressly stated above. Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate. Total base costs to include for ALL qualifying costs under each cost heading. Refer to the NRA Cost Management Manual for information on coverage and format of back-up. See attached Budget Assumptions Sheet for Further Scheme Information.</p>				

Maynooth to Leixlip Project		04/03/2022		S3-P01	
Phase 2 Stage 1: Option Comparison Estimates		Corridor 1B			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€31,116
b	Fencing	Various	m	Various	€144,000
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€898,200
d	Drainage and Service Ducts	Various	km	460000	€2,493,300
e	Earthworks	Various	m3	Various	€167,327
f	Pavement	Various	Various	Various	€7,868,964
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€207,775
h	Traffic Signs & Roadmarkings	Various	Various	Various	€568,472
k	Lighting and Electrical	Various	Various	Various	€137,630
l	Landscaping and Environmental	Various	Various	Various	€229,384
m	Structures	Various	Various	Various	€828,000
n	Accommodation Works	Various	Various	Various	€83,110
p	Statutory Authorities & Utilities	Various	Various	Various	€831,100
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€831,100
x	Parallel Road Allowance	Various	Various	Various	€2,997,750
s	Preliminaries	Various	Various	Various	€3,663,446
Total Base Cost for Main Construction Contract (Excluding VAT)					€21,980,674
Add Project Specific Risk Contingency					20% €4,396,135
Sub-Total exclusive of VAT					€26,376,809
Add VAT at					13.5% €3,560,869
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€29,937,679
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	€0
Total Base Cost for Land and Property					€0
Add Project Specific Risk Contingency					10% €0
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€0
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €1,496,884
Add Project Specific Risk Contingency					10% €149,688
Add VAT at					23% €344,283
Total P&D Base Cost plus Project Specific Risk Contingency					€1,990,856
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€200,000
Add Project Specific Risk Contingency					10% €20,000
Add VAT at					18.3% €36,600
Total Archaeology Base Cost plus Project Specific Risk Contingency					€256,600
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €748,442
Add Project Specific Risk Contingency					10% €74,844
Add VAT at					13.5% €101,040
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€924,326
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €1,496,884
Add Project Specific Risk Contingency					10% €149,688
Add VAT at					23% €344,283
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€1,990,856
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €1,496,884
Add Project Specific Risk Contingency					10% €149,688
Add VAT at					13.5% €202,079
Total Residual Network Base Cost plus Project Specific Risk Contingency					€1,848,652
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€36,948,967
Mainline Length		8.3	km	Rate per km	€4,445,791
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	04/03/2022
Phase 2 Stage 1: Option Comparison Estimates	Corridor 1B
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€31,116
B	Fencing		€144,000
C	Safety Barriers and Pedestrian Guardrails		€898,200
D	Drainage and Service Ducts		€2,493,300
E	Earthworks		€167,327
F	Pavement		€7,868,964
G	Kerbs, Footways and Paved Areas		€207,775
H	Traffic Signs		€568,472
X	Parallel Road Allowance		€2,997,750
K	Lighting and Electrical		€137,630
L	Landscaping and Environmental		€229,384
M	Structures (Including Tunnels to be separately identified)		€828,000
N	Accommodation Works		€83,110
P	Statutory Authorities & Utilities		€831,100
Q	Any Other Obligations and Liabilities of the Contractor		€831,100
	Sub-Total		€18,317,229
S	Preliminaries		€3,663,446
MCC Base Cost Total excluding Project Specific Risk Contingency			€21,980,674
	Add Project Specific Risk Contingency	20 %	€4,396,135
MCC Base Cost Total including Project Specific Risk Contingency			€26,376,809
	Add VAT at	13.5 %	€3,560,869
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€29,937,679
	Mainline Length	8.3 km	
	MCC Cost per km based on Mainline Length Only	3602175.256	

Schedule of Works		Quantity	Unit	Rate/Prices	Totals
A Site Clearance					
A1.1	General Site Clearance (Greenfield)	13.0	Ha	€2,400	€31,116
Site Clearance Total to Summary					€31,116
B Fencing					
B.1	Permanent Boundary Fencing	4,000	m	€36	€144,000
Fencing Total to Summary					€144,000

Maynooth to Leixlip Project		04/03/2022		
Phase 2 Stage 1: Option Comparison Estimates		Corridor 1B		
Arup		Gerard Hall		
C Safety Barrier and Pedestrian Guardrails				
C.1 Safety Barrier (Specify Type)	11,760	m	€72	€846,720
C.2 Median Barrier (Specify Type e.g. Concrete or Wire)	429	m	€120	€51,480
Safety Barrier and Pedestrian Guardrails Total to Summary				€898,200
D Drainage and Service Ducts				
D.1 Drainage and Service Ducts per km (Mainline)	8.3	km	€300,000	€2,493,300
Drainage and Service Ducts Total to Summary				€2,493,300
E Earthworks				
Mainline				
E.1 Excavation - Acceptable	18,118	m3	€4.75	€86,097
E.2 Disposal - U1	15,965	m3	€5.09	€81,230
Earthworks Sub-Total				€167,327
F Pavement				
New Pavement				
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	8,630	m3	€28.20	€243,377
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	115,072	m2	€20.40	€2,347,469
F.3 Binder Course (AC 20 Dense bin 55mm)	57,536	m2	€9.00	€517,824
F.4 Surface Course (SMA 40mm)	57,536	m2	€10.20	€586,867
F.5 Milling Existing Pavement (100mm including disposal)	57,536	m2	€6.00	€345,216
Existing Pavement				
F.2 Binder Course (AC 20 Dense bin 55mm)	145,008	m2	€12.00	€1,740,096
F.3 Surface Course (SMA 40mm)	145,008	m2	€10.20	€1,479,082
F.4 Milling Existing Pavement (100mm including disposal)	145,008	m2	€4.20	€609,034
Pavement Total to Summary				€7,868,964
G Kerbs Footways and Paved Areas				
Allowance based on project scope and historical costs	8.3	km	€25,000	€207,775
				€207,775
H Traffic Signs & Roadmarkings				
Additional Signage for Bus Priority Measures	8.3	km	€20,000	€166,220
Allowance based on project scope and historical costs	8.3	km	€68,400	€568,472
				€734,692
X Parallel Road Allowance				
Allowance based on project scope and historical costs		sum		€2,997,750
				€2,997,750
K Lighting and Electrical				
Allowance based on project scope and historical costs	8.3	sum	€16,560	€137,630
				€137,630
L Landscaping and Environmental				
Allowance based on project scope and historical costs	8.3	sum	€27,600	€229,384
				€229,384
M Structures (Including Tunnels to be separately identified)				
Liffey Bridge - Remedial				
M.1 Remedial works to existing bridge	2,760	m2	€300	€828,000
Structures Total to Summary				€828,000
N Accommodation Works				
Allowance based on project scope and historical costs	8.3	sum	€10,000	€83,110
				€83,110
P Statutory Authorities & Utilities				
Allowance based on project scope and historical costs	8.3	sum	€100,000	€831,100
				€831,100
Q Any Other Obligations and Liabilities of the Contractor				

Maynooth to Leixlip Project				04/03/2022
Phase 2 Stage 1: Option Comparison Estimates				Corridor 1B
Arup				Gerard Hall
Allowance based on project scope and historical costs	8.3	sum	€100,000	€831,100
				€831,100
S Preliminaries				
R.2 All Preliminary Items inc. TTM	20%	sum	€3,663,446	€3,663,446
Preliminaries Total to Summary				€3,663,446
<p>N.B. Figures are exclusive of VAT except where expressly stated above.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>				

Maynooth to Leixlip Project		04/03/2022		S3-P01	
Phase 2 Stage 1: Option Comparison Estimates		Corridor 2B			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€31,116
b	Fencing	Various	m	Various	€144,000
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€898,200
d	Drainage and Service Ducts	Various	km	460000	€2,908,850
e	Earthworks	Various	m3	Various	€352,691
f	Pavement	Various	Various	Various	€9,911,815
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€207,775
h	Traffic Signs & Roadmarkings	Various	Various	Various	€568,472
k	Lighting and Electrical	Various	Various	Various	€137,630
l	Landscaping and Environmental	Various	Various	Various	€229,384
m	Structures	Various	Various	Various	€3,948,000
n	Accommodation Works	Various	Various	Various	€249,330
p	Statutory Authorities & Utilities	Various	Various	Various	€831,100
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€831,100
x	Parallel Road Allowance	Various	Various	Various	€2,997,750
s	Preliminaries	Various	Various	Various	€4,849,443
Total Base Cost for Main Construction Contract (Excluding VAT)					€29,096,656
Add Project Specific Risk Contingency					20% €5,819,331
Sub-Total exclusive of VAT					€34,915,987
Add VAT at					13.5% €4,713,658
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€39,629,646
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	€1,000,000
Total Base Cost for Land and Property					€1,000,000
Add Project Specific Risk Contingency					10% €100,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€1,100,000
3	Planning and Design				
Provision based on percentage of Main Construction Contract Base Cost & Actual Costs where known					5% €1,981,482
Add Project Specific Risk Contingency					10% €198,148
Add VAT at					23% €455,741
Total P&D Base Cost plus Project Specific Risk Contingency					€2,635,371
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€400,000
Add Project Specific Risk Contingency					10% €40,000
Add VAT at					18.3% €73,200
Total Archaeology Base Cost plus Project Specific Risk Contingency					€513,200
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €990,741
Add Project Specific Risk Contingency					10% €99,074
Add VAT at					13.5% €133,750
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€1,223,565
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €1,981,482
Add Project Specific Risk Contingency					10% €198,148
Add VAT at					23% €455,741
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€2,635,371
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €1,981,482
Add Project Specific Risk Contingency					10% €198,148
Add VAT at					13.5% €267,500
Total Residual Network Base Cost plus Project Specific Risk Contingency					€2,447,131
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€50,184,284
Mainline Length		8.3	km	Rate per km	€6,038,297
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	04/03/2022
Phase 2 Stage 1: Option Comparison Estimates	Corridor 2B
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€31,116
B	Fencing		€144,000
C	Safety Barriers and Pedestrian Guardrails		€898,200
D	Drainage and Service Ducts		€2,908,850
E	Earthworks		€352,691
F	Pavement		€9,911,815
G	Kerbs, Footways and Paved Areas		€207,775
H	Traffic Signs		€568,472
X	Parallel Road Allowance		€2,997,750
K	Lighting and Electrical		€137,630
L	Landscaping and Environmental		€229,384
M	Structures (Including Tunnels to be seperately identified)		€3,948,000
N	Accommodation Works		€249,330
P	Statutory Authorities & Utilities		€831,100
Q	Any Other Obligations and Liabilities of the Contractor		€831,100
	Sub-Total		€24,247,213
S	Preliminaries		€4,849,443
MCC Base Cost Total excluding Project Specific Risk Contingency			€29,096,656
	Add Project Specific Risk Contingency	20 %	€5,819,331
MCC Base Cost Total including Project Specific Risk Contingency			€34,915,987
	Add VAT at	13.5 %	€4,713,658
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€39,629,646
	Mainline Length	8.3 km	
	MCC Cost per km based on Mainline Length Only	€4,768,337	

Schedule of Works		Quantity	Unit	Rate/Prices	Totals
A Site Clearance					
A1.1	General Site Clearance (Greenfield)	13.0	Ha	€2,400	€31,116
Site Clearance Total to Summary					€31,116
B Fencing					
B.1	Permanent Boundary Fencing	4,000	m	€36	€144,000
Fencing Total to Summary					€144,000

Maynooth to Leixlip Project		04/03/2022		
Phase 2 Stage 1: Option Comparison Estimates		Corridor 2B		
Arup		Gerard Hall		
C Safety Barrier and Pedestrian Guardrails				
C.1 Safety Barrier (Specify Type)	11,760	m	€72	€846,720
C.2 Median Barrier (Specify Type e.g. Concrete or Wire)	429	m	€120	€51,480
Safety Barrier and Pedestrian Guardrails Total to Summary				€898,200
D Drainage and Service Ducts				
D.1 Drainage and Service Ducts per km (Mainline)	8.3	km	€350,000	€2,908,850
Drainage and Service Ducts Total to Summary				€2,908,850
E Earthworks				
Mainline				
E.1 Excavation - Acceptable	37,036	m3	€4.75	€175,995
E.2 Disposal - U1	34,728	m3	€5.09	€176,696
Earthworks Sub-Total				€352,691
F Pavement				
New Pavement				
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	12,994	m3	€28.20	€366,420
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	173,248	m2	€20.40	€3,534,259
F.3 Binder Course (AC 20 Dense bin 55mm)	86,624	m2	€9.00	€779,616
F.4 Surface Course (SMA 40mm)	86,624	m2	€10.20	€883,565
F.5 Milling Existing Pavement (100mm including disposal)	86,624	m2	€6.00	€519,744
Existing Pavement				
F.2 Binder Course (AC 20 Dense bin 55mm)	145,008	m2	€12.00	€1,740,096
F.3 Surface Course (SMA 40mm)	145,008	m2	€10.20	€1,479,082
F.4 Milling Existing Pavement (100mm including disposal)	145,008	m2	€4.20	€609,034
Pavement Total to Summary				€9,911,815
G Kerbs Footways and Paved Areas				
Allowance based on project scope and historical costs	8.3	km	€25,000	€207,775
				€207,775
H Traffic Signs & Roadmarkings				
Additional Signage for Bus Priority Measures	8.3	km	€20,000	€166,220
Allowance based on project scope and historical costs	8.3	km	€68,400	€568,472
				€734,692
X Parallel Road Allowance				
Allowance based on project scope and historical costs		sum		€2,997,750
				€2,997,750
K Lighting and Electrical				
Allowance based on project scope and historical costs	8.3	sum	€16,560	€137,630
				€137,630
L Landscaping and Environmental				
Allowance based on project scope and historical costs	8.3	sum	€27,600	€229,384
				€229,384
M Structures (Including Tunnels to be separately identified)				
Liffey Bridge - Remedial				
M.1 Remedial works to existing bridge	2,760	m2	€300	€828,000
New Structure in Westbound Direction only	780	m2	€4,000	€3,120,000
Structures Total to Summary				€3,948,000
N Accommodation Works				
Allowance based on project scope and historical costs	8.3	sum	€30,000	€249,330
				€249,330
P Statutory Authorities & Utilities				
Allowance based on project scope and historical costs	8.3	sum	€100,000	€831,100
				€831,100
Q Any Other Obligations and Liabilities of the Contractor				

Maynooth to Leixlip Project				04/03/2022
Phase 2 Stage 1: Option Comparison Estimates				Corridor 2B
Arup				Gerard Hall
Allowance based on project scope and historical costs	8.3	sum	€100,000	€831,100
				€831,100
S Preliminaries				
R.2 All Preliminary Items inc. TTM	20%	sum	€4,849,443	€4,849,443
Preliminaries Total to Summary				€4,849,443
<p>N.B. Figures are exclusive of VAT except where expressly stated above. Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate. Total base costs to include for ALL qualifying costs under each cost heading. Refer to the NRA Cost Management Manual for information on coverage and format of back-up. See attached Budget Assumptions Sheet for Further Scheme Information.</p>				

Maynooth to Leixlip Project		04/03/2022		S3-P01	
Phase 2 Stage 1: Option Comparison Estimates		Corridor 3B			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€31,116
b	Fencing	Various	m	Various	€144,000
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€898,200
d	Drainage and Service Ducts	Various	km	460000	€3,324,400
e	Earthworks	Various	m3	Various	€639,277
f	Pavement	Various	Various	Various	€11,954,735
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€207,775
h	Traffic Signs & Roadmarkings	Various	Various	Various	€568,472
k	Lighting and Electrical	Various	Various	Various	€137,630
l	Landscaping and Environmental	Various	Various	Various	€229,384
m	Structures	Various	Various	Various	€7,068,000
n	Accommodation Works	Various	Various	Various	€415,550
p	Statutory Authorities & Utilities	Various	Various	Various	€831,100
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€831,100
x	Parallel Road Allowance	Various	Various	Various	€2,997,750
s	Preliminaries	Various	Various	Various	€6,055,698
Total Base Cost for Main Construction Contract (Excluding VAT)					€36,334,188
Add Project Specific Risk Contingency					20% €7,266,838
Sub-Total exclusive of VAT					€43,601,025
Add VAT at					13.5% €5,886,138
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€49,487,164
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	€2,000,000
Total Base Cost for Land and Property					€2,000,000
Add Project Specific Risk Contingency					10% €200,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€2,200,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €2,474,358
Add Project Specific Risk Contingency					10% €247,436
Add VAT at					23% €569,102
Total P&D Base Cost plus Project Specific Risk Contingency					€3,290,896
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€500,000
Add Project Specific Risk Contingency					10% €50,000
Add VAT at					18.3% €91,500
Total Archaeology Base Cost plus Project Specific Risk Contingency					€641,500
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €1,237,179
Add Project Specific Risk Contingency					10% €123,718
Add VAT at					13.5% €167,019
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€1,527,916
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €2,474,358
Add Project Specific Risk Contingency					10% €247,436
Add VAT at					23% €569,102
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€3,290,896
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €2,474,358
Add Project Specific Risk Contingency					10% €247,436
Add VAT at					13.5% €334,038
Total Residual Network Base Cost plus Project Specific Risk Contingency					€3,055,832
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€63,494,205
Mainline Length		8.3	km	Rate per km	€7,639,779
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	04/03/2022
Phase 2 Stage 1: Option Comparison Estimates	Corridor 3B
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€31,116
B	Fencing		€144,000
C	Safety Barriers and Pedestrian Guardrails		€898,200
D	Drainage and Service Ducts		€3,324,400
E	Earthworks		€639,277
F	Pavement		€11,954,735
G	Kerbs, Footways and Paved Areas		€207,775
H	Traffic Signs		€568,472
X	Parallel Road Allowance		€2,997,750
K	Lighting and Electrical		€137,630
L	Landscaping and Environmental		€229,384
M	Structures (Including Tunnels to be separately identified)		€7,068,000
N	Accommodation Works		€415,550
P	Statutory Authorities & Utilities		€831,100
Q	Any Other Obligations and Liabilities of the Contractor		€831,100
	Sub-Total		€30,278,490
S	Preliminaries		€6,055,698
MCC Base Cost Total excluding Project Specific Risk Contingency			€36,334,188
	Add Project Specific Risk Contingency	20 %	€7,266,838
MCC Base Cost Total including Project Specific Risk Contingency			€43,601,025
	Add VAT at	13.5 %	€5,886,138
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€49,487,164
	Mainline Length	8.3 km	
	MCC Cost per km based on Mainline Length Only	€5,954,417	

Schedule of Works		Quantity	Unit	Rate/Prices	Totals
A Site Clearance					
A1.1	General Site Clearance (Greenfield)	13.0	Ha	€2,400	€31,116
Site Clearance Total to Summary					€31,116
B Fencing					
B.1	Permanent Boundary Fencing	4,000	m	€36	€144,000
Fencing Total to Summary					€144,000

Maynooth to Leixlip Project		04/03/2022		
Phase 2 Stage 1: Option Comparison Estimates		Corridor 3B		
Arup		Gerard Hall		
C Safety Barrier and Pedestrian Guardrails				
C.1 Safety Barrier (Specify Type)	11,760	m	€72	€846,720
C.2 Median Barrier (Specify Type e.g. Concrete or Wire)	429	m	€120	€51,480
Safety Barrier and Pedestrian Guardrails Total to Summary				€898,200
D Drainage and Service Ducts				
D.1 Drainage and Service Ducts per km (Mainline)	8.3	km	€400,000	€3,324,400
Drainage and Service Ducts Total to Summary				€3,324,400
E Earthworks				
Mainline				
E.1 Excavation - Acceptable	67,748	m3	€4.75	€321,938
E.2 Disposal - U1	62,370	m3	€5.09	€317,339
Earthworks Sub-Total				€639,277
F Pavement				
New Pavement				
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	17,357	m3	€28.20	€489,466
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	231,426	m2	€20.40	€4,721,090
F.3 Binder Course (AC 20 Dense bin 55mm)	115,713	m2	€9.00	€1,041,417
F.4 Surface Course (SMA 40mm)	115,713	m2	€10.20	€1,180,273
F.5 Milling Existing Pavement (100mm including disposal)	115,713	m2	€6.00	€694,278
Existing Pavement				
F.2 Binder Course (AC 20 Dense bin 55mm)	145,008	m2	€12.00	€1,740,096
F.3 Surface Course (SMA 40mm)	145,008	m2	€10.20	€1,479,082
F.4 Milling Existing Pavement (100mm including disposal)	145,008	m2	€4.20	€609,034
Pavement Total to Summary				€11,954,735
G Kerbs Footways and Paved Areas				
Allowance based on project scope and historical costs	8.3	km	€25,000	€207,775
				€207,775
H Traffic Signs & Roadmarkings				
Additional Signage for Bus Priority Measures	8.3	km	€20,000	€166,220
Allowance based on project scope and historical costs	8.3	km	€68,400	€568,472
				€734,692
X Parallel Road Allowance				
Allowance based on project scope and historical costs		sum		€2,997,750
				€2,997,750
K Lighting and Electrical				
Allowance based on project scope and historical costs	8.3	sum	€16,560	€137,630
				€137,630
L Landscaping and Environmental				
Allowance based on project scope and historical costs	8.3	sum	€27,600	€229,384
				€229,384
M Structures (Including Tunnels to be separately identified)				
Liffey Bridge - Remedial				
M.1 Remedial works to existing bridge	2,760	m2	€300	€828,000
2 New Structures in Eastbound and Westbound Directions	1,560	m2	€4,000	€6,240,000
Structures Total to Summary				€7,068,000
N Accommodation Works				
Allowance based on project scope and historical costs	8.3	sum	€50,000	€415,550
				€415,550
P Statutory Authorities & Utilities				
Allowance based on project scope and historical costs	8.3	sum	€100,000	€831,100
				€831,100
Q Any Other Obligations and Liabilities of the Contractor				

Maynooth to Leixlip Project	04/03/2022			
Phase 2 Stage 1: Option Comparison Estimates	Corridor 3B			
Arup	Gerard Hall			
Allowance based on project scope and historical costs	8.3	sum	€100,000	€831,100
				€831,100
S Preliminaries				
R.2 All Preliminary Items inc. TTM	20%	sum	€6,055,698	€6,055,698
Preliminaries Total to Summary				€6,055,698
<p>N.B. Figures are exclusive of VAT except where expressly stated above. Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate. Total base costs to include for ALL qualifying costs under each cost heading. Refer to the NRA Cost Management Manual for information on coverage and format of back-up. See attached Budget Assumptions Sheet for Further Scheme Information.</p>				

Maynooth to Leixlip Project		13/04/2022		S3-P01	
Phase 2 Stage 1: Location Comparison Estimates		Junction 7 A			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€22,221
b	Fencing	Various	m	Various	€209,988
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€314,982
d	Drainage and Service Ducts	Various	km	460000	€1,093,688
e	Earthworks	Various	m3	Various	€1,239,091
f	Pavement	Various	Various	Various	€1,781,640
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€291,650
h	Traffic Signs & Roadmarkings	Various	Various	Various	€398,977
k	Lighting and Electrical	Various	Various	Various	€96,594
l	Landscaping and Environmental	Various	Various	Various	€160,991
m	Structures	Various	Various	Various	€2,001,650
n	Accommodation Works	Various	Various	Various	€58,330
p	Statutory Authorities & Utilities	Various	Various	Various	€583,300
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€583,300
s	Preliminaries	Various	Various	Various	€1,767,280
Total Base Cost for Main Construction Contract (Excluding VAT)					€10,603,683
Add Project Specific Risk Contingency					20% €2,120,737
Sub-Total exclusive of VAT					€12,724,420
Add VAT at					13.5% €1,717,797
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€14,442,216
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€5,000,000
Add Project Specific Risk Contingency					10% €500,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€5,500,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €722,111
Add Project Specific Risk Contingency					10% €72,211
Add VAT at					23% €166,085
Total P&D Base Cost plus Project Specific Risk Contingency					€960,407
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€200,000
Add Project Specific Risk Contingency					10% €20,000
Add VAT at					18.3% €36,600
Total Archaeology Base Cost plus Project Specific Risk Contingency					€256,600
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €361,055
Add Project Specific Risk Contingency					10% €36,106
Add VAT at					13.5% €48,742
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€445,903
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €722,111
Add Project Specific Risk Contingency					10% €72,211
Add VAT at					23% €166,085
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€960,407
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					2% €288,844
Add Project Specific Risk Contingency					10% €28,884
Add VAT at					13.5% €38,994
Total Residual Network Base Cost plus Project Specific Risk Contingency					€356,723
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€22,922,257
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	13/04/2022
Phase 2 Stage 1: Location Comparison Estimates	Junction 7 A
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€22,221
B	Fencing		€209,988
C	Safety Barriers and Pedestrian Guardrails		€314,982
D	Drainage and Service Ducts		€1,093,688
E	Earthworks		€1,239,091
F	Pavement		€1,781,640
G	Kerbs, Footways and Paved Areas		€291,650
H	Traffic Signs		€398,977
J	Roadmarking		€0
K	Lighting and Electrical		€96,594
L	Landscaping and Environmental		€160,991
M	Structures (Including Tunnels to be separately identified)		€2,001,650
N	Accommodation Works		€58,330
P	Statutory Authorities & Utilities		€583,300
Q	Any Other Obligations and Liabilities of the Contractor		€583,300
	Sub-Total		€8,836,402
S	Preliminaries		€1,767,280
MCC Base Cost Total excluding Project Specific Risk Contingency			€10,603,683
	Add Project Specific Risk Contingency	20 %	€2,120,737
MCC Base Cost Total including Project Specific Risk Contingency			€12,724,420
	Add VAT at	13.5 %	€1,717,797
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€14,442,216
	Junction Perimeter	5.8 km	
	MCC Cost per km based on Junction Perimeter Only	€2,475,950	

Schedule of Works		Quantity	Unit	Rate/Prices	Totals
A Site Clearance					
A1.1	General Site Clearance (Greenfield)	9.3	Ha	€2,400	€22,221
Site Clearance Total to Summary					€22,221
B Fencing					
B.1	Permanent Boundary Fencing	5,833	m	€36	€209,988
Fencing Total to Summary					€209,988
C Safety Barrier and Pedestrian Guardrails					
C.1	Safety Barrier (Specify Type)	4,375	m	€72	€314,982
C.2	Median Barrier (Specify Type e.g. Concrete or Wire)		m	€120	€0
Safety Barrier and Pedestrian Guardrails Total to Summary					€314,982

Maynooth to Leixlip Project	13/04/2022			
Phase 2 Stage 1: Location Comparison Estimates	Junction 7 A			
Arup	Gerard Hall			
D Drainage and Service Ducts				
D.1 Drainage and Service Ducts per km (Mainline)	4.4	km	€250,000	€1,093,688
Drainage and Service Ducts Total to Summary				€1,093,688
E Earthworks				
Junction 7 A				
E.1 Disposal - U1 - Cut	18,240	m3	€5.09	€92,803
E.2 Excavation - Acceptable - Fill	241,222	m3	€4.75	€1,146,288
Earthworks Sub-Total				€1,239,091
F Pavement				
New Pavement				
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	6,338	m3	€28.20	€178,726
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	53,430	m2	€20.40	€1,089,982
F.3 Binder Course (AC 20 Dense bin 55mm)	26,715	m2	€9.00	€240,437
F.4 Surface Course (SMA 40mm)	26,715	m2	€10.20	€272,495
F.5 Milling Existing Pavement (100mm including disposal)	-	m2	€6.00	€0
Pavement Total to Summary				€1,781,640
G Kerbs Footways and Paved Areas				
Allowance based on project scope and historical costs (Active Travel)	5.8	km	€50,000	€291,650
				€291,650
H Traffic Signs & Roadmarkings				
Allowance based on project scope and historical costs	5.8	km	€68,400	€398,977
				€398,977
J Roadmarkings				
Allowance based on project scope and historical costs	5.8	sum		€0
				€0
K Lighting and Electrical				
Allowance based on project scope and historical costs	5.8	sum	€16,560	€96,594
				€96,594
L Landscaping and Environmental				
Allowance based on project scope and historical costs	5.8	sum	€27,600	€160,991
				€160,991
M Structures (Including Tunnels to be separately identified)				
New Bridge Structure & Associated Works	1,144	m2	€1,750	€2,001,650
Structures Total to Summary				€2,001,650
N Accommodation Works				
Allowance based on project scope and historical costs	5.8	sum	€10,000	€58,330
				€58,330
P Statutory Authorities & Utilities				
Allowance based on project scope and historical costs	5.8	sum	€100,000	€583,300
				€583,300
Q Any Other Obligations and Liabilities of the Contractor				
Allowance based on project scope and historical costs	5.8	sum	€100,000	€583,300
				€583,300
S Preliminaries				
R.2 All Preliminary Items inc. TTM	20%	sum	€1,767,280	€1,767,280
Preliminaries Total to Summary				€1,767,280
N.B. Figures are exclusive of VAT except where expressly stated above.				
Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.				
Total base costs to include for ALL qualifying costs under each cost heading.				
Refer to the NRA Cost Management Manual for information on coverage and format of back-up.				
See attached Budget Assumptions Sheet for Further Scheme Information.				

Maynooth to Leixlip Project		04/03/2022		S3-P01	
Phase 2 Stage 1: Location Comparison Estimates		Junction 7 B			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€18,555
b	Fencing	Various	m	Various	€189,792
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€284,688
d	Drainage and Service Ducts	Various	km	460000	€988,500
e	Earthworks	Various	m3	Various	€614,535
f	Pavement	Various	Various	Various	€1,570,316
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€263,600
h	Traffic Signs & Roadmarkings	Various	Various	Various	€360,605
k	Lighting and Electrical	Various	Various	Various	€87,304
l	Landscaping and Environmental	Various	Various	Various	€145,507
m	Structures	Various	Various	Various	€2,001,650
n	Accommodation Works	Various	Various	Various	€52,720
p	Statutory Authorities & Utilities	Various	Various	Various	€527,200
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€527,200
s	Preliminaries	Various	Various	Various	€1,526,435
Total Base Cost for Main Construction Contract (Excluding VAT)					€9,158,608
Add Project Specific Risk Contingency					20% €1,831,722
Sub-Total exclusive of VAT					€10,990,329
Add VAT at					13.5% €1,483,694
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€12,474,024
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€5,000,000
Add Project Specific Risk Contingency					10% €500,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€5,500,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €623,701
Add Project Specific Risk Contingency					10% €62,370
Add VAT at					23% €143,451
Total P&D Base Cost plus Project Specific Risk Contingency					€829,523
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€200,000
Add Project Specific Risk Contingency					10% €20,000
Add VAT at					18.3% €36,600
Total Archaeology Base Cost plus Project Specific Risk Contingency					€256,600
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €311,851
Add Project Specific Risk Contingency					10% €31,185
Add VAT at					13.5% €42,100
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€385,135
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €623,701
Add Project Specific Risk Contingency					10% €62,370
Add VAT at					23% €143,451
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€829,523
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					2% €249,480
Add Project Specific Risk Contingency					10% €24,948
Add VAT at					13.5% €33,680
Total Residual Network Base Cost plus Project Specific Risk Contingency					€308,108
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€20,582,913
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	04/03/2022
Phase 2 Stage 1: Location Comparison Estimates	Junction 7 B
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€18,555
B	Fencing		€189,792
C	Safety Barriers and Pedestrian Guardrails		€284,688
D	Drainage and Service Ducts		€988,500
E	Earthworks		€614,535
F	Pavement		€1,570,316
G	Kerbs, Footways and Paved Areas		€263,600
H	Traffic Signs		€360,605
J	Roadmarking		€0
K	Lighting and Electrical		€87,304
L	Landscaping and Environmental		€145,507
M	Structures (Including Tunnels to be separately identified)		€2,001,650
N	Accommodation Works		€52,720
P	Statutory Authorities & Utilities		€527,200
Q	Any Other Obligations and Liabilities of the Contractor		€527,200
	Sub-Total		€7,632,173
S	Preliminaries		€1,526,435
MCC Base Cost Total excluding Project Specific Risk Contingency			€9,158,608
	Add Project Specific Risk Contingency	20 %	€1,831,722
MCC Base Cost Total including Project Specific Risk Contingency			€10,990,329
	Add VAT at	13.5 %	€1,483,694
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€12,474,024
	Junction Perimeter	5.3 km	
	MCC Cost per km based on Junction Perimeter Only	€2,366,089	

Schedule of Works		Quantity	Unit	Rate/Prices	Totals
A Site Clearance					
A1.1	General Site Clearance (Greenfield)	7.7	Ha	€2,400	€18,555
Site Clearance Total to Summary					€18,555
B Fencing					
B.1	Permanent Boundary Fencing	5,272	m	€36	€189,792
Fencing Total to Summary					€189,792
C Safety Barrier and Pedestrian Guardrails					
C.1	Safety Barrier (Specify Type)	3,954	m	€72	€284,688
C.2	Median Barrier (Specify Type e.g. Concrete or Wire)		m	€120	€0
Safety Barrier and Pedestrian Guardrails Total to Summary					€284,688

Maynooth to Leixlip Project		04/03/2022		
Phase 2 Stage 1: Location Comparison Estimates		Junction 7 B		
Arup		Gerard Hall		
D Drainage and Service Ducts				
D.1 Drainage and Service Ducts per km (Mainline)	4.0	km	€250,000	€988,500
Drainage and Service Ducts Total to Summary				€988,500
E Earthworks				
Mainline				
E.1 Disposal - U1 - Cut	27,158	m3	€5.09	€138,178
E.2 Excavation - Acceptable - Fill	100,243	m3	€4.75	€476,357
Earthworks Sub-Total				€614,535
F Pavement				
New Pavement				
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	5,584	m3	€28.20	€157,472
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	47,095	m2	€20.40	€960,734
F.3 Binder Course (AC 20 Dense bin 55mm)	23,547	m2	€9.00	€211,927
F.4 Surface Course (SMA 40mm)	23,547	m2	€10.20	€240,184
F.5 Milling Existing Pavement (100mm including disposal)	-	m2	€6.00	€0
Pavement Total to Summary				€1,570,316
G Kerbs Footways and Paved Areas				
Allowance based on project scope and historical costs (Active Travel)	5.3	km	€50,000	€263,600
				€263,600
H Traffic Signs & Roadmarkings				
Allowance based on project scope and historical costs	5.3	km	€68,400	€360,605
				€360,605
J Roadmarkings				
Allowance based on project scope and historical costs	5.3	sum		€0
				€0
K Lighting and Electrical				
Allowance based on project scope and historical costs	5.3	sum	€16,560	€87,304
				€87,304
L Landscaping and Environmental				
Allowance based on project scope and historical costs	5.3	sum	€27,600	€145,507
				€145,507
M Structures (Including Tunnels to be separately identified)				
New Bridge Structure & Associated Works	1,144	m2	€1,750	€2,001,650
Structures Total to Summary				€2,001,650
N Accommodation Works				
Allowance based on project scope and historical costs	5.3	sum	€10,000	€52,720
				€52,720
P Statutory Authorities & Utilities				
Allowance based on project scope and historical costs	5.3	sum	€100,000	€527,200
				€527,200
Q Any Other Obligations and Liabilities of the Contractor				
Allowance based on project scope and historical costs	5.3	sum	€100,000	€527,200
				€527,200
S Preliminaries				
R.2 All Preliminary Items inc. TTM	20%	sum	€1,526,435	€1,526,435
Preliminaries Total to Summary				€1,526,435
<p>N.B. Figures are exclusive of VAT except where expressly stated above.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>				

Maynooth to Leixlip Project		04/03/2022		S3-P01	
Phase 2 Stage 1: Location Comparison Estimates		Junction 7 C			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€16,336
b	Fencing	Various	m	Various	€128,878
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€193,317
d	Drainage and Service Ducts	Various	km	460000	€671,241
e	Earthworks	Various	m3	Various	€282,046
f	Pavement	Various	Various	Various	€1,100,385
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€178,998
h	Traffic Signs & Roadmarkings	Various	Various	Various	€244,869
k	Lighting and Electrical	Various	Various	Various	€59,284
l	Landscaping and Environmental	Various	Various	Various	€98,807
m	Structures	Various	Various	Various	€2,001,650
n	Accommodation Works	Various	Various	Various	€35,800
p	Statutory Authorities & Utilities	Various	Various	Various	€357,995
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€357,995
s	Preliminaries	Various	Various	Various	€1,145,520
Total Base Cost for Main Construction Contract (Excluding VAT)					€6,873,120
Add Project Specific Risk Contingency					20% €1,374,624
Sub-Total exclusive of VAT					€8,247,743
Add VAT at					13.5% €1,113,445
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€9,361,189
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€7,500,000
Add Project Specific Risk Contingency					10% €750,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€8,250,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €468,059
Add Project Specific Risk Contingency					10% €46,806
Add VAT at					23% €107,654
Total P&D Base Cost plus Project Specific Risk Contingency					€622,519
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€200,000
Add Project Specific Risk Contingency					10% €20,000
Add VAT at					18.3% €36,600
Total Archaeology Base Cost plus Project Specific Risk Contingency					€256,600
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €234,030
Add Project Specific Risk Contingency					10% €23,403
Add VAT at					13.5% €31,594
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€289,027
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €468,059
Add Project Specific Risk Contingency					10% €46,806
Add VAT at					23% €107,654
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€622,519
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					2% €187,224
Add Project Specific Risk Contingency					10% €18,722
Add VAT at					13.5% €25,275
Total Residual Network Base Cost plus Project Specific Risk Contingency					€231,221
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€19,633,075
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	04/03/2022
Phase 2 Stage 1: Location Comparison Estimates	Junction 7 C
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€16,336
B	Fencing		€128,878
C	Safety Barriers and Pedestrian Guardrails		€193,317
D	Drainage and Service Ducts		€671,241
E	Earthworks		€282,046
F	Pavement		€1,100,385
G	Kerbs, Footways and Paved Areas		€178,998
H	Traffic Signs		€244,869
J	Roadmarking		€0
K	Lighting and Electrical		€59,284
L	Landscaping and Environmental		€98,807
M	Structures (Including Tunnels to be separately identified)		€2,001,650
N	Accommodation Works		€35,800
P	Statutory Authorities & Utilities		€357,995
Q	Any Other Obligations and Liabilities of the Contractor		€357,995
	Sub-Total		€5,727,600
S	Preliminaries		€1,145,520
MCC Base Cost Total excluding Project Specific Risk Contingency			€6,873,120
	Add Project Specific Risk Contingency	20 %	€1,374,624
MCC Base Cost Total including Project Specific Risk Contingency			€8,247,743
	Add VAT at	13.5 %	€1,113,445
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€9,361,189

Junction Perimeter	3.6 km
MCC Cost per km based on Junction Perimeter Only	€2,614,894

Schedule of Works	Quantity	Unit	Rate/Prices	Totals
A Site Clearance				
A1.1 General Site Clearance (Greenfield)	6.8	Ha	€2,400	€16,336
Site Clearance Total to Summary				€16,336
B Fencing				
B.1 Permanent Boundary Fencing	3,580	m	€36	€128,878
Fencing Total to Summary				€128,878
C Safety Barrier and Pedestrian Guardrails				
C.1 Safety Barrier (Specify Type)	2,685	m	€72	€193,317
C.2 Median Barrier (Specify Type e.g. Concrete or Wire)		m	€120	€0
Safety Barrier and Pedestrian Guardrails Total to Summary				€193,317

Maynooth to Leixlip Project		04/03/2022			
Phase 2 Stage 1: Location Comparison Estimates		Junction 7 C			
Arup		Gerard Hall			
D Drainage and Service Ducts					
D.1	Drainage and Service Ducts per km (Mainline)	2.7	km	€250,000	€671,241
Drainage and Service Ducts Total to Summary					€671,241
E Earthworks					
Mainline					
E.1	Disposal - U1 - Cut	30,340	m3	€5.09	€154,368
E.2	Excavation - Acceptable - Fill	26,868	m3	€4.75	€127,678
Earthworks Sub-Total					€282,046
F Pavement					
New Pavement					
F.1	Sub-base, Granular Type B to Clause 804 150mm Depth	3,392	m3	€28.20	€95,652
F.2	Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	33,491	m2	€20.40	€683,218
F.3	Binder Course (AC 20 Dense bin 55mm)	16,746	m2	€9.00	€150,710
F.4	Surface Course (SMA 40mm)	16,746	m2	€10.20	€170,805
F.5	Milling Existing Pavement (100mm including disposal)	-	m2	€6.00	€0
Pavement Total to Summary					€1,100,385
G Kerbs Footways and Paved Areas					
Allowance based on project scope and historical costs (Active Travel)		3.6	km	€50,000	€178,998
					€178,998
H Traffic Signs & Roadmarkings					
Allowance based on project scope and historical costs		3.6	km	€68,400	€244,869
					€411,089
J Roadmarkings					
Allowance based on project scope and historical costs		3.6	sum		€0
					€0
K Lighting and Electrical					
Allowance based on project scope and historical costs		3.6	sum	€16,560	€59,284
					€59,284
L Landscaping and Environmental					
Allowance based on project scope and historical costs		3.6	sum	€27,600	€98,807
					€98,807
M Structures (Including Tunnels to be separately identified)					
New Bridge Structure & Associated Works		1,144	m2	€1,750	€2,001,650
Structures Total to Summary					€2,001,650
N Accommodation Works					
Allowance based on project scope and historical costs		3.6	sum	€10,000	€35,800
					€35,800
P Statutory Authorities & Utilities					
Allowance based on project scope and historical costs		3.6	sum	€100,000	€357,995
					€357,995
Q Any Other Obligations and Liabilities of the Contractor					
Allowance based on project scope and historical costs		3.6	sum	€100,000	€357,995
					€357,995
S Preliminaries					
R.2	All Preliminary Items inc. TTM	20%	sum	€1,145,520	€1,145,520
Preliminaries Total to Summary					€1,145,520
<p>N.B. Figures are exclusive of VAT except where expressly stated above.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project		04/03/2022		S3-P01	
Phase 2 Stage 1: Location Comparison Estimates		Junction 7 D			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€18,201
b	Fencing	Various	m	Various	€114,840
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€172,260
d	Drainage and Service Ducts	Various	km	460000	€598,125
e	Earthworks	Various	m3	Various	€276,475
f	Pavement	Various	Various	Various	€1,030,802
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€159,500
h	Traffic Signs & Roadmarkings	Various	Various	Various	€218,196
k	Lighting and Electrical	Various	Various	Various	€52,826
l	Landscaping and Environmental	Various	Various	Various	€88,044
m	Structures	Various	Various	Various	€2,001,650
n	Accommodation Works	Various	Various	Various	€31,900
p	Statutory Authorities & Utilities	Various	Various	Various	€319,000
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€319,000
s	Preliminaries	Various	Various	Various	€1,080,164
Total Base Cost for Main Construction Contract (Excluding VAT)					€6,480,983
Add Project Specific Risk Contingency					20% €1,296,197
Sub-Total exclusive of VAT					€7,777,180
Add VAT at					13.5% €1,049,919
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€8,827,099
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€2,000,000
Add Project Specific Risk Contingency					10% €200,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€2,200,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €441,355
Add Project Specific Risk Contingency					10% €44,135
Add VAT at					23% €101,512
Total P&D Base Cost plus Project Specific Risk Contingency					€587,002
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€200,000
Add Project Specific Risk Contingency					10% €20,000
Add VAT at					18.3% €36,600
Total Archaeology Base Cost plus Project Specific Risk Contingency					€256,600
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €220,677
Add Project Specific Risk Contingency					10% €22,068
Add VAT at					13.5% €29,791
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€272,537
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €441,355
Add Project Specific Risk Contingency					10% €44,135
Add VAT at					23% €101,512
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€587,002
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					2% €176,542
Add Project Specific Risk Contingency					10% €17,654
Add VAT at					13.5% €23,833
Total Residual Network Base Cost plus Project Specific Risk Contingency					€218,029
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€12,948,269

N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.
 Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.
 Total base costs to include for ALL qualifying costs under each cost heading.
 Refer to the NRA Cost Management Manual for information on coverage and format of back-up.
 See attached Budget Assumptions Sheet for Further Scheme Information.

Maynooth to Leixlip Project	04/03/2022
Phase 2 Stage 1: Location Comparison Estimates	Junction 7 D
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€18,201
B	Fencing		€114,840
C	Safety Barriers and Pedestrian Guardrails		€172,260
D	Drainage and Service Ducts		€598,125
E	Earthworks		€276,475
F	Pavement		€1,030,802
G	Kerbs, Footways and Paved Areas		€159,500
H	Traffic Signs		€218,196
J	Roadmarking		€0
K	Lighting and Electrical		€52,826
L	Landscaping and Environmental		€88,044
M	Structures (Including Tunnels to be separately identified)		€2,001,650
N	Accommodation Works		€31,900
P	Statutory Authorities & Utilities		€319,000
Q	Any Other Obligations and Liabilities of the Contractor		€319,000
	Sub-Total		€5,400,819
S	Preliminaries		€1,080,164
MCC Base Cost Total excluding Project Specific Risk Contingency			€6,480,983
	Add Project Specific Risk Contingency	20 %	€1,296,197
MCC Base Cost Total including Project Specific Risk Contingency			€7,777,180
	Add VAT at	13.5 %	€1,049,919
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€8,827,099
	Junction Perimeter	3.2 km	
	MCC Cost per km based on Junction Perimeter Only	€2,767,116	

Schedule of Works		Quantity	Unit	Rate/Prices	Totals
A Site Clearance					
A1.1	General Site Clearance (Greenfield)	7.6	Ha	€2,400	€18,201
Site Clearance Total to Summary					€18,201
B Fencing					
B.1	Permanent Boundary Fencing	3,190	m	€36	€114,840
Fencing Total to Summary					€114,840
C Safety Barrier and Pedestrian Guardrails					
C.1	Safety Barrier (Specify Type)	2,393	m	€72	€172,260
C.2	Median Barrier (Specify Type e.g. Concrete or Wire)		m	€120	€0
Safety Barrier and Pedestrian Guardrails Total to Summary					€172,260

Maynooth to Leixlip Project		04/03/2022		
Phase 2 Stage 1: Location Comparison Estimates		Junction 7 D		
Arup		Gerard Hall		
D Drainage and Service Ducts				
D.1 Drainage and Service Ducts per km (Mainline)	2.4	km	€250,000	€598,125
Drainage and Service Ducts Total to Summary				€598,125
E Earthworks				
Mainline				
E.1 Disposal - U1 - Cut	36,509	m3	€5.09	€185,757
E.2 Excavation - Acceptable - Fill	19,091	m3	€4.75	€90,719
Earthworks Sub-Total				€276,475
F Pavement				
New Pavement				
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	2,829	m3	€28.20	€79,792
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	31,700	m2	€20.40	€646,687
F.3 Binder Course (AC 20 Dense bin 55mm)	15,850	m2	€9.00	€142,652
F.4 Surface Course (SMA 40mm)	15,850	m2	€10.20	€161,672
F.5 Milling Existing Pavement (100mm including disposal)	-	m2	€6.00	€0
Pavement Total to Summary				€1,030,802
G Kerbs Footways and Paved Areas				
Allowance based on project scope and historical costs (Active Travel)	3.2	km	€50,000	€159,500
				€159,500
H Traffic Signs & Roadmarkings				
Allowance based on project scope and historical costs	3.2	km	€68,400	€218,196
				€384,416
J Roadmarkings				
Allowance based on project scope and historical costs	3.2	sum		€0
				€0
K Lighting and Electrical				
Allowance based on project scope and historical costs	3.2	sum	€16,560	€52,826
				€52,826
L Landscaping and Environmental				
Allowance based on project scope and historical costs	3.2	sum	€27,600	€88,044
				€88,044
M Structures (Including Tunnels to be separately identified)				
New Bridge Structure & Associated Works	1,144	m2	€1,750	€2,001,650
Structures Total to Summary				€2,001,650
N Accommodation Works				
Allowance based on project scope and historical costs	3.2	sum	€10,000	€31,900
				€31,900
P Statutory Authorities & Utilities				
Allowance based on project scope and historical costs	3.2	sum	€100,000	€319,000
				€319,000
Q Any Other Obligations and Liabilities of the Contractor				
Allowance based on project scope and historical costs	3.2	sum	€100,000	€319,000
				€319,000
S Preliminaries				
R.2 All Preliminary Items inc. TTM	20%	sum	€1,080,164	€1,080,164
Preliminaries Total to Summary				€1,080,164
N.B. Figures are exclusive of VAT except where expressly stated above.				
Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.				
Total base costs to include for ALL qualifying costs under each cost heading.				
Refer to the NRA Cost Management Manual for information on coverage and format of back-up.				
See attached Budget Assumptions Sheet for Further Scheme Information.				

Maynooth to Leixlip Project		04/03/2022		S3-P01	
Phase 2 Stage 1: Location Comparison Estimates		Junction 7 E			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€14,058
b	Fencing	Various	m	Various	€97,748
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€146,621
d	Drainage and Service Ducts	Various	km	460000	€509,102
e	Earthworks	Various	m3	Various	€137,728
f	Pavement	Various	Various	Various	€987,410
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€135,760
h	Traffic Signs & Roadmarkings	Various	Various	Various	€185,720
k	Lighting and Electrical	Various	Various	Various	€44,964
l	Landscaping and Environmental	Various	Various	Various	€74,940
m	Structures	Various	Various	Various	€1,000,825
n	Accommodation Works	Various	Various	Various	€27,152
p	Statutory Authorities & Utilities	Various	Various	Various	€271,521
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€271,521
s	Preliminaries	Various	Various	Various	€781,014
Total Base Cost for Main Construction Contract (Excluding VAT)					€4,686,084
Add Project Specific Risk Contingency					20% €937,217
Sub-Total exclusive of VAT					€5,623,301
Add VAT at					13.5% €759,146
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€6,382,447
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€1,500,000
Add Project Specific Risk Contingency					10% €150,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€1,650,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €319,122
Add Project Specific Risk Contingency					10% €31,912
Add VAT at					23% €73,398
Total P&D Base Cost plus Project Specific Risk Contingency					€424,433
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€200,000
Add Project Specific Risk Contingency					10% €20,000
Add VAT at					18.3% €36,600
Total Archaeology Base Cost plus Project Specific Risk Contingency					€256,600
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €159,561
Add Project Specific Risk Contingency					10% €15,956
Add VAT at					13.5% €21,541
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€197,058
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €319,122
Add Project Specific Risk Contingency					10% €31,912
Add VAT at					23% €73,398
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€424,433
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					2% €127,649
Add Project Specific Risk Contingency					10% €12,765
Add VAT at					13.5% €17,233
Total Residual Network Base Cost plus Project Specific Risk Contingency					€157,646
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€9,492,617
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	04/03/2022
Phase 2 Stage 1: Location Comparison Estimates	Junction 7 E
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate**Summary**

A	Site Clearance		€14,058
B	Fencing		€97,748
C	Safety Barriers and Pedestrian Guardrails		€146,621
D	Drainage and Service Ducts		€509,102
E	Earthworks		€137,728
F	Pavement		€987,410
G	Kerbs, Footways and Paved Areas		€135,760
H	Traffic Signs		€185,720
J	Roadmarking		€0
K	Lighting and Electrical		€44,964
L	Landscaping and Environmental		€74,940
M	Structures (Including Tunnels to be separately identified)		€1,000,825
N	Accommodation Works		€27,152
P	Statutory Authorities & Utilities		€271,521
Q	Any Other Obligations and Liabilities of the Contractor		€271,521
	Sub-Total		€3,905,070
S	Preliminaries		€781,014
MCC Base Cost Total excluding Project Specific Risk Contingency			€4,686,084
	Add Project Specific Risk Contingency	20 %	€937,217
MCC Base Cost Total including Project Specific Risk Contingency			€5,623,301
	Add VAT at	13.5 %	€759,146
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€6,382,447
Junction Perimeter		2.7 km	
MCC Cost per km based on Junction Perimeter Only		€2,350,628	

Schedule of Works				Quantity	Unit	Rate/Prices	Totals
A Site Clearance							
A1.1	General Site Clearance (Greenfield)	5.9	Ha	€2,400			€14,058
Site Clearance Total to Summary							€14,058
B Fencing							
B.1	Permanent Boundary Fencing	2,715	m	€36			€97,748
Fencing Total to Summary							€97,748
C Safety Barrier and Pedestrian Guardrails							
C.1	Safety Barrier (Specify Type)	2,036	m	€72			€146,621
C.2	Median Barrier (Specify Type e.g. Concrete or Wire)		m	€120			€0
Safety Barrier and Pedestrian Guardrails Total to Summary							€146,621

Maynooth to Leixlip Project		04/03/2022		
Phase 2 Stage 1: Location Comparison Estimates		Junction 7 E		
Arup		Gerard Hall		
D Drainage and Service Ducts				
D.1 Drainage and Service Ducts per km (Mainline)	2.0	km	€250,000	€509,102
Drainage and Service Ducts Total to Summary				€509,102
E Earthworks				
Mainline				
E.1 Disposal - U1 - Cut	21,928	m3	€5.09	€111,567
E.2 Excavation - Acceptable - Fill	5,505	m3	€4.75	€26,161
Earthworks Sub-Total				€137,728
F Pavement				
New Pavement				
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	2,461	m3	€28.20	€69,390
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	28,274	m2	€20.40	€576,790
F.3 Binder Course (AC 20 Dense bin 55mm)	14,137	m2	€9.00	€127,232
F.4 Surface Course (SMA 40mm)	14,137	m2	€10.20	€144,196
F.5 Milling Existing Pavement (100mm including disposal)	11,634	m2	€6.00	€69,802
Pavement Total to Summary				€987,410
G Kerbs Footways and Paved Areas				
Allowance based on project scope and historical costs (Active Travel)	2.7	km	€50,000	€135,760
				€135,760
H Traffic Signs & Roadmarkings				
Allowance based on project scope and historical costs	2.7	km	€68,400	€185,720
				€351,940
J Roadmarkings				
Allowance based on project scope and historical costs	2.7	sum		€0
				€0
K Lighting and Electrical				
Allowance based on project scope and historical costs	2.7	sum	€16,560	€44,964
				€44,964
L Landscaping and Environmental				
Allowance based on project scope and historical costs	2.7	sum	€27,600	€74,940
				€74,940
M Structures (Including Tunnels to be separately identified)				
Bridge Structure Update & Associated Works	1,144	m2	€875	€1,000,825
Structures Total to Summary				€1,000,825
N Accommodation Works				
Allowance based on project scope and historical costs	2.7	sum	€10,000	€27,152
				€27,152
P Statutory Authorities & Utilities				
Allowance based on project scope and historical costs	2.7	sum	€100,000	€271,521
				€271,521
Q Any Other Obligations and Liabilities of the Contractor				
Allowance based on project scope and historical costs	2.7	sum	€100,000	€271,521
				€271,521
S Preliminaries				
R.2 All Preliminary Items inc. TTM	20%	sum	€781,014	€781,014
Preliminaries Total to Summary				€781,014
N.B. Figures are exclusive of VAT except where expressly stated above.				
Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.				
Total base costs to include for ALL qualifying costs under each cost heading.				
Refer to the NRA Cost Management Manual for information on coverage and format of back-up.				
See attached Budget Assumptions Sheet for Further Scheme Information.				

Maynooth to Leixlip Project		04/03/2022		S3-P01	
Phase 2 Stage 1: Location Comparison Estimates		Junction 7 F			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€17,766
b	Fencing	Various	m	Various	€115,724
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€173,586
d	Drainage and Service Ducts	Various	km	460000	€602,731
e	Earthworks	Various	m3	Various	€906,538
f	Pavement	Various	Various	Various	€1,079,633
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€160,728
h	Traffic Signs & Roadmarkings	Various	Various	Various	€219,876
k	Lighting and Electrical	Various	Various	Various	€53,233
l	Landscaping and Environmental	Various	Various	Various	€88,722
m	Structures	Various	Various	Various	€2,001,650
n	Accommodation Works	Various	Various	Various	€32,146
p	Statutory Authorities & Utilities	Various	Various	Various	€321,456
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€321,456
s	Preliminaries	Various	Various	Various	€1,219,049
Total Base Cost for Main Construction Contract (Excluding VAT)					€7,314,296
Add Project Specific Risk Contingency					20% €1,462,859
Sub-Total exclusive of VAT					€8,777,155
Add VAT at					13.5% €1,184,916
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€9,962,071
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€2,000,000
Add Project Specific Risk Contingency					10% €200,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€2,200,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €498,104
Add Project Specific Risk Contingency					10% €49,810
Add VAT at					23% €114,564
Total P&D Base Cost plus Project Specific Risk Contingency					€662,478
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€200,000
Add Project Specific Risk Contingency					10% €20,000
Add VAT at					18.3% €36,600
Total Archaeology Base Cost plus Project Specific Risk Contingency					€256,600
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €249,052
Add Project Specific Risk Contingency					10% €24,905
Add VAT at					13.5% €33,622
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€307,579
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €498,104
Add Project Specific Risk Contingency					10% €49,810
Add VAT at					23% €114,564
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€662,478
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					2% €199,241
Add Project Specific Risk Contingency					10% €19,924
Add VAT at					13.5% €26,898
Total Residual Network Base Cost plus Project Specific Risk Contingency					€246,063
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€14,297,268
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	04/03/2022
Phase 2 Stage 1: Location Comparison Estimates	Junction 7 F
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€17,766
B	Fencing		€115,724
C	Safety Barriers and Pedestrian Guardrails		€173,586
D	Drainage and Service Ducts		€602,731
E	Earthworks		€906,538
F	Pavement		€1,079,633
G	Kerbs, Footways and Paved Areas		€160,728
H	Traffic Signs		€219,876
J	Roadmarking		€0
K	Lighting and Electrical		€53,233
L	Landscaping and Environmental		€88,722
M	Structures (Including Tunnels to be separately identified)		€2,001,650
N	Accommodation Works		€32,146
P	Statutory Authorities & Utilities		€321,456
Q	Any Other Obligations and Liabilities of the Contractor		€321,456
	Sub-Total		€6,095,246
S	Preliminaries		€1,219,049
MCC Base Cost Total excluding Project Specific Risk Contingency			€7,314,296
	Add Project Specific Risk Contingency	20 %	€1,462,859
MCC Base Cost Total including Project Specific Risk Contingency			€8,777,155
	Add VAT at	13.5 %	€1,184,916
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€9,962,071
	Junction Perimeter	3.2 km	
	MCC Cost per km based on Junction Perimeter Only	€3,099,042	

Schedule of Works		Quantity	Unit	Rate/Prices	Totals
A Site Clearance					
A1.1	General Site Clearance (Greenfield)	7.4	Ha	€2,400	€17,766
Site Clearance Total to Summary					€17,766
B Fencing					
B.1	Permanent Boundary Fencing	3,215	m	€36	€115,724
Fencing Total to Summary					€115,724
C Safety Barrier and Pedestrian Guardrails					
C.1	Safety Barrier (Specify Type)	2,411	m	€72	€173,586
C.2	Median Barrier (Specify Type e.g. Concrete or Wire)		m	€120	€0
Safety Barrier and Pedestrian Guardrails Total to Summary					€173,586

Maynooth to Leixlip Project		04/03/2022		
Phase 2 Stage 1: Location Comparison Estimates		Junction 7 F		
Arup		Gerard Hall		
D Drainage and Service Ducts				
D.1 Drainage and Service Ducts per km (Mainline)	2.4	km	€250,000	€602,731
Drainage and Service Ducts Total to Summary				€602,731
E Earthworks				
Mainline				
E.1 Disposal - U1 - Cut	20,292	m3	€5.09	€103,245
E.2 Excavation - Acceptable - Fill	169,043	m3	€4.75	€803,293
Earthworks Sub-Total				€906,538
F Pavement				
New Pavement				
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	2,889	m3	€28.20	€81,466
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	33,272	m2	€20.40	€678,749
F.3 Binder Course (AC 20 Dense bin 55mm)	16,636	m2	€9.00	€149,727
F.4 Surface Course (SMA 40mm)	16,636	m2	€10.20	€169,691
F.5 Milling Existing Pavement (100mm including disposal)	-	m2	€6.00	€0
Pavement Total to Summary				€1,079,633
G Kerbs Footways and Paved Areas				
Allowance based on project scope and historical costs (Active Travel)	3.2	km	€50,000	€160,728
				€160,728
H Traffic Signs & Roadmarkings				
Allowance based on project scope and historical costs	3.2	km	€68,400	€219,876
				€386,096
J Roadmarkings				
Allowance based on project scope and historical costs	3.2	sum		€0
				€0
K Lighting and Electrical				
Allowance based on project scope and historical costs	3.2	sum	€16,560	€53,233
				€53,233
L Landscaping and Environmental				
Allowance based on project scope and historical costs	3.2	sum	€27,600	€88,722
				€88,722
M Structures (Including Tunnels to be separately identified)				
New Bridge Structure & Associated Works	1,144	m2	€1,750	€2,001,650
Structures Total to Summary				€2,001,650
N Accommodation Works				
Allowance based on project scope and historical costs	3.2	sum	€10,000	€32,146
				€32,146
P Statutory Authorities & Utilities				
Allowance based on project scope and historical costs	3.2	sum	€100,000	€321,456
				€321,456
Q Any Other Obligations and Liabilities of the Contractor				
Allowance based on project scope and historical costs	3.2	sum	€100,000	€321,456
				€321,456
S Preliminaries				
R.2 All Preliminary Items inc. TTM	20%	sum	€1,219,049	€1,219,049
Preliminaries Total to Summary				€1,219,049
N.B. Figures are exclusive of VAT except where expressly stated above.				
Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.				
Total base costs to include for ALL qualifying costs under each cost heading.				
Refer to the NRA Cost Management Manual for information on coverage and format of back-up.				
See attached Budget Assumptions Sheet for Further Scheme Information.				

Maynooth to Leixlip Project		04/03/2022		S3-P01	
Phase 2 Stage 1: Location Comparison Estimates		Junction 5 A			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€14,566
b	Fencing	Various	m	Various	€89,698
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€134,547
d	Drainage and Service Ducts	Various	km	460000	€467,178
e	Earthworks	Various	m3	Various	€254,394
f	Pavement	Various	Various	Various	€832,958
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€124,581
h	Traffic Signs & Roadmarkings	Various	Various	Various	€170,427
k	Lighting and Electrical	Various	Various	Various	€41,261
l	Landscaping and Environmental	Various	Various	Various	€68,769
m	Structures	Various	Various	Various	€2,001,650
n	Accommodation Works	Various	Various	Various	€24,916
p	Statutory Authorities & Utilities	Various	Various	Various	€249,162
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€249,162
s	Preliminaries	Various	Various	Various	€944,654
Total Base Cost for Main Construction Contract (Excluding VAT)					€5,667,923
Add Project Specific Risk Contingency					20% €1,133,585
Sub-Total exclusive of VAT					€6,801,507
Add VAT at					13.5% €918,203
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€7,719,711
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€1,000,000
Add Project Specific Risk Contingency					10% €100,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€1,100,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €385,986
Add Project Specific Risk Contingency					10% €38,599
Add VAT at					23% €88,777
Total P&D Base Cost plus Project Specific Risk Contingency					€513,361
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€200,000
Add Project Specific Risk Contingency					10% €20,000
Add VAT at					18.3% €36,600
Total Archaeology Base Cost plus Project Specific Risk Contingency					€256,600
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €192,993
Add Project Specific Risk Contingency					10% €19,299
Add VAT at					13.5% €26,054
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€238,346
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €385,986
Add Project Specific Risk Contingency					10% €38,599
Add VAT at					23% €88,777
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€513,361
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					2% €154,394
Add Project Specific Risk Contingency					10% €15,439
Add VAT at					13.5% €20,843
Total Residual Network Base Cost plus Project Specific Risk Contingency					€190,677
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€10,532,055
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	04/03/2022
Phase 2 Stage 1: Location Comparison Estimates	Junction 7 F
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€14,566
B	Fencing		€89,698
C	Safety Barriers and Pedestrian Guardrails		€134,547
D	Drainage and Service Ducts		€467,178
E	Earthworks		€254,394
F	Pavement		€832,958
G	Kerbs, Footways and Paved Areas		€124,581
H	Traffic Signs		€170,427
J	Roadmarking		€0
K	Lighting and Electrical		€41,261
L	Landscaping and Environmental		€68,769
M	Structures (Including Tunnels to be separately identified)		€2,001,650
N	Accommodation Works		€24,916
P	Statutory Authorities & Utilities		€249,162
Q	Any Other Obligations and Liabilities of the Contractor		€249,162
	Sub-Total		€4,723,269
S	Preliminaries		€944,654
MCC Base Cost Total excluding Project Specific Risk Contingency			€5,667,923
	Add Project Specific Risk Contingency	20 %	€1,133,585
MCC Base Cost Total including Project Specific Risk Contingency			€6,801,507
	Add VAT at	13.5 %	€918,203
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€7,719,711

Junction Perimeter	2.5 km
MCC Cost per km based on Junction Perimeter Only	€3,098,272

Schedule of Works	Quantity	Unit	Rate/Prices	Totals
A Site Clearance				
A1.1 General Site Clearance (Greenfield)	6.1	Ha	€2,400	€14,566
Site Clearance Total to Summary				€14,566
B Fencing				
B.1 Permanent Boundary Fencing	2,492	m	€36	€89,698
Fencing Total to Summary				€89,698
C Safety Barrier and Pedestrian Guardrails				
C.1 Safety Barrier (Specify Type)	1,869	m	€72	€134,547
C.2 Median Barrier (Specify Type e.g. Concrete or Wire)		m	€120	€0
Safety Barrier and Pedestrian Guardrails Total to Summary				€134,547

Maynooth to Leixlip Project		04/03/2022			
Phase 2 Stage 1: Location Comparison Estimates		Junction 7 F			
Arup		Gerard Hall			
D Drainage and Service Ducts					
D.1	Drainage and Service Ducts per km (Mainline)	1.9	km	€250,000	€467,178
Drainage and Service Ducts Total to Summary					€467,178
E Earthworks					
Mainline					
E.1	Disposal - U1 - Cut	40,785	m3	€5.09	€207,513
E.2	Excavation - Acceptable - Fill	9,865	m3	€4.75	€46,880
Earthworks Sub-Total					€254,394
F Pavement					
New Pavement					
F.1	Sub-base, Granular Type B to Clause 804 150mm Depth	2,098	m3	€28.20	€59,176
F.2	Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	25,793	m2	€20.40	€526,171
F.3	Binder Course (AC 20 Dense bin 55mm)	12,896	m2	€9.00	€116,067
F.4	Surface Course (SMA 40mm)	12,896	m2	€10.20	€131,543
F.5	Milling Existing Pavement (100mm including disposal)	-	m2	€6.00	€0
Pavement Total to Summary					€832,958
G Kerbs Footways and Paved Areas					
Allowance based on project scope and historical costs (Active Travel)		2.5	km	€50,000	€124,581
					€124,581
H Traffic Signs & Roadmarkings					
Allowance based on project scope and historical costs		2.5	km	€68,400	€170,427
					€336,647
J Roadmarkings					
Allowance based on project scope and historical costs		2.5	sum		€0
					€0
K Lighting and Electrical					
Allowance based on project scope and historical costs		2.5	sum	€16,560	€41,261
					€41,261
L Landscaping and Environmental					
Allowance based on project scope and historical costs		2.5	sum	€27,600	€68,769
					€68,769
M Structures (Including Tunnels to be separately identified)					
New Bridge Structure & Associated Works		1,144	m2	€1,750	€2,001,650
Structures Total to Summary					€2,001,650
N Accommodation Works					
Allowance based on project scope and historical costs		2.5	sum	€10,000	€24,916
					€24,916
P Statutory Authorities & Utilities					
Allowance based on project scope and historical costs		2.5	sum	€100,000	€249,162
					€249,162
Q Any Other Obligations and Liabilities of the Contractor					
Allowance based on project scope and historical costs		2.5	sum	€100,000	€249,162
					€249,162
S Preliminaries					
R.2	All Preliminary Items inc. TTM	20%	sum	€944,654	€944,654
Preliminaries Total to Summary					€944,654
<p>N.B. Figures are exclusive of VAT except where expressly stated above.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project		04/03/2022		S3-P01	
Phase 2 Stage 1: Location Comparison Estimates		Junction 5 B			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€17,414
b	Fencing	Various	m	Various	€130,471
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€195,706
d	Drainage and Service Ducts	Various	km	460000	€679,534
e	Earthworks	Various	m3	Various	€357,879
f	Pavement	Various	Various	Various	€1,161,388
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€181,209
h	Traffic Signs & Roadmarkings	Various	Various	Various	€247,894
k	Lighting and Electrical	Various	Various	Various	€60,016
l	Landscaping and Environmental	Various	Various	Various	€100,027
m	Structures	Various	Various	Various	€2,001,650
n	Accommodation Works	Various	Various	Various	€36,242
p	Statutory Authorities & Utilities	Various	Various	Various	€362,418
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€362,418
s	Preliminaries	Various	Various	Various	€1,178,853
Total Base Cost for Main Construction Contract (Excluding VAT)					€7,073,120
Add Project Specific Risk Contingency					20% €1,414,624
Sub-Total exclusive of VAT					€8,487,744
Add VAT at					13.5% €1,145,845
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€9,633,589
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€4,000,000
Add Project Specific Risk Contingency					10% €400,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€4,400,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €481,679
Add Project Specific Risk Contingency					10% €48,168
Add VAT at					23% €110,786
Total P&D Base Cost plus Project Specific Risk Contingency					€640,634
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€200,000
Add Project Specific Risk Contingency					10% €20,000
Add VAT at					18.3% €36,600
Total Archaeology Base Cost plus Project Specific Risk Contingency					€256,600
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €240,840
Add Project Specific Risk Contingency					10% €24,084
Add VAT at					13.5% €32,513
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€297,437
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €481,679
Add Project Specific Risk Contingency					10% €48,168
Add VAT at					23% €110,786
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€640,634
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					2% €192,672
Add Project Specific Risk Contingency					10% €19,267
Add VAT at					13.5% €26,011
Total Residual Network Base Cost plus Project Specific Risk Contingency					€237,950
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€16,106,843
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	04/03/2022
Phase 2 Stage 1: Location Comparison Estimates	Junction 7 F
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€17,414
B	Fencing		€130,471
C	Safety Barriers and Pedestrian Guardrails		€195,706
D	Drainage and Service Ducts		€679,534
E	Earthworks		€357,879
F	Pavement		€1,161,388
G	Kerbs, Footways and Paved Areas		€181,209
H	Traffic Signs		€247,894
J	Roadmarking		€0
K	Lighting and Electrical		€60,016
L	Landscaping and Environmental		€100,027
M	Structures (Including Tunnels to be separately identified)		€2,001,650
N	Accommodation Works		€36,242
P	Statutory Authorities & Utilities		€362,418
Q	Any Other Obligations and Liabilities of the Contractor		€362,418
	Sub-Total		€5,894,266
S	Preliminaries		€1,178,853
MCC Base Cost Total excluding Project Specific Risk Contingency			€7,073,120
	Add Project Specific Risk Contingency	20 %	€1,414,624
MCC Base Cost Total including Project Specific Risk Contingency			€8,487,744
	Add VAT at	13.5 %	€1,145,845
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€9,633,589
	Junction Perimeter	3.6 km	
	MCC Cost per km based on Junction Perimeter Only	€2,658,142	

Schedule of Works		Quantity	Unit	Rate/Prices	Totals
A Site Clearance					
A1.1	General Site Clearance (Greenfield)	7.3	Ha	€2,400	€17,414
Site Clearance Total to Summary					€17,414
B Fencing					
B.1	Permanent Boundary Fencing	3,624	m	€36	€130,471
Fencing Total to Summary					€130,471
C Safety Barrier and Pedestrian Guardrails					
C.1	Safety Barrier (Specify Type)	2,718	m	€72	€195,706
C.2	Median Barrier (Specify Type e.g. Concrete or Wire)		m	€120	€0
Safety Barrier and Pedestrian Guardrails Total to Summary					€195,706

Maynooth to Leixlip Project		04/03/2022		
Phase 2 Stage 1: Location Comparison Estimates		Junction 7 F		
Arup		Gerard Hall		
D Drainage and Service Ducts				
D.1 Drainage and Service Ducts per km (Mainline)	2.7	km	€250,000	€679,534
Drainage and Service Ducts Total to Summary				€679,534
E Earthworks				
Mainline				
E.1 Disposal - U1 - Cut	61,238	m3	€5.09	€311,577
E.2 Excavation - Acceptable - Fill	9,744	m3	€4.75	€46,302
Earthworks Sub-Total				€357,879
F Pavement				
New Pavement				
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	3,408	m3	€28.20	€96,093
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	35,510	m2	€20.40	€724,401
F.3 Binder Course (AC 20 Dense bin 55mm)	17,755	m2	€9.00	€159,794
F.4 Surface Course (SMA 40mm)	17,755	m2	€10.20	€181,100
F.5 Milling Existing Pavement (100mm including disposal)	-	m2	€6.00	€0
Pavement Total to Summary				€1,161,388
G Kerbs Footways and Paved Areas				
Allowance based on project scope and historical costs (Active Travel)	3.6	km	€50,000	€181,209
				€181,209
H Traffic Signs & Roadmarkings				
Allowance based on project scope and historical costs	3.6	km	€68,400	€247,894
				€414,114
J Roadmarkings				
Allowance based on project scope and historical costs	3.6	sum		€0
				€0
K Lighting and Electrical				
Allowance based on project scope and historical costs	3.6	sum	€16,560	€60,016
				€60,016
L Landscaping and Environmental				
Allowance based on project scope and historical costs	3.6	sum	€27,600	€100,027
				€100,027
M Structures (Including Tunnels to be separately identified)				
New Bridge Structure & Associated Works	1,144	m2	€1,750	€2,001,650
Structures Total to Summary				€2,001,650
N Accommodation Works				
Allowance based on project scope and historical costs	3.6	sum	€10,000	€36,242
				€36,242
P Statutory Authorities & Utilities				
Allowance based on project scope and historical costs	3.6	sum	€100,000	€362,418
				€362,418
Q Any Other Obligations and Liabilities of the Contractor				
Allowance based on project scope and historical costs	3.6	sum	€100,000	€362,418
				€362,418
S Preliminaries				
R.2 All Preliminary Items inc. TTM	20%	sum	€1,178,853	€1,178,853
Preliminaries Total to Summary				€1,178,853
N.B. Figures are exclusive of VAT except where expressly stated above.				
Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.				
Total base costs to include for ALL qualifying costs under each cost heading.				
Refer to the NRA Cost Management Manual for information on coverage and format of back-up.				
See attached Budget Assumptions Sheet for Further Scheme Information.				



MAYNOOTH TO LEIXLIP PROJECT

Appendix 5.5
Stage 1 Sift 3 POA
Transport Assessments

Description of Impact Measure Thresholds

Impact Measure	No Change*	Impact	Negligible	Minor	Moderate	Major
Actual Flow (% change)	0% difference between "with" and "without" scheme	Adverse	Between +2% and +10%	Between +10% and +30%	Between +30% and +60%	Greater than +60%
		Beneficial	Between -2% and -10%	Between -10% and -30%	Between -30% and -60%	Less than -60%
Volume over Capacity (v/c) Threshold Change	0% difference between "with" and "without" scheme	Adverse	v/c <80% in both "with" and "without" scheme scenarios but v/c increases from "without" scheme scenario	Scheme causes link to go from v/c <80% to v/c 80-90%	Scheme causes link to go from v/c <90% to v/c 90-100%	Scheme causes link to go from v/c <100% to v/c >100%
		Beneficial	v/c <80% in both "with" and "without" scheme scenarios but v/c decreases from "without" scheme scenario	Scheme causes link to go from v/c 80-90% to v/c <80%	Scheme causes link to go from v/c 90-100% to v/c <90%	Scheme causes link to go from v/c >100% to v/c <100%
Volume over Capacity (% point change)	0% difference between "with" and "without" scheme	Adverse	Between +2% and +5%	Between +5% and +10%	Between +10% and +15%	Greater than +15%
		Beneficial	Between -2% and -5%	Between -5% and -10%	Between -10% and -15%	Less than -15%
Total Vehicle Hours Delay (% change)	0% difference between "with" and "without" scheme	Adverse	Between +2% and +10%	Between +10% and +30%	Between +30% and +60%	Greater than +60%
		Beneficial	Between -2% and -10%	Between -10% and -30%	Between -30% and -60%	Less than -60%

* Practical limit of change set to account for model noise. Change of between +2% and -2% is "no change".

AM Peak Summary		Corridor						Junction 5		Junction 7					
		Run 2A	Run 2B	Run 2C	Run 3A	Run 3B	Run 3C	2.1	2.2	2.1.1A	3.1.2A & 3.1.2F	3.3.1A & 3.3.1F	3.4.1A & 3.4.1B	4.1.1E	
										Option A	Option A & F	Option A & D	Option A & C	Option C	
											1 New J + up. exist	2 New J's- W&E	2 New J's- W&E	2 New J's- both W	1 New J + conv exist to OB
Total number of unique links exhibiting a "Major" impact	Adverse	4	18	14	4	17	13	22	23	16	41	36	30	18	
	Beneficial	6	17	13	14	23	16	25	30	31	60	67	59	34	
	Ratio Beneficial to Adverse	1.5	0.9	0.9	3.5	1.4	1.2	1.1	1.3	1.9	1.5	1.9	2.0	1.9	
Total number of unique links exhibiting a "Moderate" or "Major" impact	Adverse	4	26	27	4	25	27	38	31	23	75	67	53	36	
	Beneficial	10	42	18	20	42	25	41	48	75	125	137	121	68	
	Ratio Beneficial to Adverse	2.5	1.6	0.7	5.0	1.7	0.9	1.1	1.5	3.3	1.7	2.0	2.3	1.9	
Total number of unique links exhibiting a "Minor", "Moderate" or "Major" impact	Adverse	9	81	58	7	85	55	75	79	74	180	159	134	99	
	Beneficial	20	130	38	23	137	47	116	118	181	252	276	246	141	
	Ratio Beneficial to Adverse	2.2	1.6	0.7	3.3	1.6	0.9	1.5	1.5	2.4	1.4	1.7	1.8	1.4	
Journey Time vs Do Minimum (28km between N4 J4 and J9)	M4 Eastbound	0	-3	-3	-34	-36	-36	7	0	6	7	8	2	-7	
	M4 Westbound	-16	-16	-16	-16	-16	-16	-1	0	0	-4	-3	-3	-5	
Network Summary Statistics (whole model) vs DM	Total Travel Distance (PCU - Kms)	58	-139	-741	187	-110	-640	-525	256	63	621	427	1189	815	
Maynooth Town Centre (Main Street)	Actual Flow (PCU) Difference vs DM	0	30	-23	-11	23	-42	-31	-22	-12	177	-48	22	-56	
	Delay (secs) Difference vs DM	0	1	0	0	1	0	0	0	0	2	0	0	-1	
Leixlip Town Centre (Main Street)	Actual Flow (PCU) Difference vs DM	-1	29	-2	-1	13	-3	111	-36	-9	-14	15	9	14	
	Delay (secs) Difference vs DM	0	2	0	0	0	0	9	-4	-1	-3	-2	0	1	
Celbridge Town Centre (R405 river bridge)	Actual Flow (PCU) Difference vs DM	0	-93	14	-17	-102	1	-99	-56	3	19	10	52	51	
	Delay (secs) Difference vs DM	0	-2	0	0	-2	0	-2	-1	0	1	1	1	1	

PM Peak Summary		Corridor						Junction 5		Junction 7					
		Run 2A	Run 2B	Run 2C	Run 3A	Run 3B	Run 3C	2.1	2.2	2.1.1A	3.1.2A & 3.1.2F	3.3.1A & 3.3.1F	3.4.1A & 3.4.1B	4.1.1E	
										Option A	Option A & F	Option A & D	Option A & C	Option C	
											1 New J + up. exist	2 New J's- W&E	2 New J's- W&E	2 New J's- both W	1 New J + conv exist to OB
Total number of unique links exhibiting a "Major" impact	Adverse	4	17	9	7	18	17	23	18	6	31	33	16	28	
	Beneficial	6	19	13	10	22	16	14	28	18	42	52	51	39	
	Ratio Beneficial to Adverse	1.5	1.1	1.4	1.4	1.2	0.9	0.6	1.6	3.0	1.4	1.6	3.2	1.4	
Total number of unique links exhibiting a "Moderate" or "Major" impact	Adverse	10	41	25	11	42	32	47	37	15	72	73	49	71	
	Beneficial	13	37	26	17	42	28	38	42	54	99	116	100	85	
	Ratio Beneficial to Adverse	1.3	0.9	1.0	1.5	1.0	0.9	0.8	1.1	3.6	1.4	1.6	2.0	1.2	
Total number of unique links exhibiting a "Minor", "Moderate" or "Major" impact	Adverse	55	96	66	48	111	85	109	78	56	183	200	131	153	
	Beneficial	51	132	59	55	139	81	103	120	150	216	261	216	207	
	Ratio Beneficial to Adverse	0.9	1.4	0.9	1.1	1.3	1.0	0.9	1.5	2.7	1.2	1.3	1.6	1.4	
Journey Time vs Do Minimum (28km between N4 J4 and J9)	M4 Eastbound	0	0	0	-10	-10	-10	2	0	-1	-2	-1	-1	-2	
	M4 Westbound	-100	-113	-109	-100	-113	-112	27	20	11	17	-13	-15	-21	
Network Summary Statistics (whole model) vs DM	Total Travel Distance (PCU - Kms)	986	1163	528	1180	1093	216	177	49	6	660	1430	2142	1877	
Maynooth Town Centre (Main Street)	Actual Flow (PCU) Difference vs DM	14	64	-4	17	54	-8	-20	12	45	145	-50	-4	7	
	Delay (secs) Difference vs DM	0	0	0	0	0	0	0	0	0	1	0	0	0	
Leixlip Town Centre (Main Street)	Actual Flow (PCU) Difference vs DM	1	-15	-2	3	-14	2	-28	-145	0	-2	2	-14	-8	
	Delay (secs) Difference vs DM	1	2	0	2	4	4	0	4	0	1	3	-2	-1	
Celbridge Town Centre (R405 river bridge)	Actual Flow (PCU) Difference vs DM	-19	-82	20	-23	-81	18	-10	-27	-17	32	22	15	15	
	Delay (secs) Difference vs DM	0	-2	3	0	-2	3	-1	-1	0	3	2	2	2	

AM + PM Peak Summary		Corridor						Junction 5		Junction 7					
		Run 2A	Run 2B	Run 2C	Run 3A	Run 3B	Run 3C	2.1	2.2	2.1.1A	3.1.2A & 3.1.2F	3.3.1A & 3.3.1F	3.4.1A & 3.4.1B	4.1.1E	
										Option A	Option A & F	Option A & D	Option A & C	Option C	
											1 New J + up. exist	2 New J's- W&E	2 New J's- W&E	2 New J's- both W	1 New J + conv exist to OB
Total number of unique links exhibiting a "Major" impact	Adverse	8	35	23	11	35	30	45	41	22	72	69	46	46	
	Beneficial	12	36	26	24	45	32	39	58	49	102	119	110	73	
	Ratio Beneficial to Adverse	1.5	1.0	1.1	2.2	1.3	1.1	0.9	1.4	2.2	1.4	1.7	2.4	1.6	
Total number of unique links exhibiting a "Moderate" or "Major" impact	Adverse	14	67	52	15	67	59	85	68	38	147	140	102	107	
	Beneficial	23	79	44	37	84	53	79	90	129	224	253	221	153	
	Ratio Beneficial to Adverse	1.6	1.2	0.8	2.5	1.3	0.9	0.9	1.3	3.4	1.5	1.8	2.2	1.4	
Total number of unique links exhibiting a "Minor", "Moderate" or "Major" impact	Adverse	64	177	124	55	196	140	184	157	130	363	359	265	252	
	Beneficial	71	262	97	78	276	128	219	238	331	468	537	462	348	
	Ratio Beneficial to Adverse	1.1	1.5	0.8	1.4	1.4	0.9	1.2	1.5	2.5	1.3	1.5	1.7	1.4	
Network Summary Statistics (whole model) vs DM	Total Travel Distance (PCU - Kms)	1044	1024	-213	1367	983	-424	-348	305	69	1281	1857	3331	2692	
Maynooth Town Centre (Main Street)	Actual Flow (PCU) Difference vs DM	14	94	-27	6	78	-50	-51	-9	33	322	-98	18	-49	
	Delay (secs) Difference vs DM	0	1	0	0	1	0	0	0	1	2	0	0	-1	
Leixlip Town Centre (Main Street)	Actual Flow (PCU) Difference vs DM	0	14	-5	2	-1	-1	83	-181	-9	-16	16	-5	6	
	Delay (secs) Difference vs DM	1	4	0	1	4	4	9	0	-1	-2	1	-1	0	
Celbridge Town Centre (R405 river bridge)	Actual Flow (PCU) Difference vs DM	-19	-175	34	-40	-182	19	-109	-83	-14	50	32	67	66	
	Delay (secs) Difference vs DM	0	-4	3	0	-4	3	-3	-3	0	4	3	3	3	

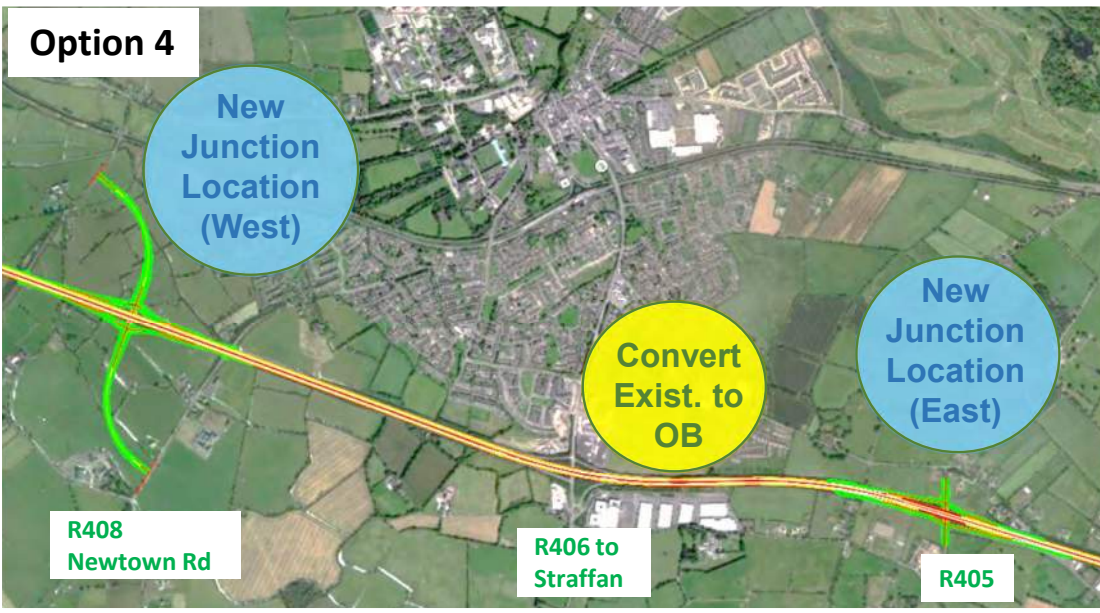
Assessment	Junction/Corridor Assessed			New Junctions No.	Existing Junction Upgraded or Converted to Overbridge?	Ranking (1st most preferred)	Comment
Corridor	Run 1A			n/a	n/a	-	Not included in highway LAM (tested in Eastern Regional Model)
	Run 1B			n/a	n/a	-	Not included in highway LAM and not tested in Eastern Regional Model, but can be assessed via a comparison of 2A vs 2B or 3A vs 3B.
	Run 2A			n/a	n/a	1st	Benefits from WB journey time saving of up to 100 seconds (PM peak). Reflective of delays currently observed WB.
	Run 2B/2C			n/a	n/a	3rd	Limited benefit of provision of parallel service road
	Run 3A			n/a	n/a	2nd	Benefits from WB journey time saving of up to 100 seconds (PM peak). Journey time saving of circa. 30 seconds EB.
	Run 3B/3C			n/a	n/a	4th	Limited benefit of provision of parallel service road with additional EB lane on M4.
Junction 5	Junction 2.1	Option A		1 new	Junction 5 converted to overbridge	2nd	Flow increase in Leixlip town centre
	Junction 2.2	Option B		1 new	Junction 5 converted to overbridge	1st	Flow reduction in Leixlip town centre
Junction 7	Junction 2.1.1A	Option A	1 New J + up. exist	1 new	Junction 7 retained and upgraded	1st	Beneficial to local links (more so than some other options) and marginal increase in total travel distance (less than other options)
	Junction 3.1.2A & 3.1.2F	Option A & F	2 New J's-W&E	2	Junction 7 converted to overbridge	4th	
	Junction 3.3.1A & 3.3.1F	Option A & D	2 New J's-W&E	2 new	Junction 7 converted to overbridge	2nd	Benefit of two new junctions and benefit of less of an increase in total travel distance (compared to other options), plus marginal decrease in Maynooth town centre traffic.
	Junction 3.4.1A & 3.4.1B	Option A & C	2 New J's-both W	2 new	Junction 7 converted to overbridge	4th	Greatest increase in total travel distance of all options.
	Junction 4.1.1E	Option C	1 New J + conv exist to OB	1 new	Junction 7 converted to overbridge	3rd	Compared to Run with Junction 3.4.1A & 3.4.1B (ranked 4th), total travel distance difference is less and volume of traffic flow increase in Maynooth town centre is less.

Project Objectives	Junction 7 - Driver/Basis/Tipping Point/Indicators
Economy	
Provide a more reliable and resilient transport solution	
Manage congestion on the M4 corridor	Volumes on M4 and J7 Junction Capacity Trip Types and On/Off Trips
Provide the infrastructure to enable transport solutions to move more people more efficiently	
Support the protection of the economic prospects of Maynooth, Leixlip, Celbridge, Kilcock, Enfield and their rural hinterland	Flow Diff Plots Junction v/c Journey times to town centre Over capacity / Delays for screened area of town centre
Facilitate effective strategic traffic movement, including from regional centres of Athlone and Sligo	
Facilitate effective freight movement	
Safety	
Enable the provision of a safer travelling environment for all road users, including vulnerable road users	Junction capacity taking on board Maynooth growth Flow Diff Plots for HGVs HGV Movements in Maynooth
Environment	
Facilitate an increase in modal shift from private car to public transport and walking/cycling thus supporting a transition towards low carbon and climate resilience	Flow Diff Plots in Maynooth town Policy
Accessibility and Social Inclusion	
Provide improved accessibility to the GDA public transport network from regions outside of the GDA	
Support improved connectivity for all road users to public transport	
Enable the successful creation of place making and assist in the generation of vibrant communities	Flow Diff Plots for Maynooth town
Integration	
Provide the infrastructure to support an improved balance of transport modes	
Support greater road based user integration and connectivity with all other transport modes	
Physical Activity	
Improve infrastructure in, across and adjacent to the M4/N4 corridor which may form barriers to physical activity and in particular linkage between key local trip attractors including education, work, residential, leisure and natural environment.	Flows on Straffan Road
Support the provision for cycle parking and infrastructure at key public transport nodes and destinations.	
Support the creation of a healthy environment conducive to active travel	Flow Diff Plots for Maynooth town / reduction of traffic volumes in Maynooth town

Transport and Traffic Modelling

Junction 7 – Maynooth Options

Junction 7- 2 Options for 1 Junction and 2 Options for 2 Junctions



Options Tested and Objectives

Four Options tested in more detail;

- **Option 1a** – Improve existing junction
- **Option 1b** – Improve existing junction and new link road to Newtown Road
- **Option 1c** – Improve existing junction and new link road to Millfarm
- **Option 3** – Improve existing junction and new junction to west of Maynooth



Objectives and the KPIs used to access the impacts of each option

KPI	Economy	Safety	Enviroment	Accesibility and Social Inclusion	Physical Activity
Volumes on M4 and at Junction 7	Manage congestion on the M4 corridor.				
Flows in Maynooth	Support the protection of the economic prospects of Maynooth.		Facilitate an increase in modal shift from private car to public transport and walking/cycling thus supporting a transition towards low carbon and climate resilience.	Enable the successful creation of place making and assist in the generation of vibrant communities.	Support the creation of a healthy environment conducive to active travel.
Junction Volume over Capacity	Support the protection of the economic prospects of Maynooth.	Enable the provision of a safer travelling environment for all road users, including vulnerable road users.			
Delays in Maynooth	Support the protection of the economic prospects of Maynooth.				
HGV Flows		Enable the provision of a safer travelling environment for all road users, including vulnerable road users.			
Flows on Straffan Road					Improve infrastructure in, across and adjacent to the M4/N4 corridor which may form barriers to physical activity and in particular linkage between key local trip attractors including education, work, residential, leisure and natural environment.

Corridor Flows and Junction Performance

Objective: Manage congestion on the M4 corridor

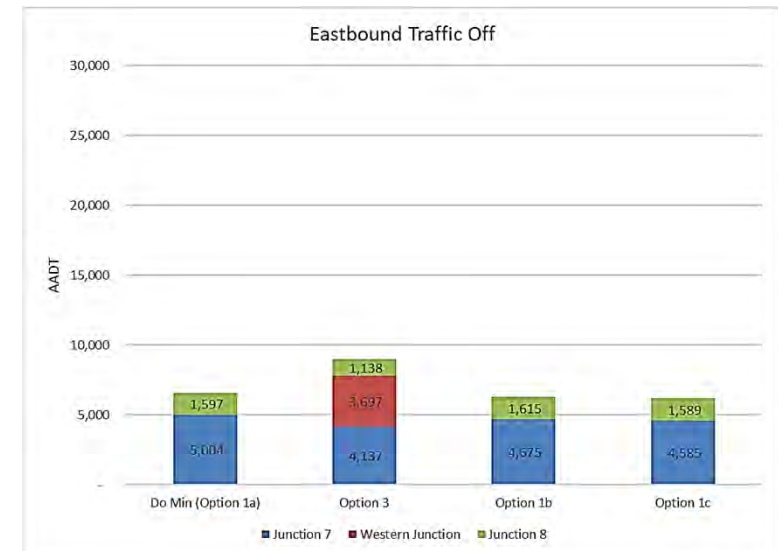
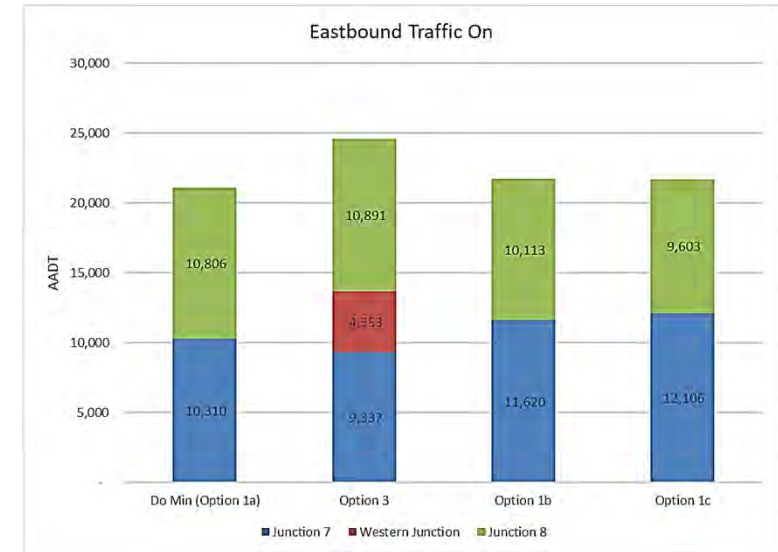
Eastbound AADT On/Off M4



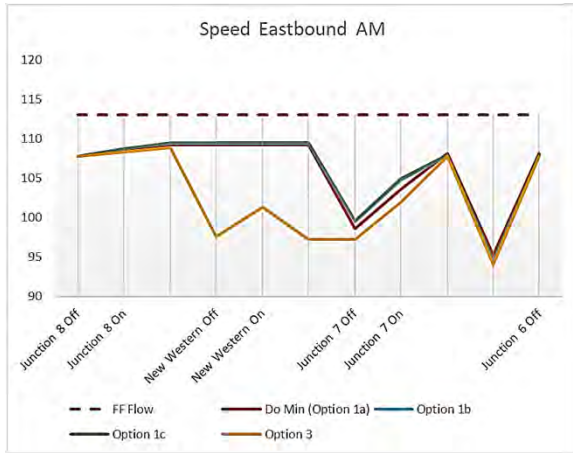
AADT	Eastbound			
	J9 to J8	J8 to J7a	J7a to J7	J7 to J6
Do Min (Option 1a)	17,696	26,888	26,888	32,207
Option 1b	17,696	26,175	26,175	33,131
Option 1c	17,696	25,693	25,693	33,224
Option 3	17,696	27,438	28,102	33,312

Regardless of the option tested, overall AADTs remain similar between the options after J7, around 100 vehicles higher than the Do Min.

This suggests that the increase in trips entering, and exiting, the M4 at these junctions with **Option 3** is the result of more short distance trips on the national road network replacing trips on the parallel regional road network.

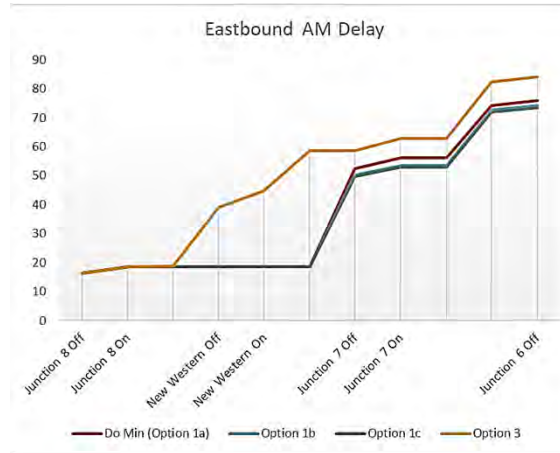


Eastbound AM Peak Performance



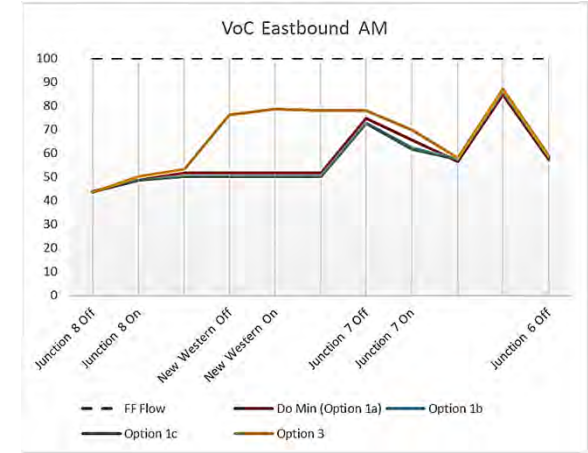
Link Speeds

Addition of the western junction leads to a reduction in speed along the M4 between J8 and J7 due to additional traffic joining the M4, however speeds return to Do Min levels after J7. With Option 1b and 1c there is a slight increase in speed between Junction 7 off and Junction 7 on.



Cumulative Delay

Cumulative delay along the M4 between J8 and J6 shows that with Option 3 there is a higher level of delay than in the Do Min, while Option 1b and 1c lead to a very minor reduction in delay.



Link Volume over Capacity

In all scenarios capacity is constrained around Junction 6, however with Option 3 there is further constraint between Junction 8 and 7 around the new Western Junction.

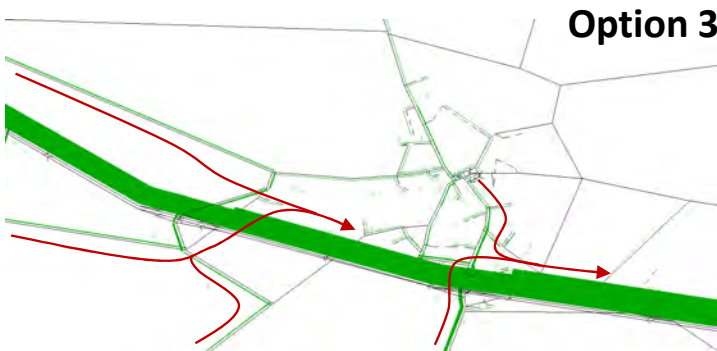
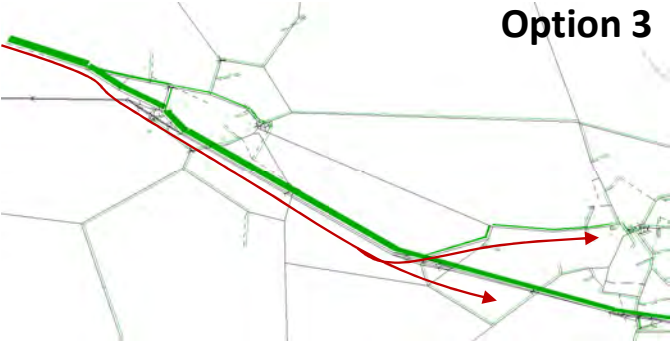
Summary:

With addition of Western Junction (Option 3)

- M4 speeds decrease
- M4 delays increase
- Capacity is further constrained

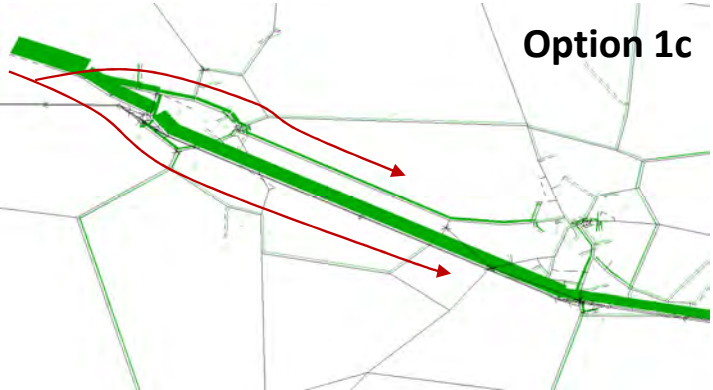
Eastbound AM Peak Performance

With the new western junction, traffic from Kilcock and traffic arriving at the edge of the model via the R148 tend to join the M4 at Junction 8 Kilcock. Some of these trips come off the new junction for Maynooth accounting for short trips as seen in the AADTs.



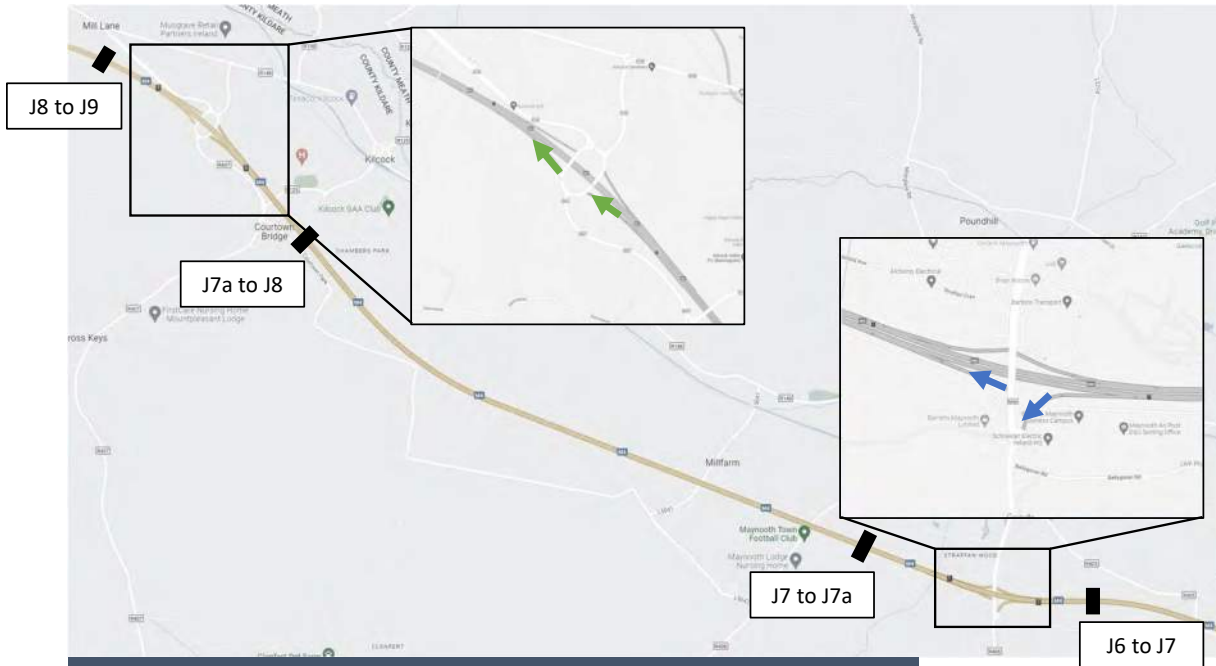
**With New
Western
Junction**

Without the new junction some traffic uses the R148 between Maynooth and Kilcock reducing delay on the M4. However, with the new link road in place, this traffic is distributed onto the M4 at Maynooth.



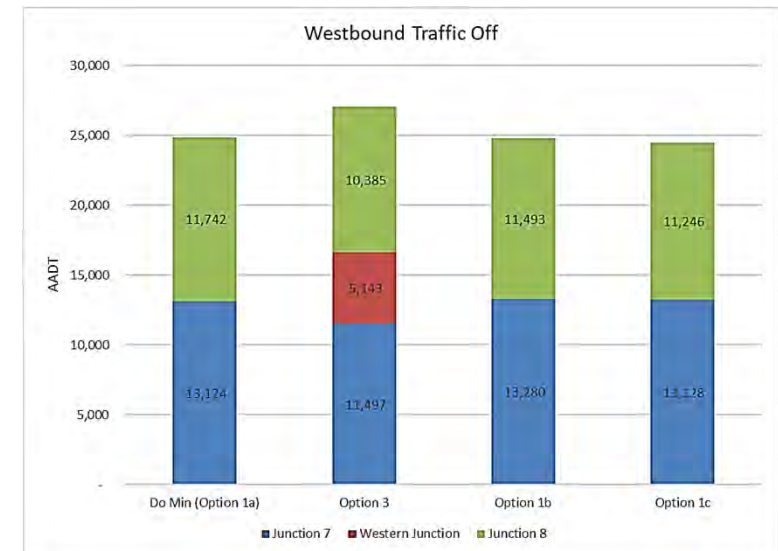
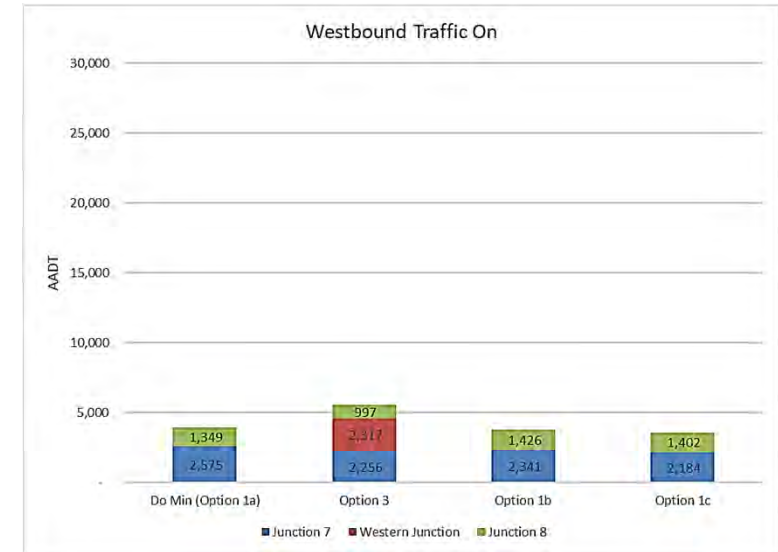
**Without New
Western
Junction**

Westbound AADT On/Off M4

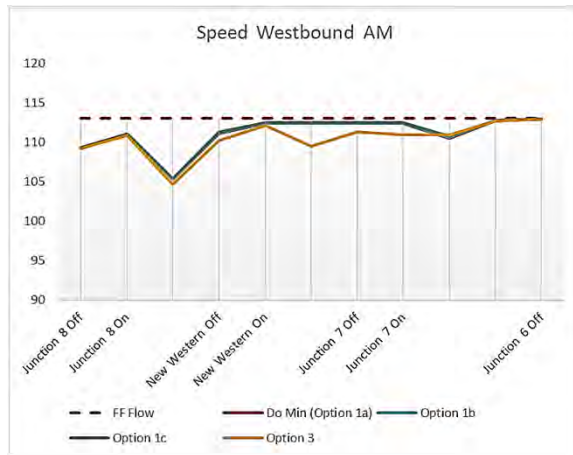


AADT	Westbound			
	J6 to J7	J7 to J7a	J7a to J8	J8 to J9
Do Min (Option 1a)	37,593	26,791	26,791	16,400
Option 1b	37,696	26,430	26,430	16,363
Option 1c	37,594	26,218	26,218	16,374
Option 3	38,229	28,683	25,845	16,457

With Option 1, the traffic from the East stays consistent with Do Minimum levels, however with the introduction of the Western Junction there is an increase in total traffic on the M4 coming from the East. This additional traffic is mostly leaving the M4 at the new junction to access both West Maynooth and Kilcock.

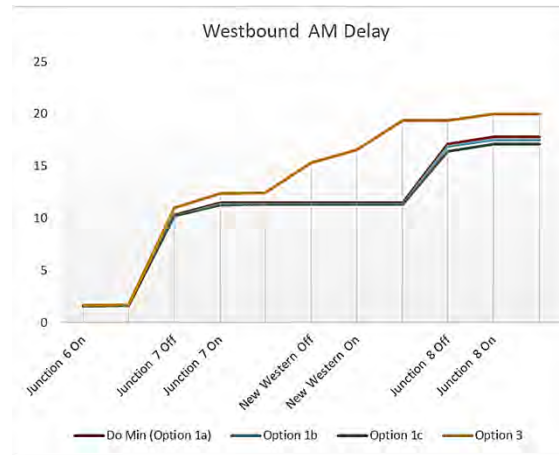


Westbound AM Peak Performance



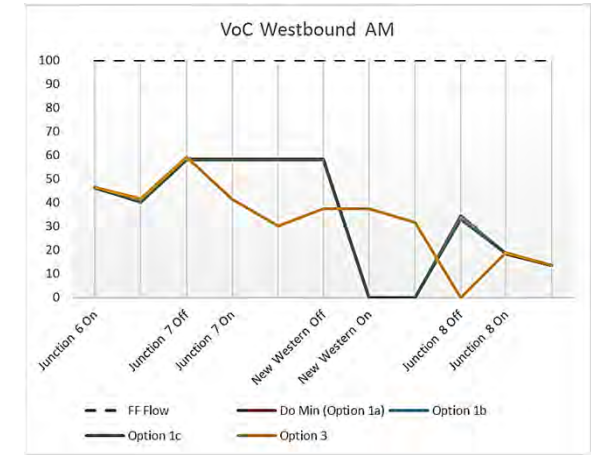
Link Speeds

With lower traffic flows Westbound in the AM, none of the scenarios have substantial impacts on speed along the M4.



Cumulative Delay

As with the Eastbound there is a small impact on delay with the new Western Junction, however this delay is minor.



Link Volume over Capacity

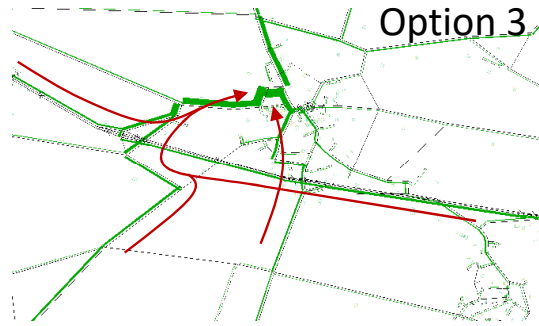
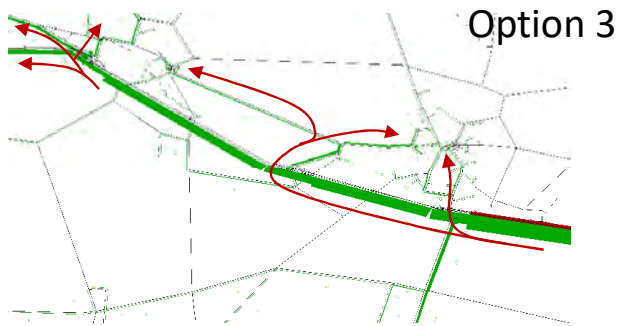
Capacity is not an issue Westbound in the AM due to the lower demand for travel in the western direction.

Summary:

Westbound AM Peak is not a differentiator

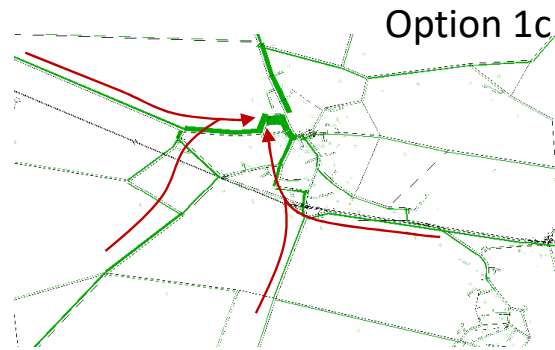
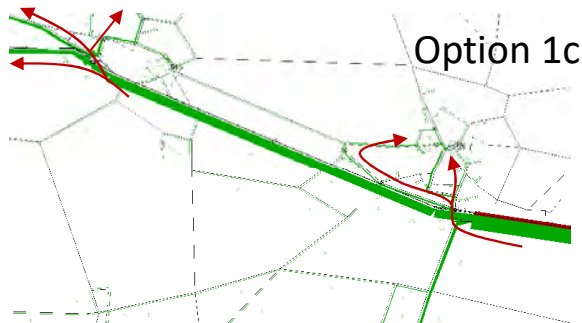
Westbound AM Peak Performance

With the western junction traffic for Maynooth University avoids the town centre, using the new junction to access the campus. The junctions also provides access to the eastern side of Kilcock for some traffic.



**With New
Western
Junction**

The upgraded existing junction with full link road provides a similar function as the new western junction though also removes delays on the M4 due to an increase in short trips.



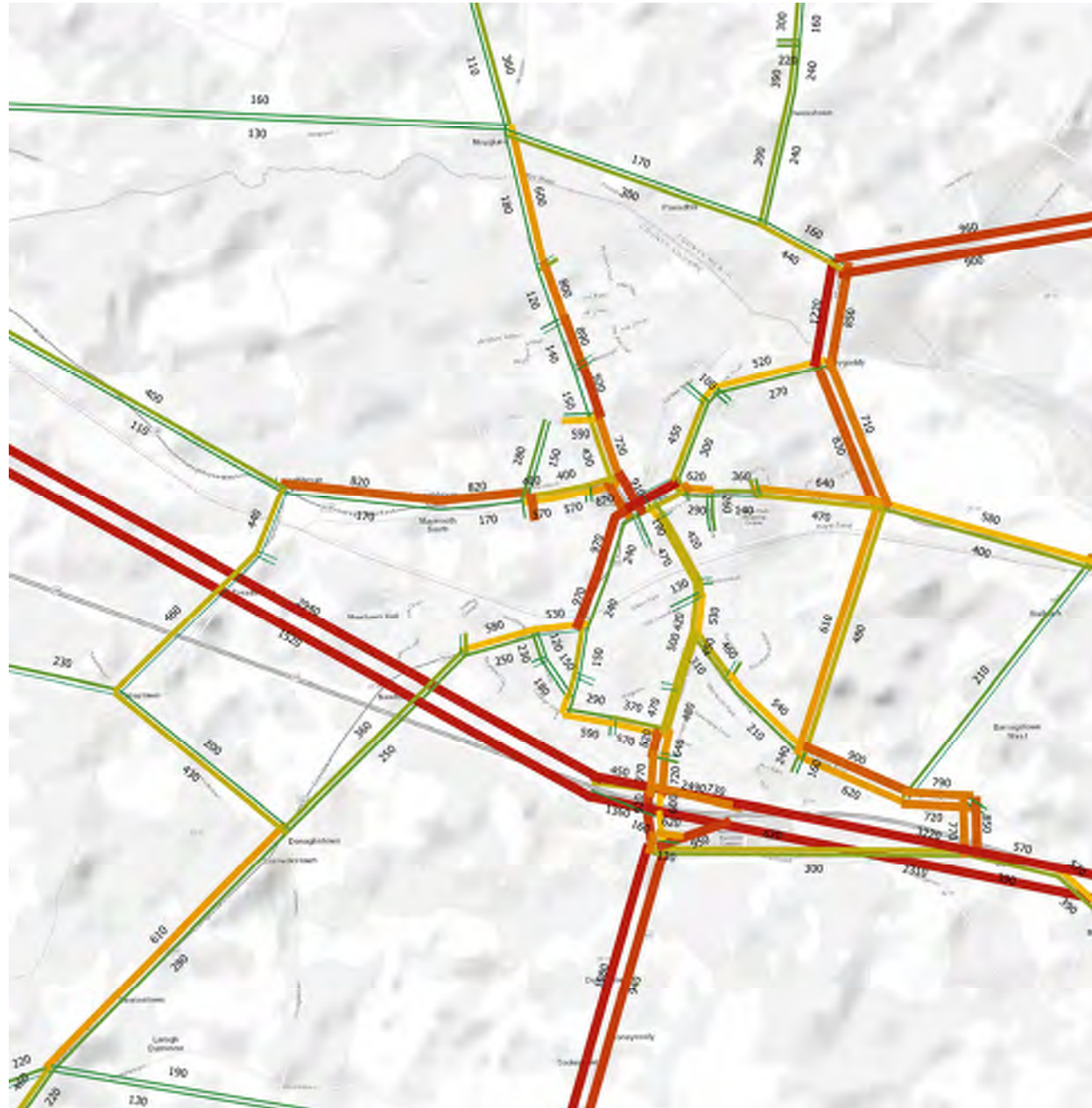
**Without New
Western
Junction**

Maynooth - AM Difference Flows

Objectives:

- Support the protection of the economic prospects of Maynooth.
- Facilitate an increase in modal shift from private car to public transport and walking/cycling thus supporting a transition towards low carbon and climate resilience.
- Enable the successful creation of place making and assist in the generation of vibrant communities.
- Support the creation of a healthy environment conducive to active travel.

Do Minimum Flows in the AM period



Maynooth - Road Flow Distribution AM DM 2047



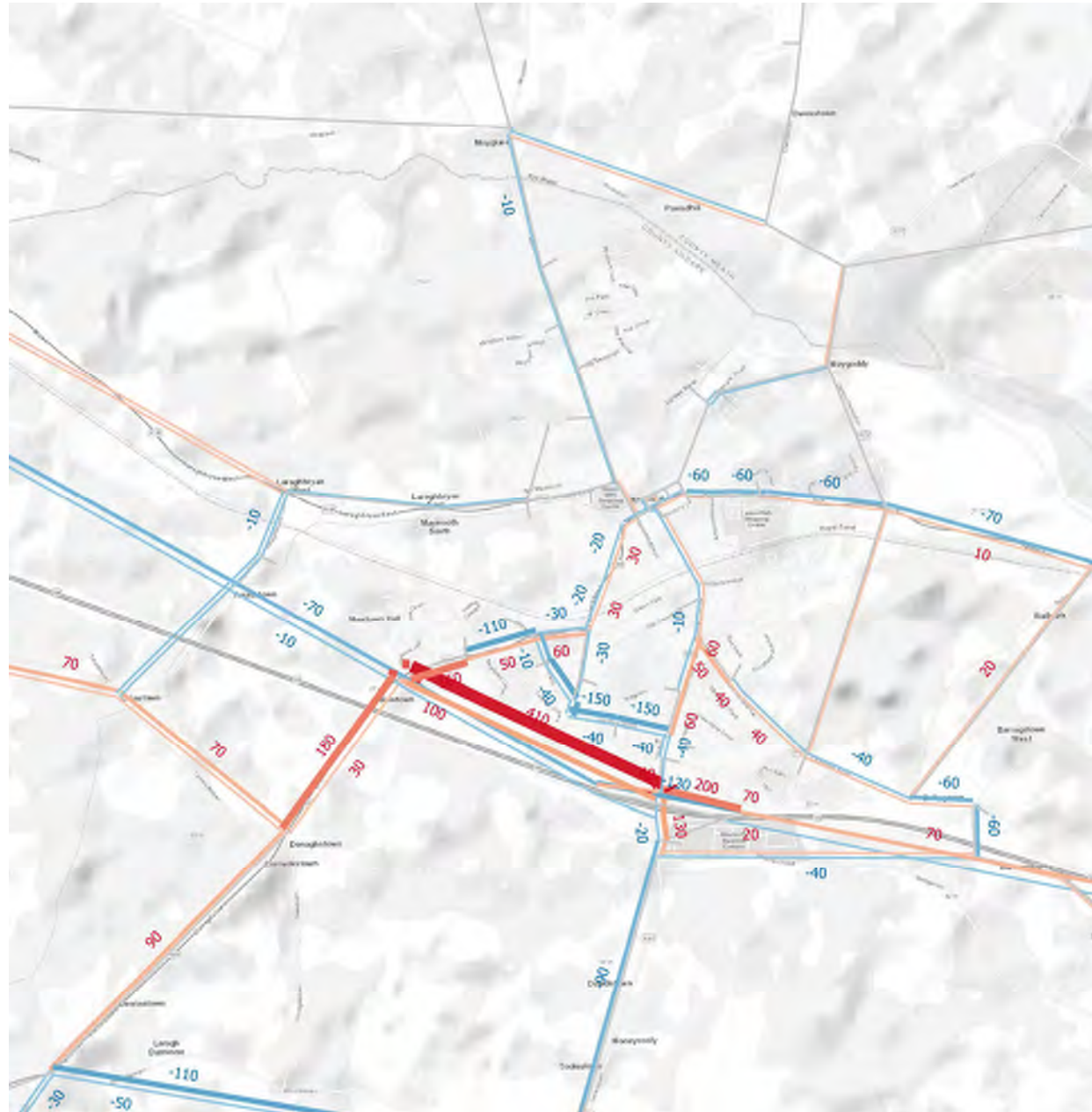
Option 1b vs Do Min for AM Period

Option 1b provides traffic relief to road network south of Maynooth town centre, notably on Meadowbrook Link Road and Beaufield Close.

Most of the eastbound traffic on the new link road is collected from residential areas to the south of Maynooth and rural areas south of the M4

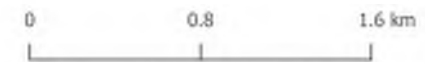
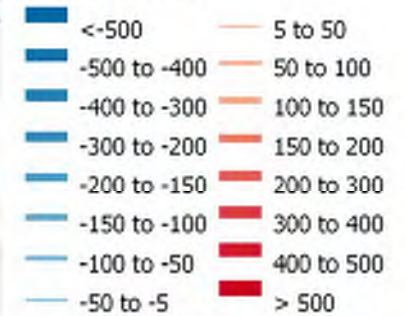


Westbound traffic on the link is mostly accessing the rural area to the south of the M4.



Maynooth - Road Flow Distribution AM
DM 2047 Option 1B vs DM 2047

Flow Distribution



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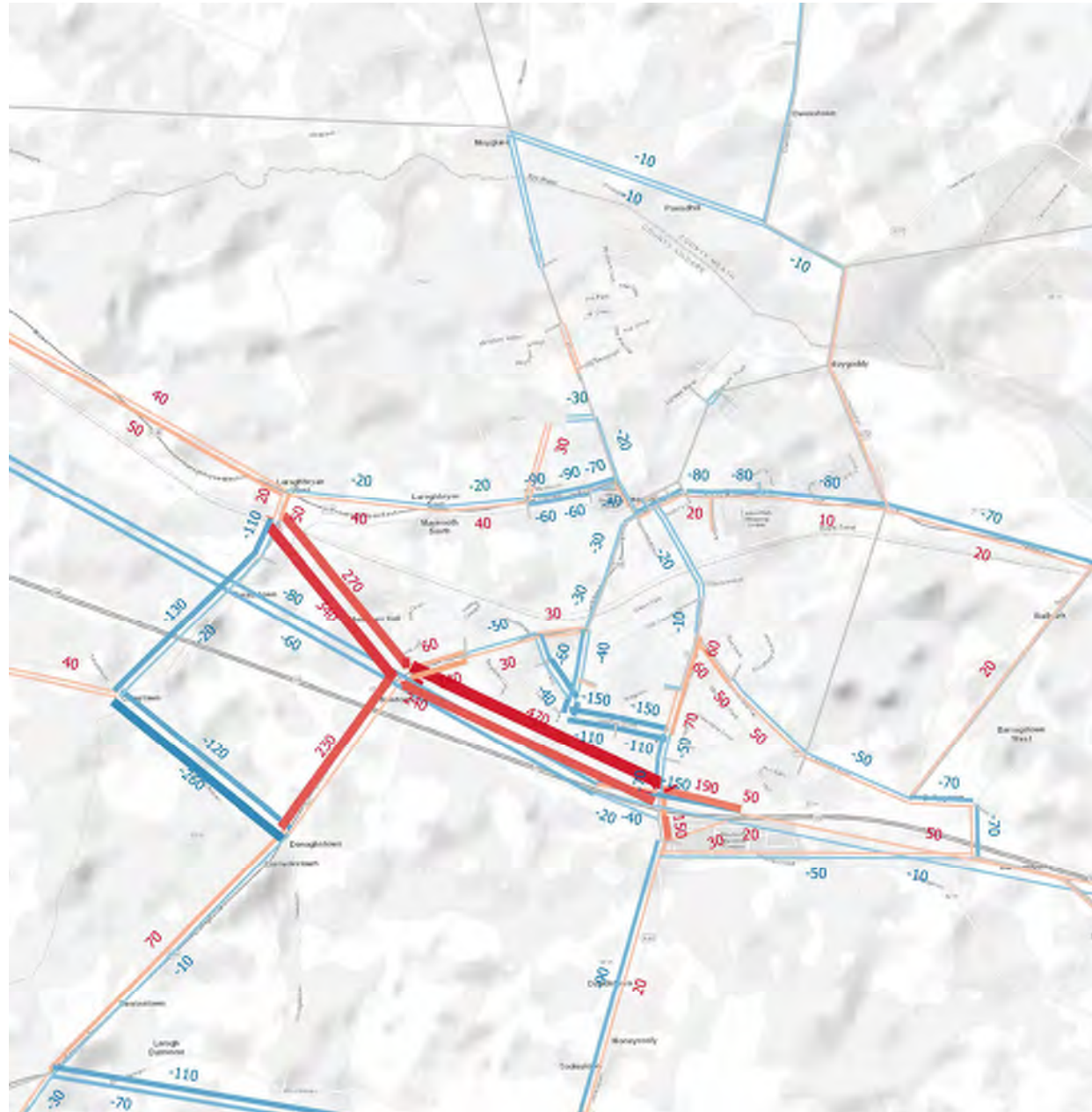
01-07-2022

Option 1c vs Do Min for AM Period

Option 1c provides traffic relief to local roads south of Maynooth town centre as with 1b **but also provides relief for the town centre, providing access to West Maynooth from the M4 and south of the M4 without passing through the town centre.**

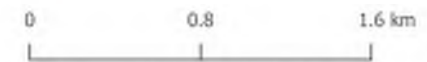
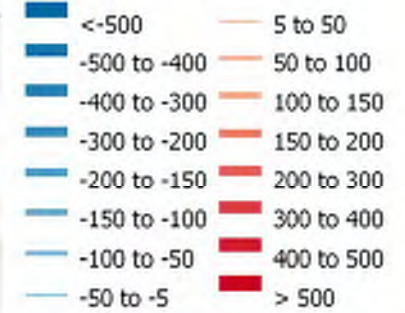


The new link road is used eastbound by traffic accessing Maynooth from south of the M4 as well as West Maynooth traffic accessing the M4.



Maynooth - Road Flow Distribution AM
DM 2047 Option 1C vs DM 2047

Flow Distribution



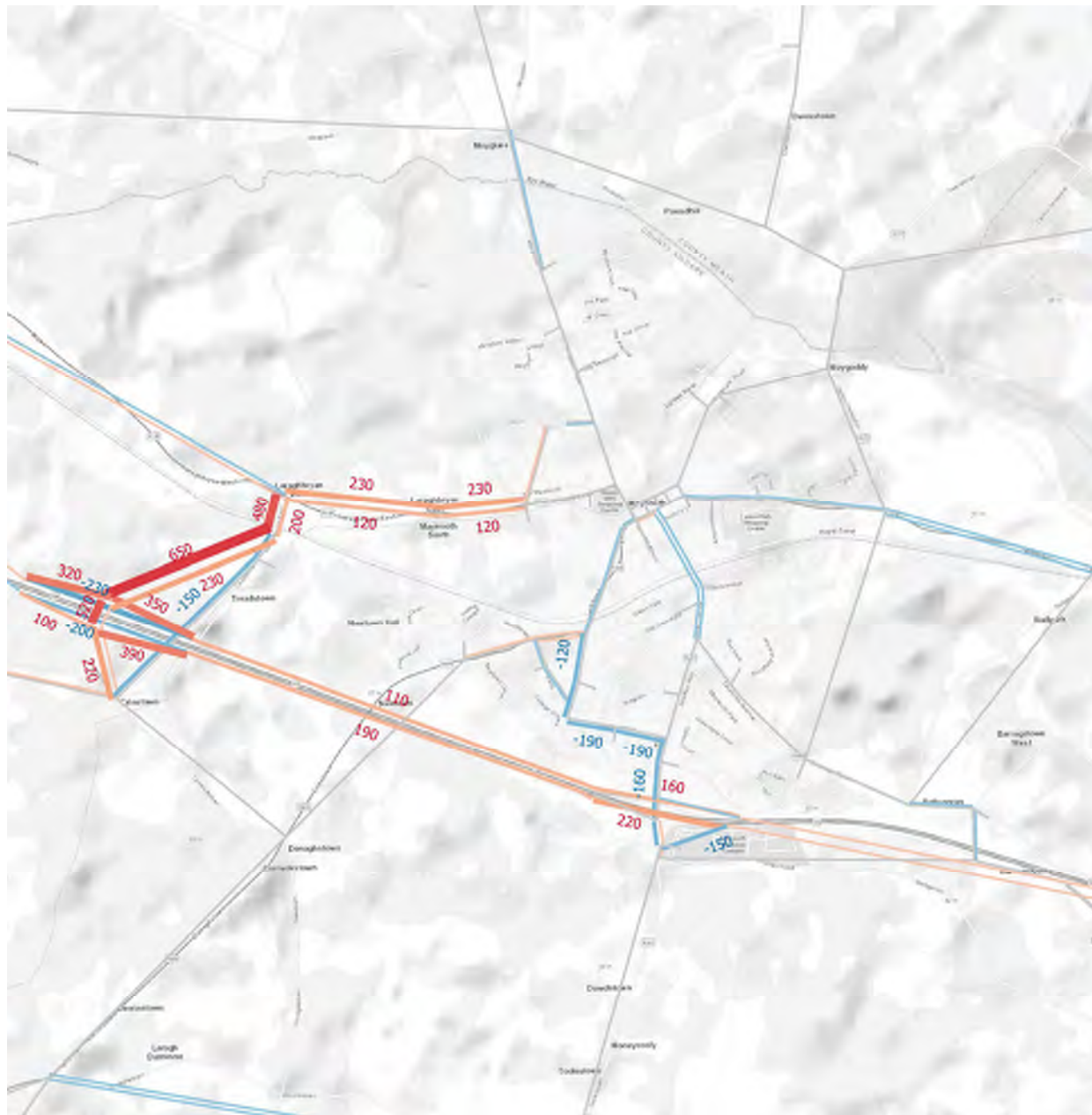
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Option C vs Do Min for AM Period

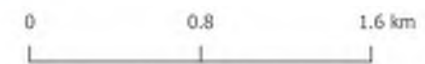
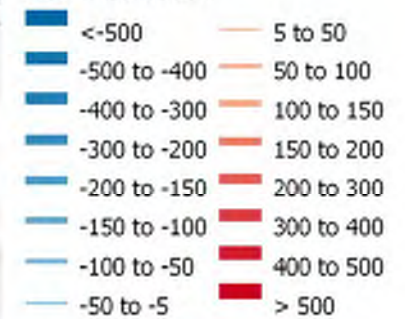
Option 3 doesn't offer as much benefit to the centre of Maynooth as the Option 1 scenarios. There is some relief offered to the Meadowbrook Road area but only inbound.

Option 3 is heavily utilised by traffic accessing West Maynooth and the University and does lead to reduced flows on regional roads around Maynooth as traffic swaps from rural roads to the M4.



Maynooth - Road Flow Distribution AM
DS 2047 Option 3 vs DM 2047

Flow Distribution



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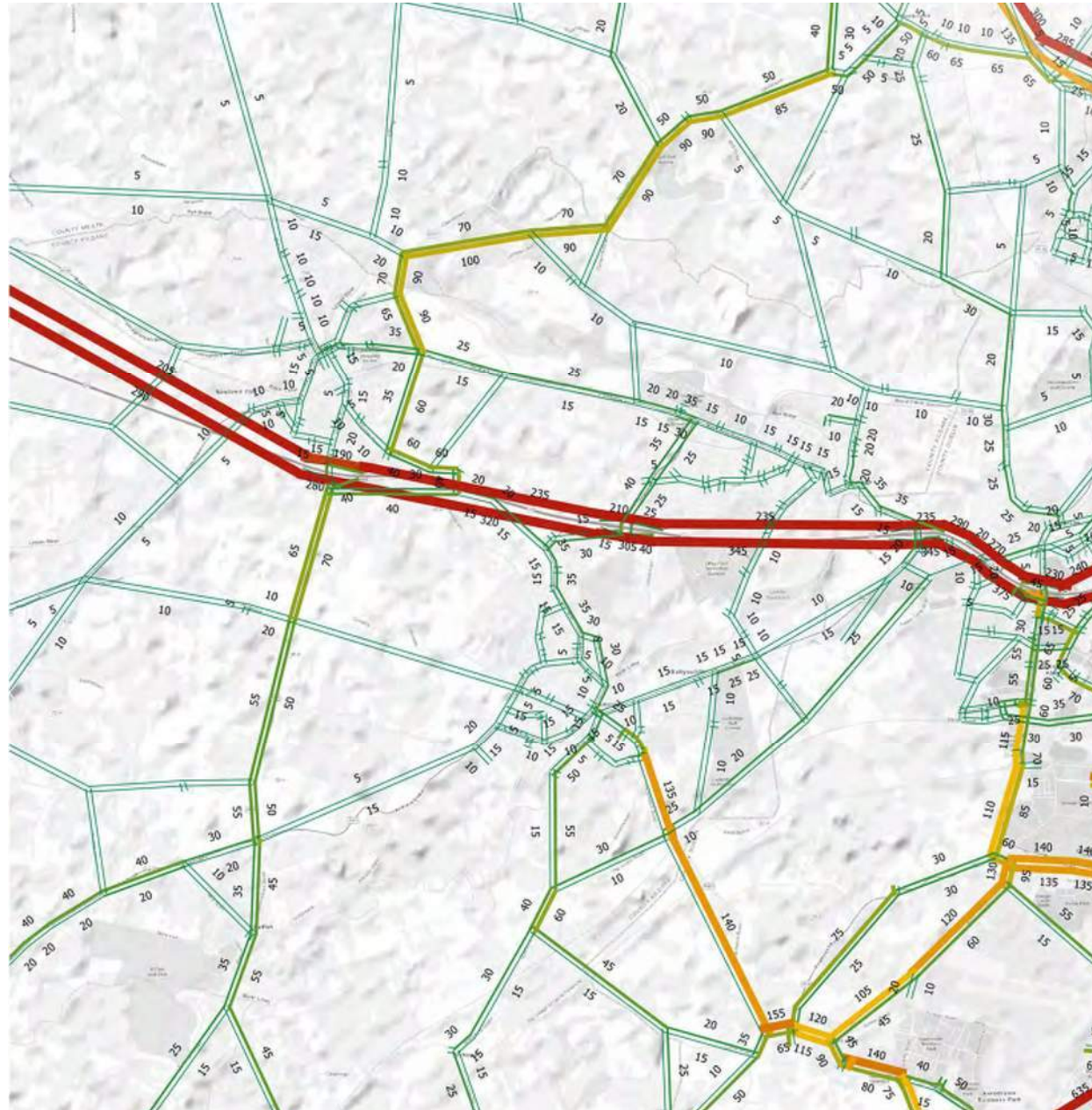
01-07-2022

Maynooth - AM HGV Difference Flows

Objectives:

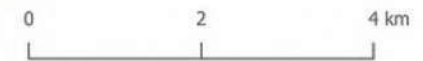
- Enable the provision of a safer travelling environment for all road users, including vulnerable road users.

Do Minimum HGV Flows in the AM period



Overview - HGV Flow Distribution AM DM 2047

Flow Distribution

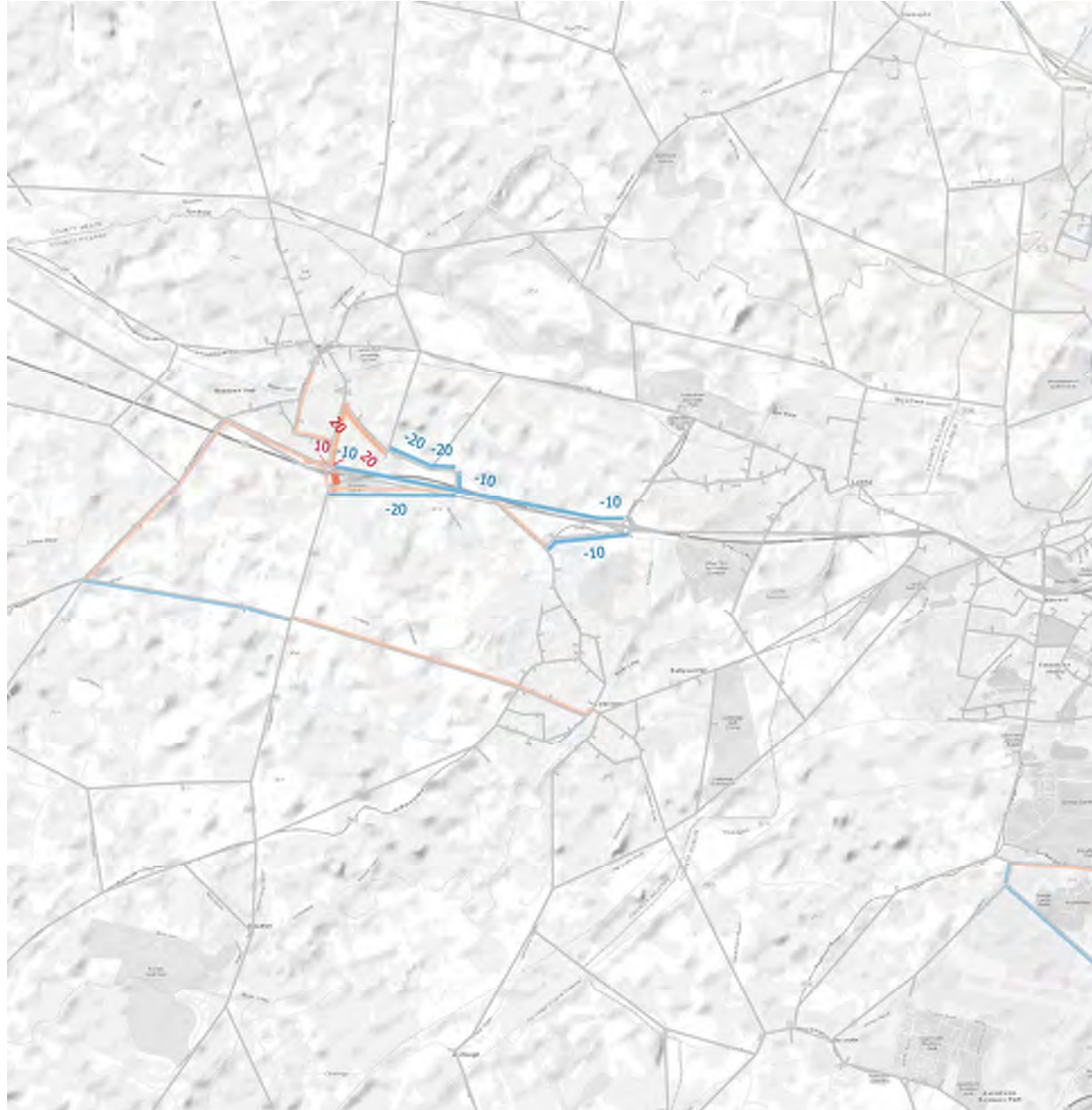


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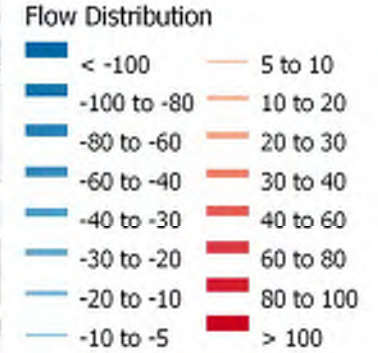
15-06-2022

Option 1b vs Do Min for AM Period

With Option 1b there is a minor increase in the number of HGVs using roads within Maynooth, particularly on the Straffan Road. This is due to a redistribution of trips from Junction 6 to Junction 7.



Overview - HGV Flow Distribution AM DM 2047 Option B vs DM 2047



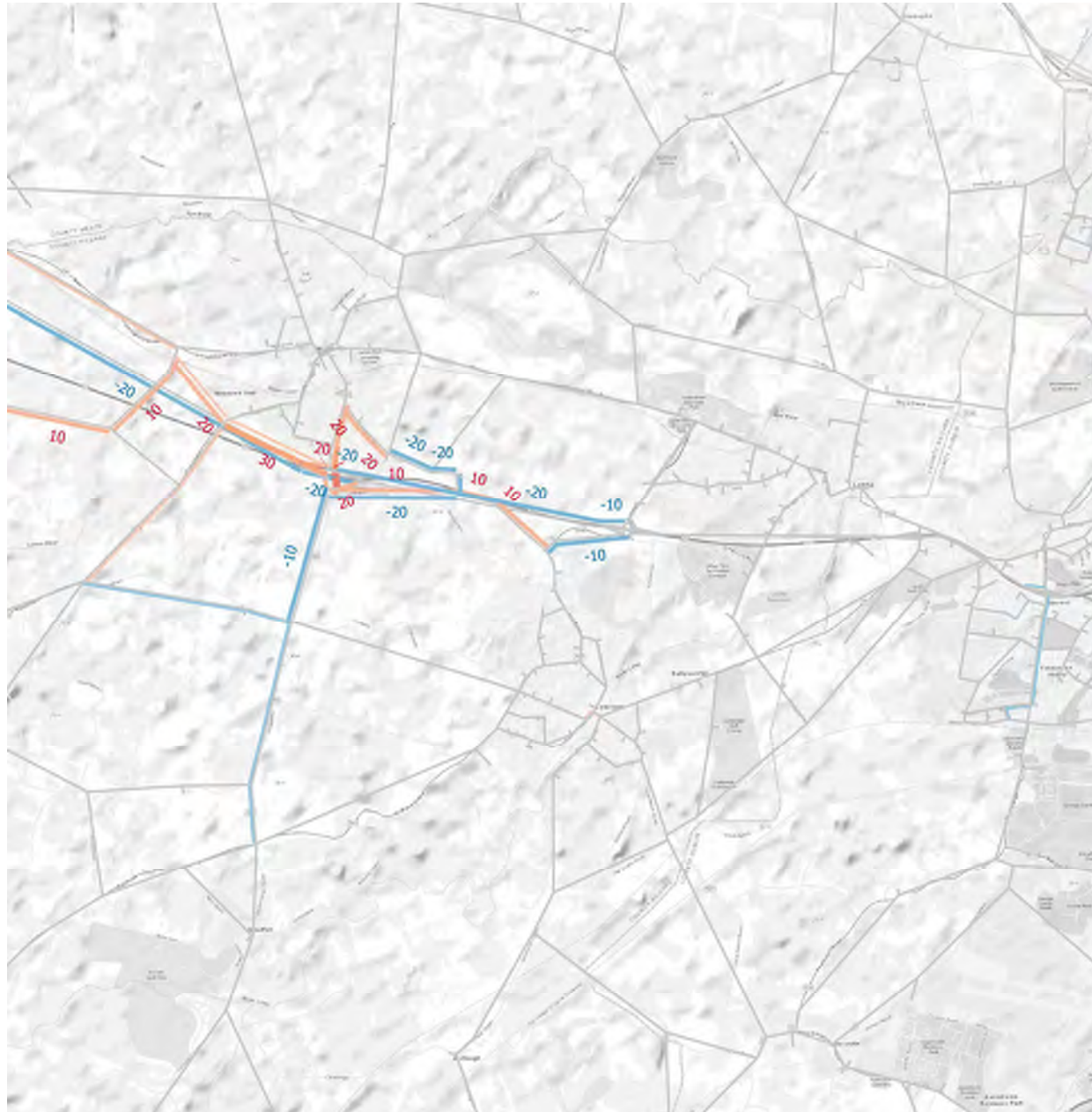
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15-06-2022

Option 1c vs Do Min for AM Period

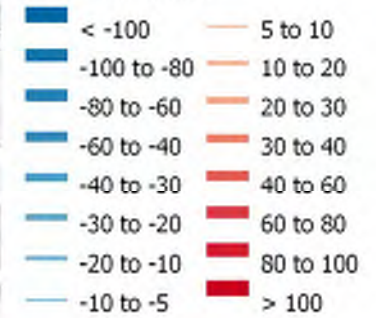
With Option 1c there is a minor increase in the number of HGVs focused on the new link road and Straffan Road.

Unlike Option 1b, there is no increase in HGVs within Maynooth.



Overview - HGV Flow Distribution AM DM 2047 Option C vs DM 2047

Flow Distribution

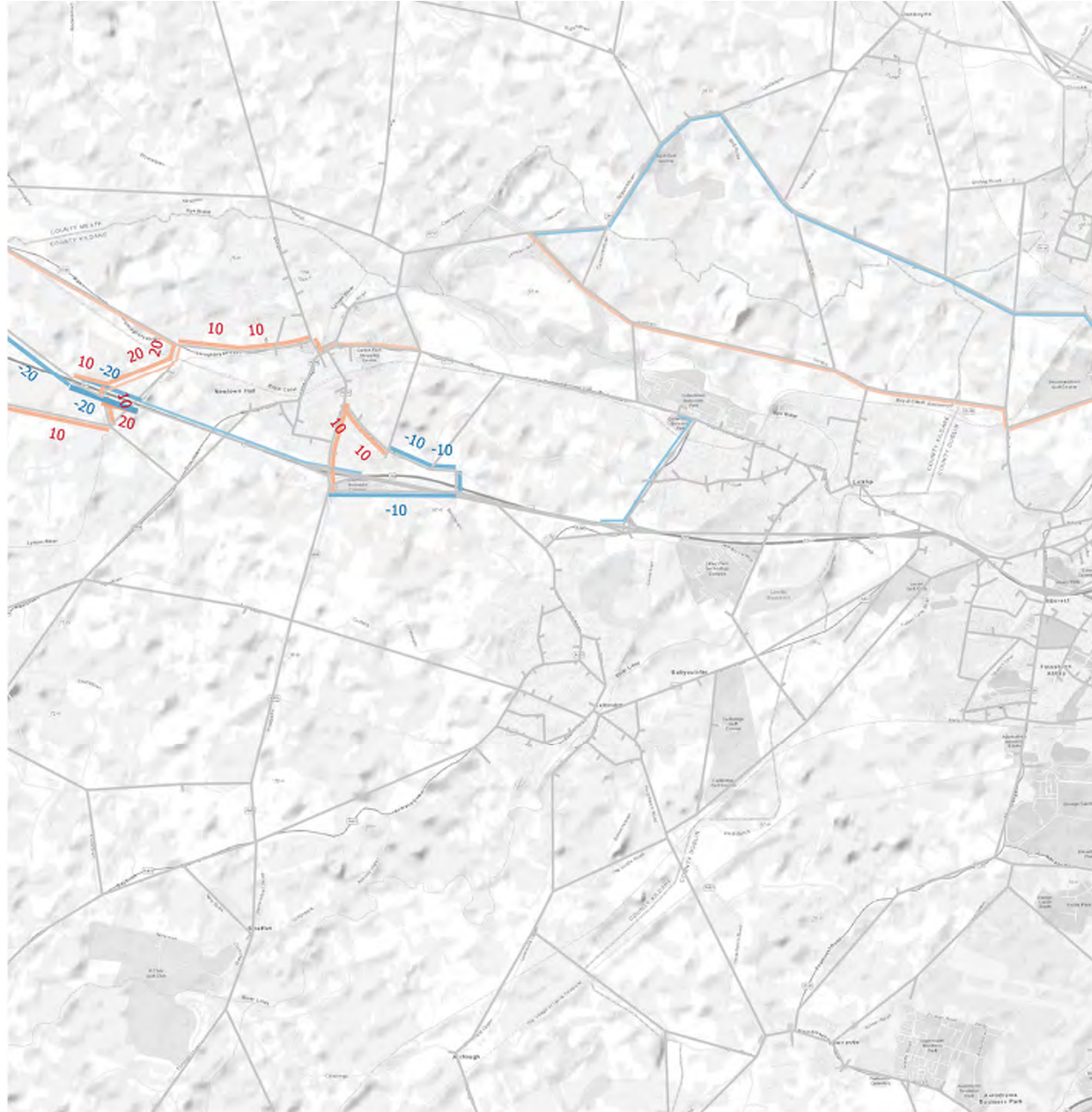


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15-06-2022

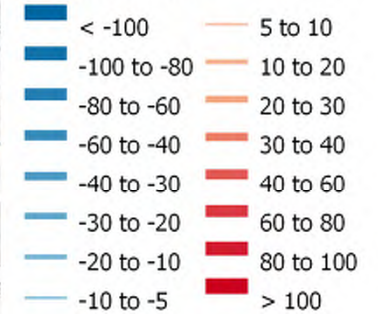
Option C vs Do Min for AM Period

With Option 3 there is an increase in HGV traffic through the centre of Maynooth Town, with HGVs from the West choosing to use the new junction to access Maynooth rather than Junction 7. There is also some minor rerouting of traffic around Junction 7.



Overview - HGV Flow Distribution AM DS 2047 Option C vs DM 2047

Flow Distribution



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04-07-2022

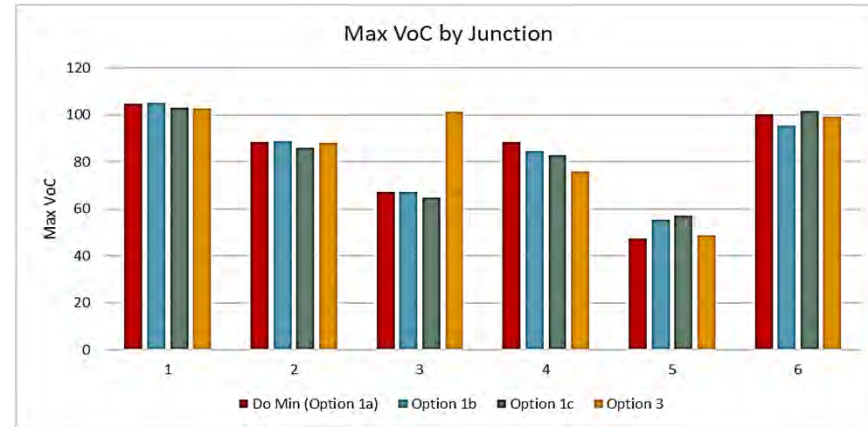
Network Performance

Volume over Capacity
Delays

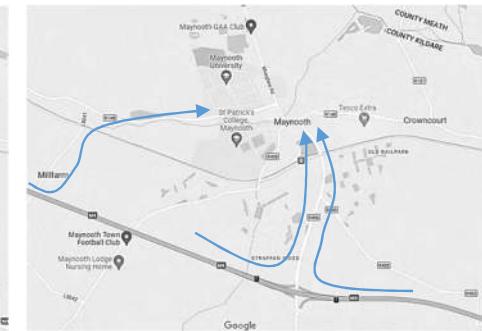
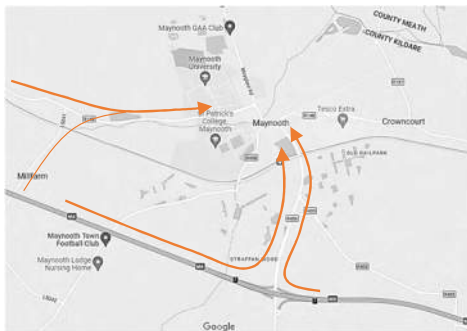
Objectives:

- Support the protection of the economic prospects of Maynooth, Leixlip, Celbridge, Kilcock, Enfield and their rural hinterland.
- Enable the provision of a safer travelling environment for all road users, including vulnerable road users.

Max Volume over Capacity



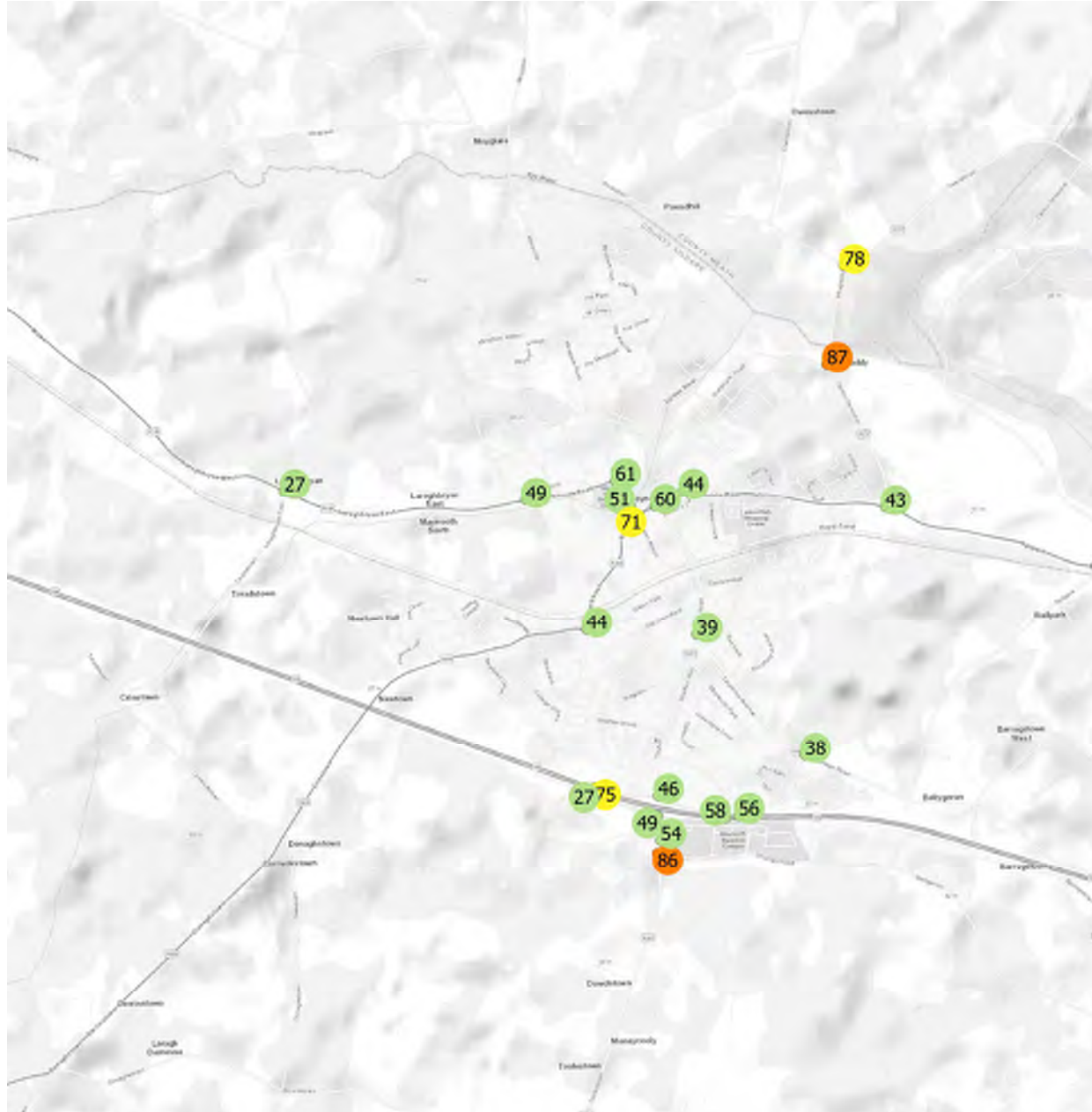
Option	Impact
Option 1b	Slight reduction in max VoC at junction 4 and junction 6. Leads to an increase in Max VoC at junction 5 but not enough to lead to delays. Overall impact is minimal.
Option 1c	Slight reductions in VoC for all junctions except for 5 and 6 where there is a slight increase. Overall impact is minimal.
Option 3	Large increase in Max VoC for junction 3, the access to the university. This increase is on the eastbound R148 due to the increase in traffic coming from the new western junction.



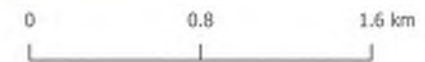
Do Min Weighted Average VoC

In the Do Min there is some pressure around the existing Junction 7 with high VoC on the westbound off ramp roundabout. There is also a moderately high VoC on the Eastbound off ramp.

The model also reports a moderately high VoC for Maynooth Town centre.



Maynooth - VoC AM
DM 2047



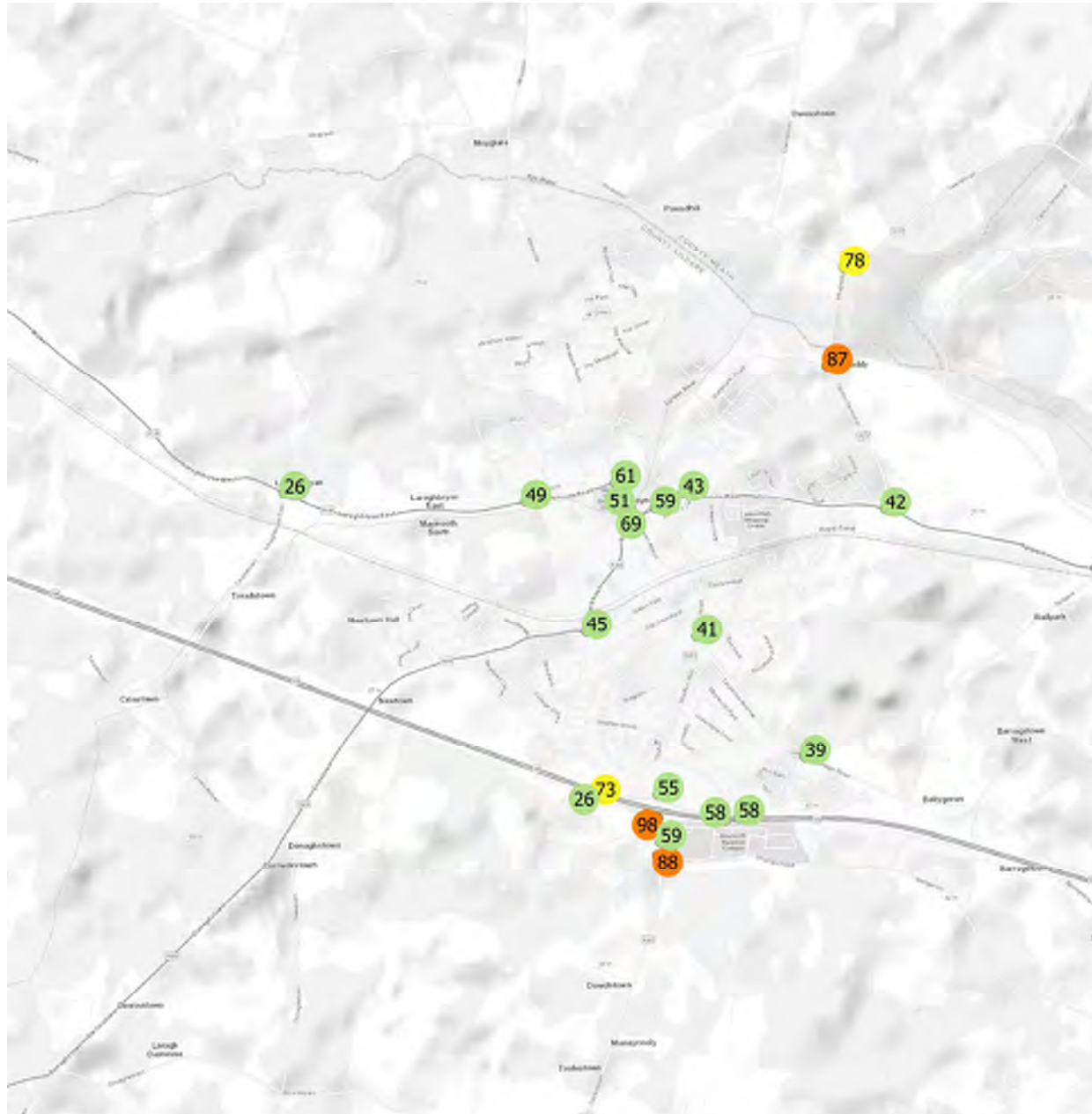
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Option 1b Weighted Average VoC

With Option 1b there is no notable change in the existing issues at Junction 7, however the Westbound on ramp junction does experience a high VoC.

With Option 1b there is a slight reduction in Maynooth town centre VoC, but this masks the issues shown previous where some junctions retain a high Max VoC.



Maynooth - VoC AM DM 2047 - Option B

VoC %

- < 70
- 70 to 85
- 85 to 100
- > 100



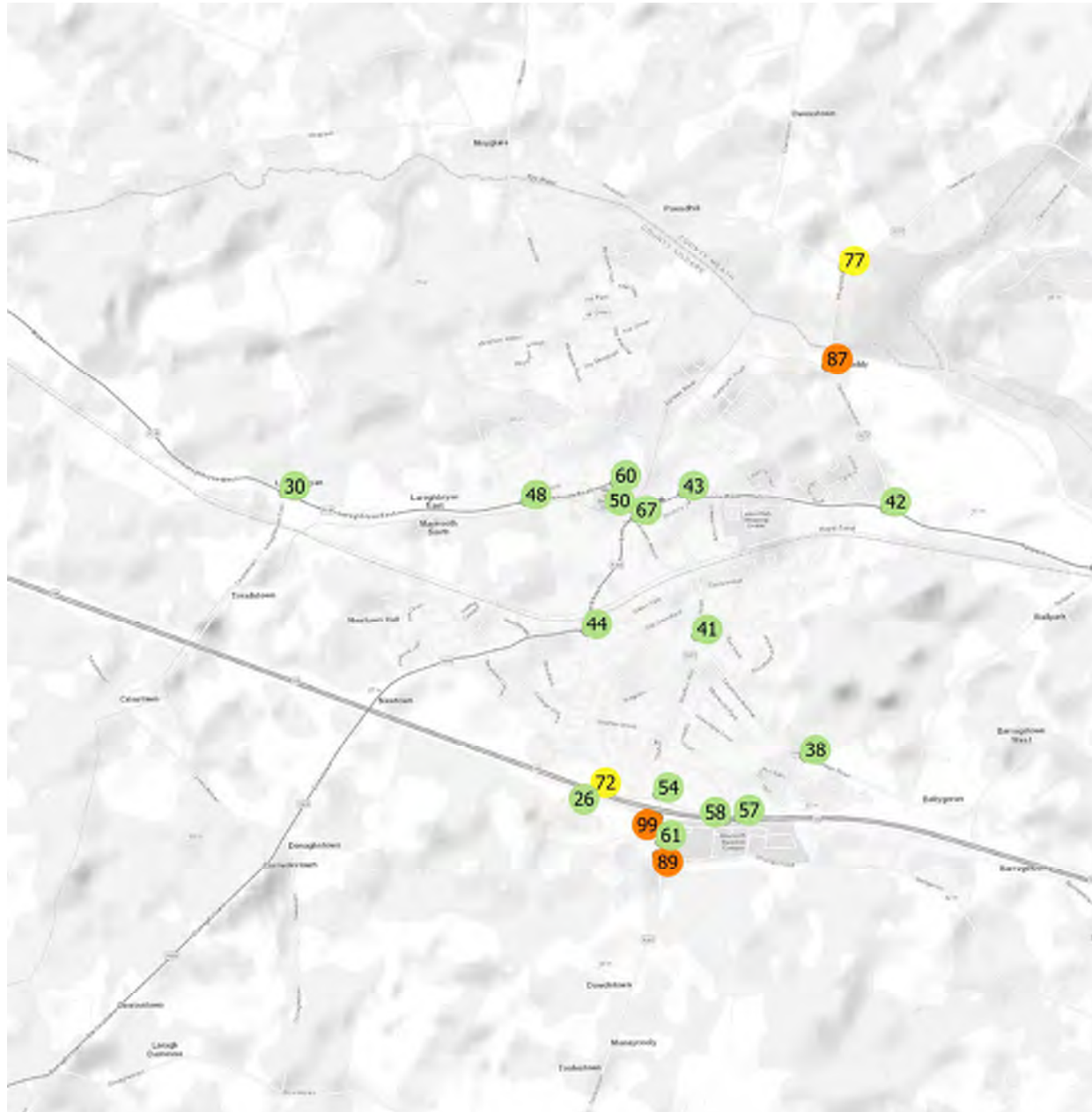
0 0.8 1.6 km

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04-07-2022

Option 1c Weighted Average VoC

Option 1c performs much the same as Option 1b at the existing junction 7 and within Maynooth town.



Maynooth - VoC AM
DM 2047 - Option C

- VoC %
- < 70
 - 70 to 85
 - 85 to 100
 - > 100



0 0.8 1.6 km

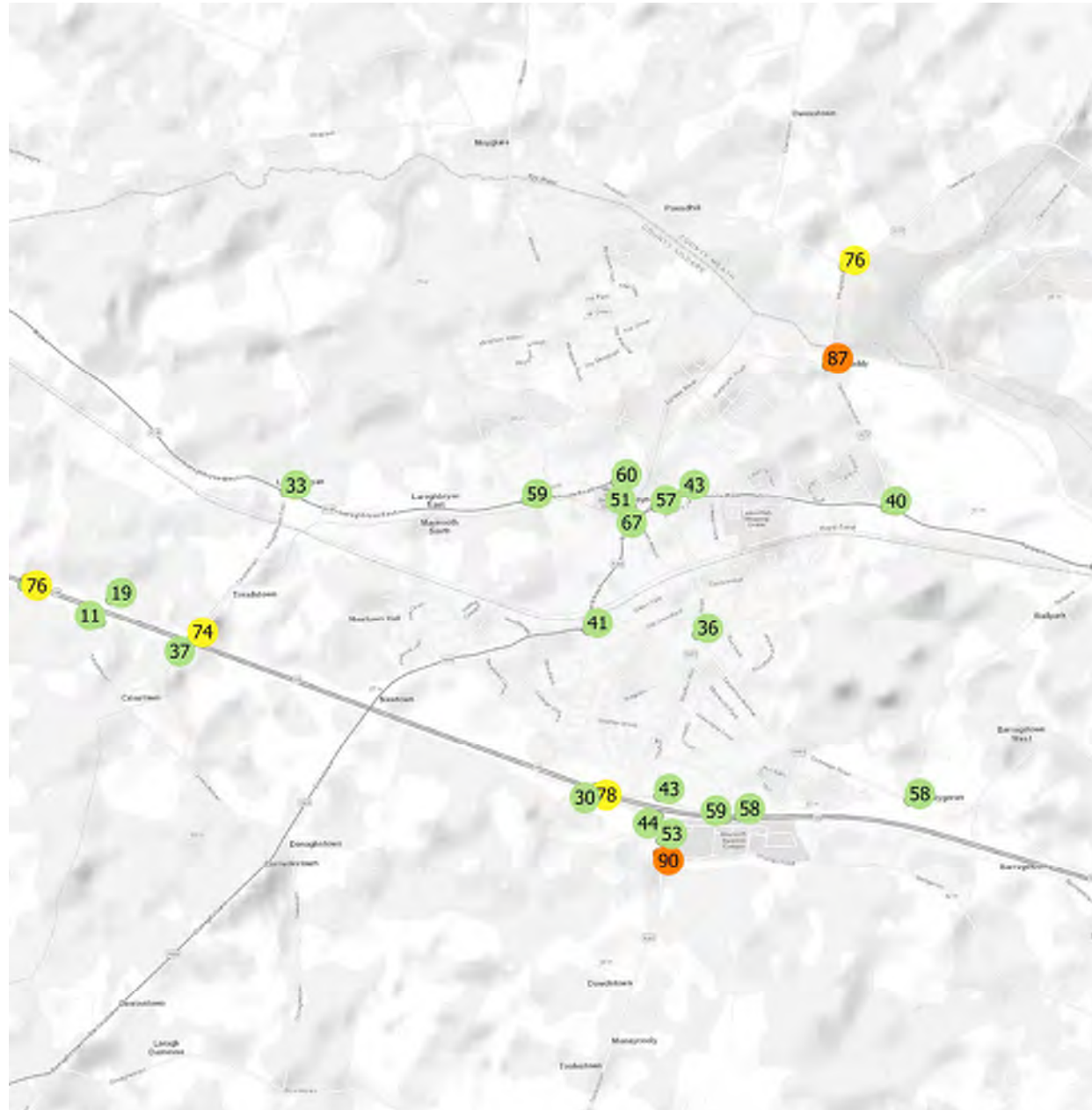
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04-07-2022

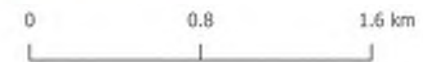
Option 3 Weighted Average VoC

With Option 3 the performance on the existing Junction 7 remains much the same as the Do Minimum with additional traffic shifted to the new junction.

With Option 3 there is a notable increase in VoC at the university access roundabout, however as this is an average weighted VoC the high Max VoC seen previously is masked.



Maynooth - VoC AM
DS 2047 - Option 3



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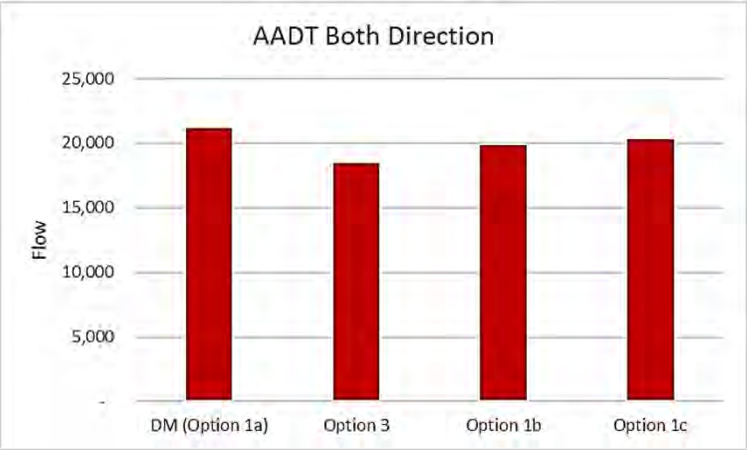
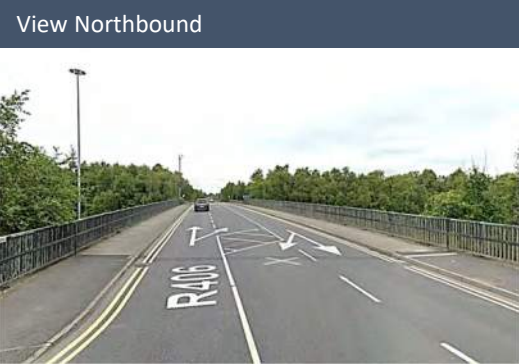
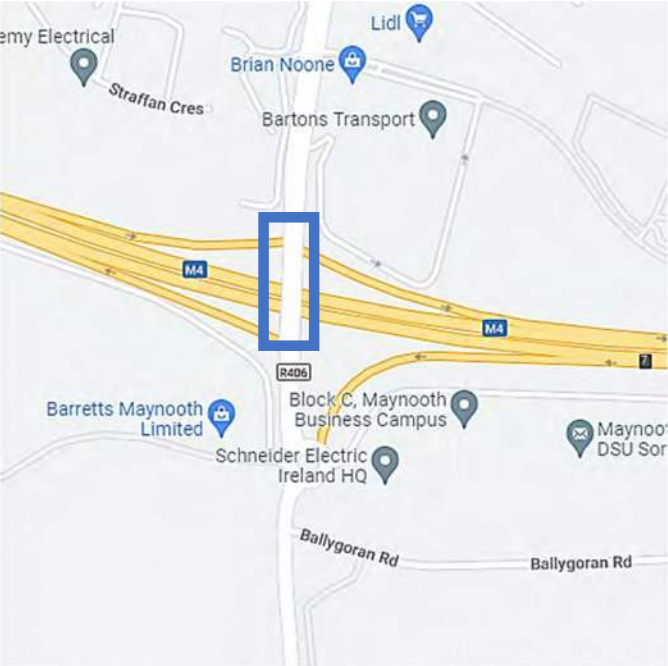
04-07-2022

Straffan Road Flows

Objectives:

- Improve infrastructure in, across and adjacent to the M4/N4 corridor which may form barriers to physical activity and in particular linkage between key local trip attractors including education, work, residential, leisure and natural environment.

Straffan Road M4 Crossing Flows



The Straffan Road bridge does not provide much space for vulnerable road users and would be seen as a barrier to active travel to Maynooth Business Campus south of the M4. Reduction in traffic on this bridge would make the route more attractive and could allow for change in road layout to provide more space for vulnerable users.

Both Option 1 and Option 3 lead to reductions in traffic across the Straffan Road bridge, however none result in a significant reduction that would lead to a more attractive environment for venerable road users. Furthermore, all three scenarios lead to an increase in HGV traffic across the bridge.

Summary

Option	Option Description	Mainline M4 Impacts	Local Impacts
Option 1a	Improve Existing Junction	Negligible change from Do Min	Negligible change from Do Min
Option 1b	Improve Existing Junction with linkage to Newtown Road	Minor improvement to M4 function with reduced delays and increased average speed	Increase in traffic on regional roads around Maynooth. Slight impact on Maynooth town centre with a small reduction in delays. South of Maynooth sees strong reduction in traffic around Meadowbrook Road, however there is an increase in HGV traffic.
Option 1c	Improve Existing Junction with linkage to Millfarm	Minor improvement to M4 function with reduced delays and increased average speed	Slight impact on Maynooth town centre with a small reduction in delays. South of Maynooth sees strong reduction in traffic around Meadowbrook Road and no change in HGV traffic. Minor increase in traffic on regional roads around Maynooth.
Option 3	Improve Existing junction and new Western Junction	Minor negative impact on M4 function with increased delays and reduced speed due to interference caused by additional junction.	Increase in HGV traffic through Maynooth town centre, but reduction in delays in Maynooth Town.

Notes:

- The corridor model used for this more in-depth look is not ideally suited to analyse the impacts of the new junction on Maynooth due to its focus being on the mainline.
- To fully understand the impacts on Maynooth it would be suggested to use a Maynooth Town Model.

Assessment	Run	Junctions Assessed	Location	M4 West of J7		M4 Between J7 and J6		M4 Between J6 and J5		M4 East of J5	
				AADT	% HGV	AADT	% HGV	AADT	% HGV	AADT	% HGV
Do-Minimum	n/a	n/a		53,679	8.2%	69,801	7.5%	77,656	7.0%	86,507	7.0%
Corridor	Run 1A / 1B	n/a		53,679	8.2%	69,801	7.5%	77,656	7.0%	86,507	7.0%
	Run 2A	n/a		53,782	8.2%	70,650	7.4%	78,091	6.9%	86,668	7.0%
	Run 2B	n/a		53,760	8.2%	68,996	7.2%	77,778	7.0%	86,727	7.0%
	Run 3A	n/a		53,834	8.2%	71,028	7.4%	78,417	6.9%	86,707	7.0%
	Run 3B	n/a		53,782	8.2%	69,241	7.2%	78,233	6.9%	86,801	7.0%
Junction 5	Run 1	Junction 2.1	Location A	53,763	8.2%	70,472	7.4%	79,102	6.9%	83,717	6.9%
	Run 2	Junction 2.2	Location B	53,707	8.2%	70,141	7.5%	79,869	6.8%	84,656	7.0%
Junction 7	Run 1	Junction 2.1.1A	Location A/B	56,121	7.7%	71,541	7.3%	78,082	7.0%	86,693	7.0%
	Run 2	Junction 3.1.2A & 3.1.2F	Location A/B and F	56,577	7.5%	74,054	7.3%	78,170	7.0%	86,537	7.0%
	Run 3	Junction 3.3.1A & 3.3.1F	Location A/B and D	57,856	7.4%	72,118	7.4%	77,724	7.0%	86,305	7.0%
	Run 4	Junction 3.4.1A & 3.4.1B	Location A and C	52,809	8.0%	68,397	6.7%	77,638	6.8%	86,462	6.9%
	Run 5	Junction 4.1.1E	Location C	49,166	8.8%	67,666	6.8%	77,570	6.8%	86,350	6.9%

Kildare County Council
Maynooth to Leixlip Project
Options Report - Parallel Roads
Sensitivity Analysis

Draft 2 | 04 July 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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1 Stage 1 - Parallel Roads Sensitivity Analysis

1.1 Introduction

This Appendix details the refined scope and sensitivity analysis carried out for the Stage 1 Engineering and Transportation assessment of the Corridor Options.

1.2 Parallel Road Overview

The existing parallel road is outlined in Figure 1.1 below.

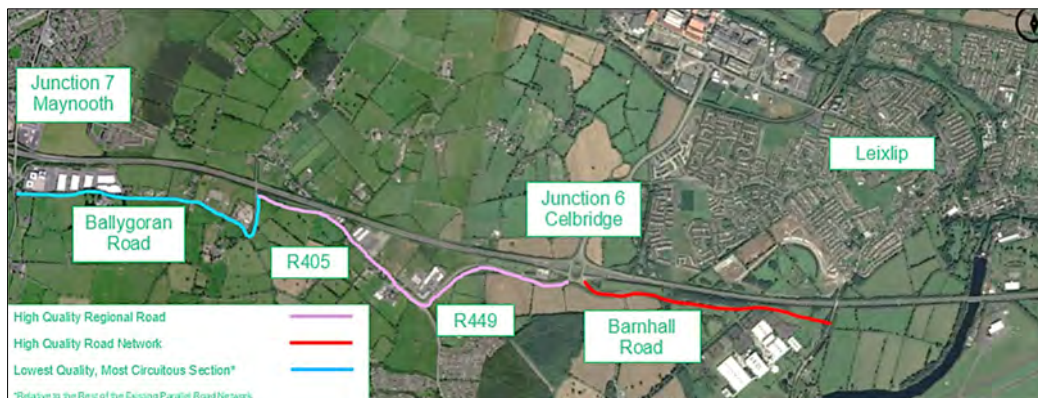


Figure 1.1: Existing Parallel Road Network

The section in cyan is Ballygoran Road (L5054) and Ballygoran View. This section represents a lower quality road standard and a more circuitous section in comparison to the rest of the existing road network assessed.

Given the relative high standard of the remaining existing road network, this section represents the greatest opportunity for generation or maximising benefit for this option versus the cost of the infrastructure. Therefore, further traffic modelling has been completed to determine the benefits (if any) of improving this section alone. In addition, to verify the results of the traffic model, a high-level traffic movement assessment was completed on this section of the corridor. Combined, these steps also represent a sensitivity analysis on the overall results of the traffic modelling.

1.3 Movement Assessment

The following movement were assessed in each direction (origin and destination) between the following locations:

- M4 Westbound (to West);
- N7 / Naas / Clane;
- Maynooth;
- Celbridge;
- Leixlip West;
- Leixlip East; and
- M4/N4 Eastbound (to Dublin).

Following the assessment, the potential trips that have the greatest likelihood (comparatively) of using the Ballygoran Road L5054 and Ballygoran View, were:

- N7 / Naas / Clane to Leixlip East; and
- Leixlip East to N7 / Naas / Clane.

Please see Figure 1.2 and Figure 1.3 below.

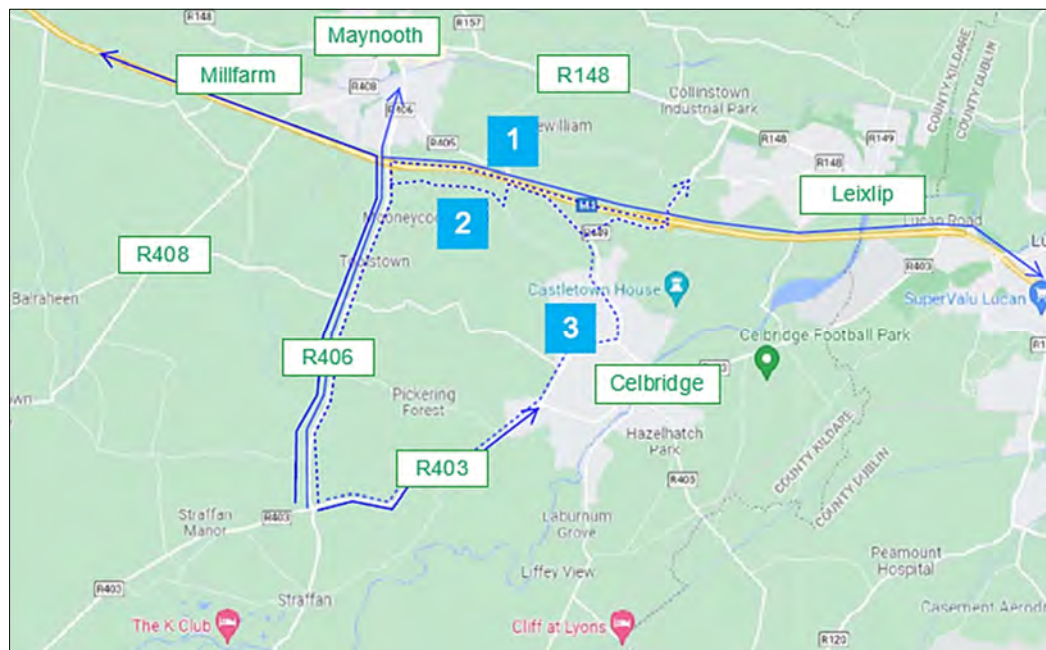


Figure 1.2: Movement Assessment - N7 / Naas / Clane to Leixlip East

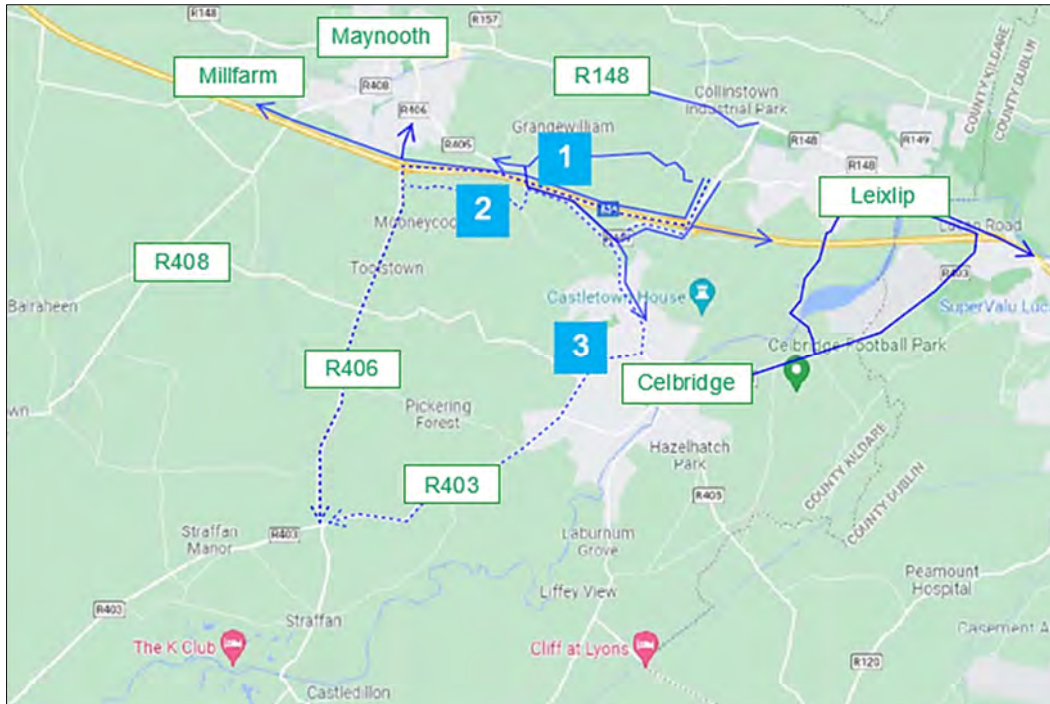


Figure 1.3: Movement Assessment - Leixlip East to N7 / Naas / Clane

As per Figure 1.2 and 1.3, Route 2 follows Ballygoran Road L5054 and Ballygoran View. The greatest potential benefit of this route is as an alternative to Route 1 and 3, which is assessed in Table 1.1 and Table 1.2.

For journey times, Tuesday the 9th of October 2018 was used to represent pre-covid travel patterns on a weekday. Journeys were taken from Barberstown Roundabout to the Intel Campus on Google Maps. 7:50 and 17:20 were chosen as longest delays on the M4.

Routes	Length (km)	Journey Time (min)
Route 1 – via M4	11.3	12-22
Route 2 – Ballygoran Road L5054 and Ballygoran View	11.7	14-22
Route 3 – via Celbridge	10.4	14-24

Table 1.1: Journey Times AM

Routes	Length (km)	Journey Time (min)
Route 1 – via M4	11.3	12-18
Route 2 – Ballygoran Road L5054 and Ballygoran View	11.7	14-20
Route 3 – via Celbridge	10.4	14-26

Table 1.2: Journey Times PM

Based on Table 1.1 and 1.2, Route 2 would likely be the second preference route for this movement. It should be noted that Route 2 is longer than Route 1 (preferred route).

As shown in Figure 1.4, applying a best-case straight line distance, would produce a distance of 2.5km versus the existing (blue line) 2.9km. This represents a reduction of 0.4km. Applying this reduction to the tables above brings the overall journey kilometres into a similar distance as the M4 (Route 1 option). However, the speed would remain at 80km/h (lower than Route 1) and a completed straight-line alignment as shown would not be feasible and thus this length will increase. Therefore, Route 1 would always remain the preferred option.

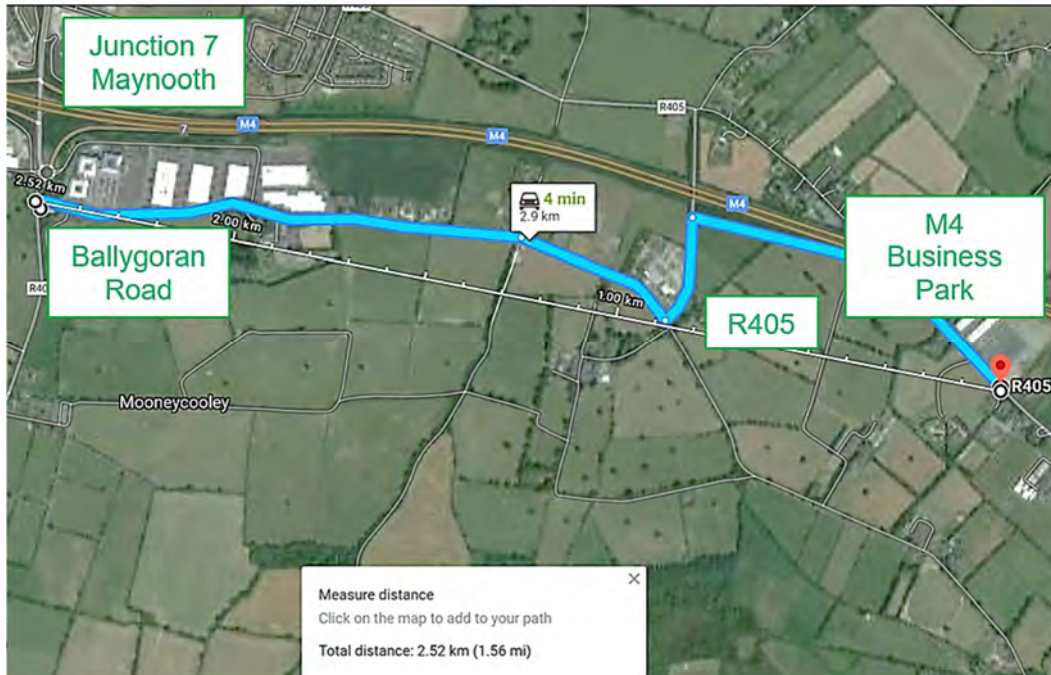


Figure 1.4: Movement Assessment

1.4 Summary and Key Conclusions

In summary, the key conclusions are as follows:

- Journey time savings (compared to the Do-Minimum) on the M4 eastbound and westbound are almost identical to the journey time savings observed for Corridor Option 2 and Corridor Option 3, with proposed parallel road in place, therefore, it is concluded that there is little, or no benefit generated from this section from an M4 journey time perspective.
- There are negligible benefits in terms of flow reduction and delay reduction in Maynooth, Leixlip and Celbridge town centres, indicating that there is little, or no benefit generated from this section in terms of benefits to links in Maynooth, Leixlip and Celbridge.
- The number of links exhibiting a major or moderate beneficial impact is lower than in Corridor Option 2B and Corridor Option 3B (with proposed parallel road), again indicating there is little or no benefit generated from this section.
- Link flows on the sensitivity analysis section (Ballygoran Road L5054 and Ballygoran View) are very similar to those observed in Corridor Option 2A and Corridor Option 3A (no parallel road), again indicating that there are little, or no benefits generated from upgrading this section of the parallel road.



MAYNOOTH TO LEIXLIP PROJECT

Appendix 5.6A
Stage 1 Sift 3 POA
Environmental Assessments -
Corridors

Kildare County Council

Maynooth to Leixlip Project

Options Report - App 6 - Stage 1
Material Assets – Agriculture -
Corridor Options Assessment

Draft 1 | 30 April 2022

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Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Corridor Options Material Assets – Agriculture - Assessment Summary

1 Stage 1 Material Assets – Agriculture - Corridor Options Assessment

1.1 Introduction

This section details the Stage 1 Material Assets Agricultural assessment of the Corridor Options with respect to the Material Assets Agriculture constraints identified in the Constraints Report.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

The following guidelines and legislation were referred to when undertaking this Stage 1 Corridor Option assessment:

- European Union (2018) (Planning and Development) (Environmental Impact Assessment) Regulations. (SI 296 of 2018);
- Environmental Protection Agency (EPA) (August 2017) Guidelines on the Information to be contained in Environmental Impact Assessment Reports¹; and
- Transport Infrastructure Ireland (TII) (2016) Project Appraisal Guidelines Unit 7.0 - Multi Criteria Analysis, PE-PAG-02031².

This assessment is a combination of a desktop assessment of available data sources as set out in Section 4.11.2 combined with the on-site survey conducted in January 2021. The assessment in this section compares the impacts of the Corridor Options (as presented in Section 6.2.2 of this report) on the agricultural constraints identified in Section 4.11.3.1. The five criteria as set out in Section 3.1.5 of the 2016 PAG Guidelines² are assessed for each Corridor Option i.e.

1. The farm size along each corridor option.

This criteria was assessed by referencing the CSO data (Tables 4.33 and 4.34 of Section 4.11.3.1) for the study area. Larger farms are generally more resilient to land loss than smaller farms. The farm size is assumed to be the same along each of the Corridor Options;

2. The types of farm enterprises along each corridor option.

In assessing this criteria, high and very high sensitive farm enterprises along each Corridor Option are distinguished from low – medium sensitivity farm

¹Environmental Protection Agency (EPA) (August 2017) Guidelines on the Information to be contained in Environmental Impact Assessment Report. Available from: <https://www.epa.ie/pubs/advice/ea/EPA%20EIA%20Guidelines.pdf> [Accessed 09 April 2020]

² Transport Infrastructure Ireland (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf> [Accessed: 09 April 2020]

enterprises according to criteria set out in Table 4.31 of Section 4.11.2. Dairy, equine farms, horticultural and other highly sensitive enterprises were identified from aerial photography and the site survey. The folios of these high and very high sensitivity enterprises were identified using the PRAI data;

3. Landtake impacts (including impacts of farm yards) for each corridor option.

A high level assessment of the potential landtake impacts was made by assessing the Corridor Options. The potential landtake of agricultural land (as identified in Section 4.11.3 and Figure 11.1 – Land Use) and impacts on farm yards is assessed.;

4. Mitigated severance impacts along each Corridor Option.

The severance impacts of the Corridor Options were assessed by measuring offline lengths (if any) of the options.

5. Impacts on farm viability.

Farm viability describes the capacity of a farm to survive, grow and develop. High viability is associated with large farm size, good land quality, intensive land-use and the presence of high sensitivity farm enterprises such as dairy and equine. The farm viability within the study area is high due to the presence of good quality land, a large farm size (50.6ha compared to national average of 32.7hectares – see Table 4.34 of Chapter 4) and the presence of regionally important stud farms.

1.2.1 Scoring Procedure

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG scoring procedure. The PAG seven-point scale scoring procedure is shown in Table 1.1.

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

In the first instance, individual assessments were carried out on each criterion followed by an overall assessment. A score was assigned to each Corridor Option based on the TII PAG seven point scale, and the overall preference for each

Corridor Option of Preferred, Intermediate, or Least Preferred was assigned using a combination of the assessment criteria results and professional judgement.

1.3 Corridor Options Assessment

1.3.1 Corridor Option 1

The farms adjacent to this Corridor Option are approximately 50.6 hectares (Table 4.34). This is larger than the County Kildare average (44.1 hectares) and the State average (32.7 hectares).

There are three high and very high sensitivity farm enterprises adjoining this Corridor Option.

The landtake is assessed to be imperceptible. The proposed hard shoulder bus priority measure in both the eastbound and westbound directions will be constructed within the existing fenceline - with the potential for a very small amount of additional land.

The mitigated severance impact will be imperceptible because the development of the proposed hard shoulder bus priority measure in both the eastbound and westbound directions will be within the existing fenceline.

The farm viability adjacent to Corridor Option 1 is high due to the presence of good quality land, a large farm size and the presence of two regionally important stud farms and one high sensitivity equine farm and dog kennels.

Having assessed the five criteria (farm size, farm type, landtake, severance and viability) this Corridor Option is assessed to have a ‘Not Significant or Neutral’ impact - PAG Score 4 on the seven point scale. This option is Preferred because there is unlikely to be potential for any landtake outside of the existing fenceline.

1.3.2 Corridor Option 2

The farm size, type and farm viability along this Corridor Option is the same as Corridor Option 1. While the cross section of this Corridor Option is circa 1.5m wider than Corridor Option 1 the landtake is also assessed to be imperceptible. The mitigated severance impact is imperceptible because this option will be within the existing fenceline.

Having assessed the five criteria (farm size, farm type, landtake, severance and viability) this Corridor Option is assessed to have a ‘Not Significant or Neutral’ impact - PAG Score 4 on the seven point scale. This option is also Preferred because there is the potential for only a very minimal landtake outside of the existing fenceline.

1.3.3 Corridor Option 3

The farm size, type and farm viability along this Corridor Option is the same as Corridor Option 1 and Option 2. While the cross section of this Corridor Option is circa 5m wider than Corridor Option 1, the landtake is also assessed to be

imperceptible. The mitigated severance impact is imperceptible because this option will have minimal landtake outside of the existing fenceline.

Having assessed the five criteria (farm size, farm type, landtake, severance and viability) this Corridor Option is assessed to have a ‘Not Significant or Neutral’ impact - PAG Score 4 on the seven point scale. This option is Least Preferred because while potential landtake is minimal, the cross section of this option is 5m wider than Corridor Option 1 and 3.5m wider than Corridor Option 2.

1.3.4 Assessment Matrix

Table 1.2: Corridor Options Material Assets – Agriculture - Assessment Summary

Assessment Criteria	Corridor Option 1	Corridor Option 2	Corridor Option 3
Quantitative Assessment Assessment criteria 1 – Farm Size	50.6ha (compared to the national average of 32.7ha) PAG Score 4	50.6ha (compared to the national average of 32.7ha) PAG Score 4	50.6ha (compared to the national average of 32.7ha) PAG Score 4
Assessment criteria 2 – Farm Type	A small number of very high sensitivity stud farms – reminder of farms are medium sensitivity. Potential impacts are assessed to be low due to on-line nature of the Corridor Option PAG Score 3	A small number of very high sensitivity stud farms – reminder of farms are medium sensitivity. Potential impacts are assessed to be low due to on-line nature of the Corridor Option PAG Score 3	A small number of very high sensitivity stud farms – reminder of farms are medium sensitivity. Potential impacts are assessed to be low due to on-line nature of the Corridor Option PAG Score 3
Assessment criteria 3 – Land take Sub-criteria – Land take Sub-criteria – Length on-line / off-line Impacts On farm-yards	Proposed cross section = 29m. Proposed development mainly within the existing fenceline. Land take is assessed as imperceptible. Approx. 8.4km (100%) of entire length is on-line. There are 2 farm yards along the existing fenceline – the impacts on these yards will not increase significantly.	Proposed cross section = 30.5m. Proposed development mainly within the existing fenceline. Land take is assessed as imperceptible. Approx. 8.4km (100%) of entire length is on-line. There are 2 farm yards along the existing fenceline – the impacts on these yards will not increase significantly.	Proposed cross section = 34m. Proposed development mainly within the existing fenceline. Land take is assessed as imperceptible. Approx. 8.4km (100%) of entire length is on-line. There are 2 farm yards along the existing fenceline – the impacts on these yards will not increase significantly.

Assessment Criteria	Corridor Option 1	Corridor Option 2	Corridor Option 3
Sub-criteria – Quality of land take	Main soil type is a Luvisol – good quality land - with a minority of heavy gley soils PAG Score 4	Main soil type is a Luvisol – good quality land – with a minority of heavy gley soils PAG Score 4	Main soil type is a Luvisol – good quality land – with a minority of heavy gley soils PAG Score 4
Assessment criteria 4 – Severance (length off-line)	Approx. 8.4km (100%) of entire length is on-line, therefore not significant severance impact. PAG Score 4	Approx. 8.4km (100%) of entire length is on-line, therefore not significant severance impact. PAG Score 4	Approx. 8.4km (100%) of entire length is on-line, therefore not significant severance impact. PAG Score 4
Assessment criteria 5 – Viability	Viability is high along this Corridor option – but impact on the viability of farms is low. PAG Score 3	Viability is high along this Corridor option – but impact on the viability of farms is low. PAG Score 3	Viability is high along this Corridor option – but impact on the viability of farms is low. PAG Score 3
Qualitative Assessment	Neutral or Not significant Corridor Option almost entirely within existing fenceline and entirely on-line thus minimising the land take and severance impacts. Large farms. There are three high and very high sensitivity farms adjacent to this Corridor Option, however potential impacts are at the edge of these enterprises. High viability but low impacts.	Neutral or Not significant Corridor Option almost entirely within existing fenceline and entirely on-line thus minimising the land take and severance impacts. Large farms. There are three high and very high sensitivity farms adjacent to this Corridor Option, however potential impacts are at the edge of these enterprises. High viability but low impacts.	Neutral or Not significant Corridor Option almost entirely within existing fenceline and entirely on-line thus minimising the land take and severance impacts. Large farms. There are three high and very high sensitivity farms adjacent to this Corridor Option, however potential impacts are at the edge of these enterprises. High viability but low impacts.
Overall Score / Impact Level	4	4	4
Preference	Preferred	Preferred	Least Preferred

1.4 Summary

The three Corridor Options are assessed to have a ‘Not Significant or Neutral’ impact - PAG Score 4 on the seven point scale. Corridor Options 1 and 2 are both Preferred, and Corridor Option 3 is Least Preferred.

Kildare County Council

Maynooth to Leixlip Project

Options Report - Appendix 5 - Stage
1 Air Quality- Corridor Options
Assessment

Draft 1 | 30 April 2022

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Job number 272691-00

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Tables

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Air Quality Assessment Matrix of Corridor Options

1 Stage 1 Air Quality Corridor Options Assessment

1.1 Introduction

This section details the Stage 1 Air Quality assessment of the Corridor Options with respect to the Air Quality constraints identified in the Constraints Report.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

The multi-criteria air assessment was undertaken with reference to the Transport Infrastructure Ireland (TII) Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes¹ and in accordance with the requirements of the TII Project Management Guidelines 2019², and the TII Project Manager's Manual, 2019³ and the TII Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis PE-PAG-02031, October 2016. An air quality specialist is required to define their assessment methodology and assessment sub-criteria based on their expert opinion and best practice. The assessment includes both a quantitative and qualitative element. Each impact is scored qualitatively based on the PAG seven-point scale and an integer is assigned according to the impact level as shown in **Table 1.1**.

Using a combination of the impact scores and professional judgement, a determination as to the level of the impact of each Corridor Option was provided. The Environmental Protection Agency (EPA) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports were also referred to when undertaking this assessment, particularly Table 3.3 in determining the significance of the impact.

Using the impact scores and the professional judgement of the specialist, a determination is made as to whether each Corridor Option that is assessed is either:

- Preferred;
- Intermediate; or

¹ National Roads Authority NRA, 2011. Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes, 2011. Available from <https://www.tii.ie/technical-services/environment/planning/Guidelines-for-the-Treatment-of-Air-Quality-during-the-Planning-and-Construction-of-National-Road-Schemes.pdf>

² Transport Infrastructure Ireland, 2020. Project Management Guidelines PE-PMG-02041. Available from: <https://www.tiipublications.ie/library/PE-PMG-02041-03.pdf> [Accessed: 30th October 2021]

³ Transport Infrastructure Ireland (TII), 2019. Project Manger's Manual for Major National Road Projects PE-PMG-02042. Available from <https://www.tiipublications.ie/library/PE-PMG-02042-01.pdf> [Accessed: 30th October 2021]

- Least Preferred.

The Corridor Options are weighted against each other in the assessment matrix. Each environmental discipline may require a number of matrix tables to assess various sub-criteria, however, an overall matrix will be included at the conclusion of each assessment providing an overall summary of the assessment for the three Corridor Options.

1.2.1 Assessment Criteria

The Air Quality assessment is based on the number of sensitive receptors in proximity to each Corridor Option and the projected traffic volumes accessing the corridors during the operational phase. The construction phase is assessed through the consideration of the number of sensitive properties located in proximity to the likely construction works where dust impacts may be experienced.

Section 2.3, *Route Selection Process Stage 1 Preliminary Options Assessment*, of the NRA, 2011 Guidelines¹ includes the initial steps to assess air quality within a study area as follows:

“The specific objectives of the air quality input to the Stage 1 Preliminary Options Assessment of the Route Selection Process are to characterise the existing and ambient air quality in the study area and to initially identify all sensitive receptor locations within the study area likely to be impacted by the proposed scheme before feasible route options are identified. Once feasible route options are identified and in order to undertake the preliminary options assessment, the total number of sensitive receptors (e.g. residential properties) within 50m of the carriageway of each feasible route option should be recorded with a view to eliminating those routes with the greater number of sensitive receptors likely to be impacted by the proposed scheme.”

The existing and ambient air quality and the initial identification of sensitive receptor locations within the study area are included in the Air Quality Constraints in the Constraints Report. The air quality conditions for this assessment are in line with the baseline conditions set out in the Constraints Report.

The scope of the air quality assessment is described in Section 2.3 of the NRA, 2011 Guidelines¹ as follows:

“Identify and record all sensitive receptor locations within the study area and all sensitive receptors within 50 m of the carriageway of each feasible route option that are, or have the potential to be significantly affected by a proposed scheme”

In line with the NRA, 2011 Guidelines¹ a quantitative assessment of potential air quality impacts on existing and potential sensitive receptors was undertaken.

Sensitive receptor locations are defined in the NRA, 2011 Guidelines as residential housing, schools, hospitals, places of worship, sports centres, and shopping areas, i.e. locations where members of the public are likely to be regularly present. In addition, planning applications give an indication to the potential number of future sensitive receptors adjacent to corridors.

Traffic data projections are provided for each Corridor Option. This data is considered in the assessment of options.

1.2.2 Scoring Procedure

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG scoring procedure. The PAG seven-point scale scoring procedure is shown in Table 1.1.

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

In the first instance, individual assessments were carried out on each criterion followed by an overall assessment. A score was assigned to each Corridor Option based on the TII PAG seven point scale, and the overall preference for each Corridor Option of Preferred, Intermediate, or Least Preferred was assigned using a combination of the assessment criteria results and professional judgement.

1.3 Corridor Options Assessment

The number of existing and potential sensitive receptors in proximity to each Corridor Option determines local air quality impacts. The zone of interest for the assessment is 0-50m from each Corridor Option potential road footprint. This is an offset from the edge of the potential road footprint of each Corridor Option and assumes that properties within the potential footprint would be acquired and would therefore not be counted as receptors.

All of the Corridor Options are located within the existing M4/N4 corridor and include both bus and road elements, therefore the sensitive receptors in proximity are the same for Corridor Options 1, 2 and 3.

The numbers of sensitive receptors in proximity to each Corridor Option and the air quality assessment determinations are outlined in Table 1.2. The predicted AADT volumes listed below are taken from the same section of the M4 between Junction 7 Maynooth and Junction 6 Celbridge for each Corridor Option.

1.3.1 Corridor Option 1

Corridor Option 1 is predicted to have minor or slightly negative air quality impacts on sensitive receptors in close proximity to the M4/N4.

During the operational stage of Corridor Option 1, the implementation of bus priority measures will result in no change to traffic volumes.

Air quality impacts are predicted to have the least negative impacts compared to other options and therefore, Corridor Option has been ranked as Preferred in the Assessment Matrix Table, both in relation to construction and operational phases.

1.3.2 Corridor Option 2

The addition of a new westbound traffic lane has the potential to result in minor or slightly negative impacts on surrounding sensitive receptors, during the construction and operational phases.

During the operational phase, the implementation of bus priority measures and the addition of an additional westbound traffic lane will result in an increase in traffic volumes. Both the construction and the operational stages are predicted to result in minor or slightly negative impacts to air quality. The construction stage is expected to result in short term adverse impacts. However, the operational phase is expected to result in long term adverse impacts on air quality due to increases in traffic volumes. This Corridor Option is rated as 'Intermediate' relative to the other Corridor Options.

1.3.3 Corridor Option 3

During the operational phase, the implementation of bus priority measures and the addition of two new traffic lanes will result in an increase in traffic volumes. Both the construction and the operational stages are predicted to result in moderate negative impacts to air quality. The construction stage is expected to result in short term adverse impacts. However, the operational phase is expected to result in long term adverse impacts on air quality due to increases in traffic volumes. This corridor is the Least Preferred Corridor Option relative to the other two options.

Table 1.2: Air Quality Assessment Matrix of Corridor Options

Assessment Criteria	Do-Minimum	Corridor Option 1	Corridor Option 2	Corridor Option 3
Property counts – existing sensitive receptors 0 - 50m	45	45	45	45
Property counts – granted planning applications for sensitive receptor developments 0 – 50m	N/A	57	57	57
Total No. of Receptors within 0-50m	45	102	102	102

Assessment Criteria	Do-Minimum	Corridor Option 1	Corridor Option 2	Corridor Option 3
Annual Average Daily Traffic	69,801	69,801	70,650	71,028
Qualitative Assessment	N/A	Minor or slightly negative	Minor or slightly negative	Moderately negative
Score / Impact Level	N/A	3	3	2
Preference	N/A	Preferred	Intermediate	Least Preferred

1.4 Summary

The results from the air quality assessment conclude that Corridor Option 1 is the Preferred as it involves the least amount of construction work and no increase in traffic volumes is predicted. Corridor Option 2 is considered as Intermediate as additional traffic volumes are predicted to be less than Corridor Option 3. Finally, Corridor Option 3 was assessed as the Least Preferred as it is predicted to result in the largest increase in traffic volumes, with a substantial level of construction work required.

Kildare County Council

Maynooth to Leixlip Project

Options Report - App 5 - Stage 1
Archaeological, Architectural and
Cultural Heritage Corridor Options
Assessment

Draft 1 | 30 April 2022

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Job number 272691-00

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Table 1.4: Assessment of Corridor Option 1

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1 Stage 1 Archaeological, Architectural and Cultural Heritage Options Assessment

1.1 Introduction

This section details the Stage 1 assessment of the Corridor Options with respect to the constraints associated with Archaeological, Architectural and Cultural Heritage identified in the Constraints Report.

Section 1.2 outlines the methodology that was used to carry out the assessment, Section 1.3 details the Archaeological, Architectural and Cultural Heritage Corridor Options assessment and Section 1.4 summarises the results of the assessment.

1.2 Methodology

In order to produce a meaningful assessment (in relation to the Archaeological, Architectural and Cultural Heritage resource), a preliminary design of the Corridor Options footprint has been used to assess for potential direct and indirect impacts on the Archaeological, Architectural and Cultural Heritage constraints (identified in Constraints Report). A study area of 200m from the edge of designed Corridor Option has been utilised to assess for potential direct and indirect impacts upon same. Measurements are made from the edge of the Corridor Option to the upstanding remains of the archaeological, architectural, or cultural heritage constraint. If no remains are upstanding, the measurement is made to the centre of the site.

Each key constraint included in and within 200m of the Corridor Option is tabulated with measurements from the Corridor Option included. The impact type is then defined (direct, indirect, no impact, positive, negative, neutral) based on whether the constraint will be physically affected or not by the Corridor Option. Dependant on the how the constraint will be affected this will define the potential impact on the constraint (significant, very significant, profound). The impact types and the definition of the significance of effects are included in Table 1.4 – Table 1.6 below. Any Corridor Option that results in a high amount of direct negative impacts on the key Archaeological, Architectural and Cultural Heritage constraints, are deemed to be Least Preferred.

Based on the above therefore, the assessment comprises the calculation and definition of the potential direct and indirect impacts upon the Archaeological, Architectural and Cultural Heritage resource associated with each Corridor Option and the potential significance of those impacts. This results in the overall ranking of the Corridor Options in order of preference.

The assessment of the Corridor Options is focused on the key Archaeological, Architectural and Cultural Heritage constraints, identified during the overall constraints study for the project (Section 4.10). These consist of the following:

- Recorded Monuments & Places (RMP) (AH sites);

- Sites and Monuments Record (SMR) (AH sites);
- National Monuments (AH sites);
- Monuments protected with a Preservation Order (AH sites);
- Protected Structures (BH sites);
- National Inventory of Architectural Heritage (BH sites);
- Architectural Conservation Areas (ACA);
- Designed Landscapes (DL); and
- Previous Archaeological Excavations (EX).

The TII Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis was used as a basis for the assessment of potential impacts on the Archaeological, Architectural and Cultural Heritage resource and these have been streamlined with the significance of effects, as contained within the Environmental Protection Agency (EPA) Draft Guidelines on Information to be Contained within an Environmental Impact Assessment (Table 1.1). The EPA guidelines are used in the tabulation of the Significance of Effects in all the assessment tables for each Corridor Option. However, in the summary matrix, these significance ratings are realigned to the TII Multi Criteria Analysis as set out in Table 1.1.

Table 1.1: Alignment of TII and EPA Guidelines

TII Multi Criteria Analysis	Assessment Score	EPA Guidelines (Significance of Effects)
Majorly positive	7	Profound positive
		Very significant positive
Moderately positive	6	Significant positive
		Moderate positive
Minor or slightly positive	5	Slight positive
		Not significant positive
Not significant or neutral	4	Imperceptible negative
		Not significant negative
Minor or slightly negative	3	Slight negative
Moderately negative	2	Moderate negative
		Significant negative
Major or highly negative	1	Very significant negative
		Profound negative

The following impact types and definitions (of significance of effect) were used in order to assess the potential impacts of the proposed Corridor Options on each relevant Archaeological, Architectural and Cultural Heritage constraint.

Impact Types

The quality and type of an impact can vary to include the following (as per NRA's Guidelines for the Assessment of Archaeological / Architectural Heritage Impacts of National Road Schemes (NRA, 2005, 25/54) (Table 1.2):

Table 1.2: Types of Impact

Impact Type	Definition
Negative Impact:	A change that will detract from or permanently remove an archaeological / architectural monument/structure from the landscape.
Neutral Impact:	A change that does not affect the archaeological / architectural heritage.
Positive Impact:	A change that improves or enhances the setting of an archaeological / architectural monument/structure.
Direct Impact:	Where an archaeological/architectural feature or site is physically located within the footprint of the option and entails the removal of part, or all of the monument or feature.
Indirect Impact:	Where a feature or site of archaeological / architectural heritage merit or its setting is located in close proximity to the option.
No Predicted Impact:	Where the potential option does not adversely or positively affect an archaeological / architectural heritage site.

It should be noted that whilst impact levels and definitions are applied consistently to the cultural heritage resource, direct impacts on sites that are subject to statutory protection are considered to be of more consequence during the Option Selection process.

Definition of the Significance of Effects

The definition of the significance of effects is included in the NRA's Guidelines for the Assessment of Archaeological / Architectural Heritage Impacts of National Road Schemes (NRA, 2005, 54/21) (Table 1.3). These have been aligned, and added to, with the more recent Environmental Protection Agency (2017) Draft Guidelines on Information to be Contained within an Environmental Impact Assessment.

Table 1.3: Significance of Effect Definitions: Archaeology and Architecture

Significance of Effect	Definitions relating to sites of an archaeological nature	Definitions relating to sites of an architectural nature
Profound negative	Applies where mitigation would be unlikely to remove adverse effects. Reserved for adverse, negative effects only. These effects arise when an archaeological site is completely and irreversibly destroyed by a proposed development.	An impact that obliterates the architectural heritage of a structure or feature of national or international importance. These effects arise where an architectural structure or feature is completely and irreversibly destroyed by the proposed development. Mitigation is unlikely to remove adverse effects.
Very Significant negative	An effect which, by its character, magnitude, duration, or intensity significantly alters the majority of a sensitive aspect of the environment. An impact like this would be where the majority of the site would be permanently impacted upon, leading to a loss of character, integrity, and data about the archaeological feature/site.	An effect which, by its character, magnitude, duration, or intensity significantly alters the majority of a sensitive aspect of the environment. An impact like this would be where the majority of the structure would be permanently impacted upon, leading to a loss of character, integrity, and data about the archaeological feature/site.
Significant negative	An impact which, by its magnitude, duration, or intensity, alters an important aspect of the environment. An impact like this would be where part of a site would be permanently impacted upon, leading to a loss of character, integrity, and data about the archaeological feature/site.	An impact that, by its, magnitude, duration or intensity alters the character and/or setting of the architectural heritage. These effects arise where an aspect or aspects of the architectural heritage is/are permanently impacted upon leading to a loss of character and integrity in the architectural structure or feature. Appropriate mitigation is likely to reduce the impact.
Moderate negative	A moderate impact arises where a change to the site is proposed, which although noticeable, is not such that the archaeological integrity of the site is compromised, and which is reversible. This arises where an archaeological feature can be incorporated into modern day development without damage and that all procedures used to facilitate this are reversible.	An impact that results in a change to the architectural heritage which, although noticeable, is not such that alters the integrity of the heritage. The change is likely to be consistent with existing and emerging trends. Impacts are probably reversible and may be of relatively short duration. Appropriate mitigation is very likely to reduce the impact.
Slight negative	An impact which causes changes to the character of the environment which are not significant or profound and do not directly impact or affect an archaeological feature or monument.	An impact that causes some minor change in the character of architectural heritage of local or regional importance without affecting its integrity or sensitivities. Although noticeable, the effects do not directly impact on the architectural structure or feature. Impacts are reversible and of relatively short duration. Appropriate mitigation will reduce the impact.
Not Significant negative	An effect which causes noticeable changes in the character of the	An effect which causes noticeable changes in the character of the

Significance of Effect	Definitions relating to sites of an archaeological nature	Definitions relating to sites of an architectural nature
	environment but without noticeable consequences.	environment but without noticeable consequences.
Imperceptible negative	An impact capable of measurement but without noticeable consequences.	An impact on architectural heritage of local importance that is capable of measurement but without noticeable consequences.
Imperceptible positive	An impact capable of measurement but without noticeable consequences.	An impact on architectural heritage of local importance that is capable of measurement but without noticeable consequences.
Slight positive	An impact which causes positive changes to the character of the environment which are not significant or profound but enhance the setting of an archaeological feature or monument.	An impact that causes some minor positive change in the character of architectural heritage of local or regional importance enhancing its integrity or sensitivities.

The overall assessment of the Corridor Options has resulted in the identification of Preferred, Intermediate and Least Preferred assigned to each Corridor Option in relation to the Archaeological, Architectural and Cultural Heritage resource. The results of this assessment are then included in the Multi Criteria Analysis (MCA) for the overall options assessment.

1.3 Archaeological, Architectural and Cultural Heritage Corridor Option Assessments

1.3.1 Corridor Option 1

Table 1.4: Assessment of Corridor Option 1

Site Ref.:	Type:	Designation	Dist. from option:	Impact Type:	Significance of Effect:
BH15	Round House	RPS	145m southeast	None predicted	N/A
BH14	Weir	RPS	135m northeast	None predicted	N/A
DL7	Lucan demesne	None	0m	None predicted	N/A
BH12	Water pump	NIAH	161m south	None predicted	N/A
BH9	Cooldrinagh Lodge	RPS	97m north	None predicted	N/A
DL6	Cooldrinagh Lodge demesne	Principal structure in RPS	0m	None predicted	N/A
DL5	Westonpark House demesne	None	0m	None predicted	N/A

Site Ref.:	Type:	Designation	Dist. from option:	Impact Type:	Significance of Effect:
AH28	Ring barrow/ lithic scatter	RMP	197m north	None predicted	N/A
AH26	Bridge/ fish weir	RMP	108m south	None predicted	N/A
DL4	Leixlip Castle demesne	Principal structure in RPS	0m	None predicted	N/A
BH3	Wonderful Barn	RPS	192m north	None predicted	N/A
DL2	Castletown demesne	Principal structure in RPS	0m	None predicted	N/A
AH18	Habitation site	SMR	12m north	None predicted	N/A
AH19	Burnt mound	Proposed RMP	56m north	None predicted	N/A
AH20	Habitation sites (x2)	SMR	29m north	None predicted	N/A
AH21	Corn drying kiln/ metal working site	SMR	26m south	None predicted	N/A
AH22	Enclosure/ corn drying kiln/ ring ditch	Proposed RMP	85m SSW	None predicted	N/A
AH13	Field system	RMP	114m north	None predicted	N/A
AH11	Habitation site	SMR	70m south	None predicted	N/A
AH7	Furnace	SMR	120m north	None predicted	N/A
AH8	Burial ground	SMR	163m north	None predicted	N/A
AH6	Field system	Proposed SMR	126m south	None predicted	N/A

1.3.2 Corridor Option 2

Table 1.5: Assessment of Corridor Option 2

Site Ref.	Type	Designation	Dist. from option	Impact Type	Significance of Effect
BH15	Round House	RPS	145m southeast	None predicted	N/A
BH14	Weir	RPS	135m northeast	None predicted	N/A
DL7	Lucan demesne	None	0m	None predicted	N/A
BH12	Water pump	NIAH	161m south	None predicted	N/A
BH9	Cooldrinagh Lodge	RPS	97m north	None predicted	N/A
DL6	Cooldrinagh Lodge demesne	Principal structure in RPS	0m	None predicted	N/A
DL5	Westonpark House demesne	None	0m	None predicted	N/A
AH28	Ring barrow/ lithic scatter	RMP	197m north	None predicted	N/A
AH26	Bridge/ fish weir	RMP	108m south	None predicted	N/A
DL4	Leixlip Castle demesne	Principal structure in RPS	0m	None predicted	N/A
BH3	Wonderful Barn	RPS	192m north	None predicted	N/A
DL2	Castletown demesne	Principal structure in RPS	0m	None predicted	N/A
AH18	Habitation site	SMR	12m north	None predicted	N/A
AH19	Burnt mound	Proposed RMP	56m north	None predicted	N/A
AH20	Habitation sites (x2)	SMR	29m north	None predicted	N/A
AH21	Corn drying kiln/ metal working site	SMR	26m south	None predicted	N/A
AH22	Enclosure/ corn drying kiln/ ring ditch	Proposed RMP	85m SSW	None predicted	N/A
AH13	Field system	RMP	114m north	None predicted	N/A
AH11	Habitation site	SMR	70m south	None predicted	N/A

Site Ref.	Type	Designation	Dist. from option	Impact Type	Significance of Effect
AH7	Furnace	SMR	120m north	None predicted	N/A
AH8	Burial ground	SMR	163m north	None predicted	N/A
AH6	Field system	Proposed SMR	126m south	None predicted	N/A

1.3.3 Corridor Option 3

Table 1.6: Assessment of Corridor Option 3

Site Ref.:	Type	Designation	Dist. from option	Impact Type	Significance of Effect
BH15	Round House	RPS	145m southeast	None predicted	N/A
BH14	Weir	RPS	135m northeast	None predicted	N/A
DL7	Lucan demesne	None	0m	None predicted	N/A
BH12	Water pump	NIAH	161m south	None predicted	N/A
BH9	Cooldrinagh Lodge	RPS	97m north	None predicted	N/A
DL6	Cooldrinagh Lodge demesne	Principal structure in RPS	0m	None predicted	N/A
DL5	Westonpark House demesne	None	0m	None predicted	N/A
AH28	Ring barrow/ lithic scatter	RMP	197m north	None predicted	N/A
AH26	Bridge/ fish weir	RMP	108m south	None predicted	N/A
DL4	Leixlip Castle demesne	Principal structure in RPS	0m	None predicted	N/A
BH3	Wonderful Barn	RPS	192m north	None predicted	N/A
DL2	Castletown demesne	Principal structure in RPS	0m	None predicted	N/A
AH18	Habitation site	SMR	12m north	None predicted	N/A
AH19	Burnt mound	Proposed RMP	56m north	None predicted	N/A

Site Ref.:	Type	Designation	Dist. from option	Impact Type	Significance of Effect
AH20	Habitation sites (x2)	SMR	29m north	None predicted	N/A
AH21	Corn drying kiln/ metal working site	SMR	26m south	None predicted	N/A
AH22	Enclosure/ corn drying kiln/ ring ditch	Proposed RMP	85m SSW	None predicted	N/A
AH13	Field system	RMP	114m north	None predicted	N/A
AH11	Habitation site	SMR	70m south	None predicted	N/A
AH7	Furnace	SMR	120m north	None predicted	N/A
AH8	Burial ground	SMR	163m north	None predicted	N/A
AH6	Field system	Proposed SMR	126m south	None predicted	N/A

1.4 Summary

Each of the three Corridor Options under assessment are located within the corridor of the existing M4/N4. As such, none of the options (which relate to the way in which traffic will use the roadway) will have either a direct or indirect impact on any of the recorded archaeological, architectural or cultural heritage resource. All Corridor Options are considered to be neutral and of equal preference from an archaeological, architectural and cultural heritage perspective.

Table 1.7: Summary Assessment of Options

Criteria	Corridor Option 1	Corridor Option 2	Corridor Option 3
Impacts to number of sites subject to statutory protection	None predicted	None predicted	None predicted
Impacts to number of sites not subject to statutory protection	None predicted	None predicted	None predicted
Qualitative Assessment	Due to the Corridor Option being located in the existing M4/N4 corridor, no direct or indirect impacts are predicted upon the surrounding recorded archaeological, architectural or cultural heritage resource. Not significant or neutral	Due to the option being located in the existing M4/N4 corridor, no direct or indirect impacts are predicted upon the surrounding recorded archaeological, architectural or cultural heritage resource. Not significant or neutral	Due to the option being in the existing M4/N4 corridor, no direct or indirect impacts are predicted upon the surrounding recorded archaeological, architectural or cultural heritage resource. Not significant or neutral
Score / Impact Level	4	4	4
Preference	Preferred	Preferred	Preferred

Kildare County Council

Maynooth to Leixlip Project

Options Report - Appendix 5 - Stage
1 Biodiversity Corridor Options
Assessment

Draft 1 | 30 April 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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Tables

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Key Ecological Receptors Located within, or partially within, a Corridor Option

Table 1.3: Number of Biodiversity Impacts for each Corridor Option

Table 1.4: Biodiversity Assessment Matrix of Corridor Options

1 Stage 1 Biodiversity Corridor Options Assessment

1.1 Introduction

This section details the Biodiversity assessment of the Stage 1 Corridor Options with respect to the Biodiversity constraints identified in the Constraints Report.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment and a summary is presented in Section 1.4.

1.2 Methodology

There are three Corridor Options, all of which are broadly within the existing M4/N4 corridor between Junction 7 Maynooth and Junction 5 Leixlip.

The Stage 1 biodiversity assessment has been carried out on corridor options within which a road and bus based solution could be constructed.

The principal objectives of this assessment are to:

- Evaluate the Corridor Options, based on ecological criteria, as per the National Road Authority (NRA) *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009)¹ and Chartered Institute for Ecology and Environmental Management (CIEEM) *Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine* (2018)²;
- Assess the significance of the likely impacts on each of the biodiversity receptors potentially impacted by each Corridor Option. As per the Transport Infrastructure Ireland (TII)¹ guidance, this step discounted biodiversity receptors or ecological sites where the risk of significant impacts is unlikely considering where the application of standard mitigation and best practice during construction is unambiguous and success is highly likely; and

¹ National Roads Authority (2009) Guidelines for Assessment of Ecological Impacts of National Road Schemes. Available from: <https://www.tii.ie/technical-services/environment/planning/Guidelines-for-Assessment-of-Ecological-Impacts-of-National-Road-Schemes.pdf> [Accessed: February 2022]

² Chartered Institute for Ecology and Environmental Management (CIEEM) (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine. Available from: <https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.1.pdf> [Accessed: February 2022]

- To assess each option in accordance with Transport Infrastructure Ireland’s *Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis* (TII, 2016)³.

To fulfil these objectives, an assessment of the likely or potential impacts of each of the three Corridor Options on ecological receptors is carried out so that an informed comparison of the Corridor Options can be made with cognisance of the potential ecological consequences.

Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. Alongside the term “biodiversity”, the terms “ecology” and “ecological” are also used throughout this section of the report as a broader term to refer to the relationships of biodiversity receptors to one another and to their environment.

1.2.1 Biodiversity Stage 1 Assessment Process

The process by which the Corridor Options were assessed is as follows:

- The key ecological receptors within the study area were identified based on a combination of desktop data, consultation (i.e. relevant bodies/organisations) and field surveys;
- The key ecological receptors were assigned an ecological value based on a geographic frame of reference ranging from international to local importance;
- The likely impacts of each Corridor Option on the key ecological receptors were identified and assessed, indicating which, if any, of these are likely to be significant, and at what geographical level;
- The impacts of each Corridor Option on the key ecological receptors were scored in accordance with the TII approach⁴, on a seven-point scale ranging from ‘major or highly negative (1)’ to ‘major or highly positive (7)’;
- The overall cumulative impact of each Corridor Option across all the key ecological receptors affected was also scored on the same seven-point scale; and
- The scores attributed to each of the Corridor Options were assessed comparatively and assigned a preference ranking.

³ Transport Infrastructure Ireland (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf> [Accessed: February 2022]

⁴ TII (2016). Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis Document PE-PAG-02031

1.2.2 Key Ecological Receptors

Key ecological receptors are those biodiversity receptors confirmed, or likely to occur, within the study area with an ecological value of local importance (higher value) or greater and, therefore, likely to affect the scoring and ranking of the Corridor Options. These include:

- Designated sites for nature conservation (e.g. SACs, SPAs, NHAs, pNHAs and Nature Reserves);
- Sensitive habitats (e.g., non-Annex I semi-natural woodland habitats and watercourses⁵);
- Sensitive species (e.g. otter *Lutra lutra*); and
- Ecological sites (identified from a combination of desktop and field assessment).

The key ecological receptors were initially identified in the Constraints Report based on collation of available existing information from the desk study and consultations with relevant bodies/organisations and focussed on the known/potential ecological value for the habitats/species present. In the case of the ecological sites, the boundaries were initially defined based on interpretation of orthophotography and collation of available existing habitat information.

Walkover surveys of ecological sites within the study area were undertaken in April 2021. This was further supplemented for this Stage 1 assessment with an additional field survey undertaken in December 2021. The purpose of the field surveys was to ground truth and verify the orthophotography interpretation and selection of ecological sites, refine site boundaries, assess the ecological evaluation of each of the identified ecological sites and to detect any additional ecological sites not identified during the desk study. Walkover surveys of ecological sites which were located in proximity to, or overlapped with, one or more of the Corridor Options, were undertaken during the December survey.

In some cases, certain sections of the ecological sites (especially those lining the existing M4/N4) were viewed from a distance, owing to limited access or safety issues. However, professional assumptions were made on the value of those ecological sites based on local information gathered during previous constraints field surveys and desk study as necessary.

⁵ Watercourses are referred to as per the names presented on the EPA's online Map Viewer. Available from: <https://gis.epa.ie/EPAMaps/> [Accessed February 2022]

Where possible, during the site walkover surveys, habitat types were classified using the *Guide to Habitats in Ireland* (Fossitt, 2000)⁶ and the likelihood/potential for Annex I habitat types was confirmed or inferred based on the professional judgement of the surveyor, with reference to the *Interpretation manual of European Union Habitats EUR 28* (CEC, 2013)⁷.

Where it was not possible to confirm the presence of Annex I habitats, a precautionary approach was adopted with regards to the identification of the potential presence of Annex I habitats within an ecological site.

It should be noted that this Stage 1 assessment is on Corridor Options.

1.2.3 Ecological Valuation

The key ecological receptors identified have been valued with regard to ecological valuation guidance set out in *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009)¹ and *Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine* (CIEEM, 2018)².

The following geographic frame of reference is used when valuing the key ecological receptors:

- International importance;
- National importance;
- County importance; and
- Local importance (higher value).

All Annex I habitats that lie outside of European sites, are valued as being of at least national importance, given that these habitats are of high conservation concern. Priority Annex I habitat types that lie outside of European sites may be valued as being of international importance given that they are of the highest conservation concern at a European level (i.e., natural habitat types in danger of disappearance⁸). No Annex I habitats, priority or otherwise, have been recorded during the walkover surveys to date.

For individual sites (e.g., designated sites, watercourses or ecological sites identified during the Constraints Study), the overall ecological valuation for each of the key ecological receptors was based upon the highest value receptor known to be present, or potentially present, within the site.

⁶ Fossitt, J.A. (2000) *A Guide to Habitats in Ireland*. Heritage Council, Kilkenny. Available from: <https://www.npws.ie/sites/default/files/publications/pdf/A%20Guide%20to%20Habitats%20in%20Ireland%20-%20Fossitt.pdf> [Accessed: February 2022]

⁷ CEC. (Commission of the European Communities) (2013) *Interpretation manual of European Union Habitats EUR28*. European Commission, DG Environment. Available from: https://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf [Accessed: February 2022]

⁸ From the definition of “priority natural habitat types” in Article 1(d) of the Habitats Directive (Council Directive 92/43/EEC).

1.2.4 Assessment Criteria

The assessment of each Corridor Option included both a quantitative and qualitative assessment. Firstly, the impact on each key ecological receptor is assessed.

Although a given Corridor Option may impact upon a particular key ecological receptor, the direct impact(s) on the site may not necessarily directly impact on the highest value receptor(s). This is accounted for in the assessment as much as possible, based on the level of ecological information available.

To assess the likely ecological impacts of each Corridor Option on individual key ecological receptors, the following criteria are applied, with the use of professional judgement as to the likelihood of significant effects occurring:

- Potential impacts on an ecological receptor of national / international importance were assessed as being Major or highly negative;
- Potential impacts on an ecological receptor of county importance were assessed as being Moderately negative; and
- Potential impacts on a receptor of local importance (higher value) were assessed as being Minor or slightly negative.

To assess the likely cumulative overall ecological impacts for each Corridor Option, the following criteria were applied, in conjunction with the use of professional judgement as to the likelihood of significant effects occurring:

- Biodiversity impacts are major or highly negative) if:
 - The impact is directly on one or more designated sites valued as international or national importance (i.e. Sac, spa, pnha or nha);or
 - The impacts associated with the Corridor Option would likely result in an adverse effect on the integrity of the SAC/SPA/pnha/NHA site (i.e. For SAC/SPA this could equate to the loss of qualifying interest habitat or undermining the conservation objectives and for pnha/NHA this could relate to the loss of features for which the site is designated).
- Biodiversity impacts are moderately negative if:
 - The impact is directly on one or more non-designated ecological sites valued as national or county importance, or numerous ecological sites valued as local high importance;or
 - The impacts associated with the Corridor Option would likely result in permanent/long-term effects on non-qualifying interest Annex I habitat or on a species population considered to be of national importance.or
 - Impacts associated with the Corridor Option would likely have permanent/long-term effects on a habitat(s) or on a species population considered to be of county/local (high) importance

- Biodiversity impacts are minor or slightly negative if:
 - The impact is directly on a small number of ecological sites valued as local high importance;
 or
 - The impacts associated with the corridor option would likely have permanent/long-term effects on a habitat(s) or on a species population considered to be of local (high) importance.

Considering these cumulative impacts on the key ecological receptors identified, each Corridor Option was scored, based on the seven-point scale below and an integer was assigned according to the impact significance.

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

As all Corridor Options may be likely to have some level of a negative impact on biodiversity, neutral or positive impact scorings do not apply in this assessment.

Each of the Corridor Options were also comparatively assessed in terms of the overall impact significance, to provide a preference ranking. The preference ranking was as follows:

- Preferred;
- Intermediate; and
- Least Preferred.

In accordance with the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009)¹, key ecological receptors within the study area were not assessed against the Corridor Options where the risk of significant impacts is unlikely, considering where the delivery of standard mitigation and best practice during construction is unequivocal and success is highly likely. For example, with the application of standard pollution control measures during construction and an operational drainage and pollution control system designed to current standards, sensitive biodiversity receptors downstream of Corridor Options are not likely to be affected. However, it should be noted that potential watercourse crossings were considered in this assessment, as it cannot be assumed that clear-span crossings will be possible at each crossing points.

In addition, potential watercourse crossings may result in indirect impacts on the watercourse in question (e.g. potential for disturbance to QI species, potential for spread of non-native invasive species).

1.3 Biodiversity Corridor Option Assessments

This section details the biodiversity Stage 1 Preliminary Assessment of the Corridor Options. Key ecological receptors which are located within, or partially within, a Corridor Option, and on which the Corridor Options were assessed, are presented in Table 1.2.

Only direct impacts were considered. Indirect impacts, such as those resulting from air quality impacts/ impacts to hydrogeology were not considered at this stage of the assessment.

Table 1.2: Key Ecological Receptors Located within, or partially within, a Corridor Option

Site Name	Description	Ecological Value
EC18	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC19	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC20	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC21	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC22	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC23	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC29	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC30	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC40	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC41	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC44	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC45	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC47	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC48	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)

Site Name	Description	Ecological Value
Kilmacredock_upper	Watercourse joining with the River Liffey within Leixlip reservoir.	County importance
River Liffey	Nationally important watercourse of a large scale which ultimately discharges to a number of downstream European sites i.e., those within Dublin Bay. Based on consultation with IFI, the Liffey supports a regionally significant population of Atlantic salmon (<i>Salmo salar</i>), a species listed under Annex II and V of the EU Habitats Directive in addition to Brown trout, lamprey, eel and many other sensitive species.	National importance

1.3.1 Ecological Receptors

A summary of the number of ecological receptors impacted by each Corridor Option is provided in Table 1.3.

Table 1.3: Number of Biodiversity Impacts for each Corridor Option

Assessment Criteria	Corridor Option 1	Corridor Option 2	Corridor Option 3
Significant impact on sites of International Importance (major or highly negative)	0	0	0
Significant impact on sites of National Importance (major or highly negative)	0	0	0
Significant impact on sites of County Importance (moderately negative)	0	0	0
Significant impact on sites of Local Importance (Higher Value) (minor or slightly negative)	11	12	16

At this stage of the process, three corridor options are being assessed. All three are along the existing M4/N4 corridor.

1.3.2 Corridor Option 1

Corridor Option 1 interacts with ecological sites EC29, EC30, EC40, EC41 between Junction 5 Leixlip and Junction 6 Celbridge. It interacts with ecological sites EC20, EC21, EC22, EC23 and EC45 between Junction 6 Celbridge and Junction 7 Maynooth.

Between Junction 7 Maynooth and Junction 5 Leixlip, Corridor Option 1 crosses two watercourses, one of National importance; the River Liffey and one of County importance; the Kilmacredock_upper. The River Liffey is valued as a Nationally important watercourse due to its large scale and the fact that it ultimately discharges to a number of downstream European sites i.e., those within Dublin Bay. Additionally, based on consultation with IFI carried out as part of the earlier constraints phase for the project, the Liffey supports a regionally significant population of Atlantic salmon (*Salmo salar*), a species listed under Annex II and V of the EU Habitats Directive, in addition to Brown trout, lamprey, eel and many other sensitive species.

The Kilmacredock Upper is valued as County importance given its direct connectivity to the River Liffey and being part of the overall Liffey system, it is considered Salmonid. Although the River Liffey is valued as National importance and the Kilmacredock Upper is valued as County importance, the proposed works will not significantly impact on either.

It is envisaged that existing structures will not be significantly impacted and that overbridges including the River Liffey Bridge will not be impacted. Additionally, as outlined above, only direct impacts were considered. Indirect impacts, such as those resulting from air quality impacts/impacts to hydrogeology were not considered at this stage of the assessment and thus the impact significance of the Corridor Options are valued as local importance (higher value) for both watercourses.

Given that this option interacts with the least number of terrestrial ecological sites (all of which are valued as being of Local importance (higher value)) it is ranked as the Preferred Corridor Option with respect to biodiversity.

This corridor also interacts with two watercourses; however this is not unique to this option as all three Corridor Options cross these two watercourses at the same locations.

1.3.3 Corridor Option 2

Corridor Option 2 has an almost identical footprint to Corridor Option 1, consisting of primarily of roadway and roadside planting along the existing M4/N4 corridor between Junction 7 Maynooth and Junction 5 Leixlip. Corridor Option 2 intersects with the same ecological sites and watercourses as Corridor Option 1. Corridor Option 2 does interact with one additional ecological site, valued as local importance (higher value); EC48. Based on the mapped boundaries, Corridor Option 2 also interacts with slightly more area of EC23 along the southern extents of the M4/N4 in Moortown.

Given the similarities between both options described above there is very little to distinguish these Corridor Options from a biodiversity perspective. However, given that this option interacts with one additional ecological site and includes an additional third lane in the westbound direction, Corridor Option 2 has been classified as intermediate preference.

1.3.4 Corridor Option 3

As noted with Corridor Option 2, Corridor Option 3 follows the existing M4/N4 and has a very similar footprint to the two options described above. Corridor Option 3 interacts with two additional ecological sites, namely EC18 and EC19. Corridor Option 3 also interacts with two additional ecological sites in the vicinity of Junction 7 Maynooth; EC44 and EC47, both of which consist of treeline/narrow woodland band planting along the existing M4 and are valued as local importance (higher value). Corridor Option 3 also has a wider footprint and expands into the existing M4/N4 verges more than either of the other two options in certain areas including the River Liffey, Ballygoran, Kilmacredock Upper, Barnhall and Leixlip Demesne.

As with both of the above options, Corridor Option 3 also crosses the River Liffey and the Kilmacredock Upper.

Corridor Option 3 was assessed as being the Least Preferred, due to the fact that it interacts with four additional ecological sites (of Local importance (Higher value) than Corridor Option 2 and five additional Ecological sites than Corridor Option 1. Furthermore, this option includes an additional third traffic lane in both the eastbound and westbound directions.

The Biodiversity Assessment Matrix of the Corridor Options is provided in Table 1.4.

Table 1.4: Biodiversity Assessment Matrix of Corridor Options

Assessment Criteria	Corridor Option 1	Corridor Option 2	Corridor Option 3
Significant impact on sites of International Importance	0 major or highly negative impacts	0 major or highly negative impacts	0 major or highly negative impacts
Significant impact on sites of National Importance	0 major or highly negative impacts	0 major or highly negative impacts	0 major or highly negative impacts
Significant impact on sites of County Importance	0 moderately negative impact	0 moderately negative impact	0 moderately negative impact
Significant impact on sites of Local Importance (Higher Value)	11 minor or slightly negative	12 minor or slightly negative	16 minor or slightly negative
Overall Assessment	There are 11 'minor or slightly negative' impacts associated with this Corridor Option	There are 12 'minor or slightly negative' impacts associated with this Corridor Option	There are 16 'minor or slightly negative' impacts associated with this Corridor Option
Qualitative Assessment	Impacts on the Kilmacredock Upper River and nine additional ecological sites of local importance (higher value) all of which consist of treelines and narrow woodland bands lining the existing M4/N4. Minor Negative	Impacts on the River Liffey, River Kilmacredock Upper River and 10 additional ecological sites of local importance (higher value) all of which consist of treelines and narrow woodland bands lining the existing M4/N4. Minor Negative	Impacts on the River Liffey, River Kilmacredock Upper and 14 additional ecological sites of local importance (higher value) all of which consist of treelines and narrow woodland bands lining the existing M4/N4. Minor Negative
Score/ Impact Level	3	3	3
Preference	Preferred	Intermediate	Least Preferred

1.4 Summary

Key ecological receptors within the study area were identified and assigned an ecological value based on a geographic frame of reference ranging from national to local importance (higher value). The likely impacts of each of the Corridor Options on the key ecological receptors were identified and assessed, indicating which, if any, of these are likely to be significant, and at what geographical level.

The impacts of each of the Corridor Options on the key ecological receptors were identified and assigned an impact rating. The overall cumulative impact of each Corridor Option across all the key ecological receptors affected was then scored in accordance with the TII approach³, on a seven-point Likert scale ranging from ‘major or highly negative (1)’ to ‘major or highly positive (7)’. The scores attributed to each of the Corridor Options were assessed comparatively and assigned a preference ranking.

Corridor Option 1 was ranked Preferred, Corridor Option 2 was ranked Intermediate, whilst the Corridor Option 3 was ranked Least Preferred.

Kildare County Council

Maynooth to Leixlip Project

Options Report - Appendix 5 - Stage
1 Climate - Corridor Options
Assessment

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This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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Tables

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Climate Assessment Matrix of Options Corridors

1 Stage 1 Climate Corridor Options Assessment

1.1 Introduction

This section details the Stage 1 Climate assessment of the Corridor Options with respect to the Climate constraints identified in the Constraints Report.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

1.2.1 Scoring Classification

The multi-criteria climate assessment was undertaken with reference to the TII Project Appraisal Guidelines for National Roads Unit – 7.0 – Multi Criteria Analysis. The assessment includes both a quantitative and qualitative element. Each impact is scored qualitatively based on the seven-point scale below and an integer is assigned according to the impact level.

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Using the impact scores and professional judgement a determination as to the level of the impact of each alternative was provided. The Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports were also referred to when undertaking this assessment, particularly Table 3.3 in determining the significance of the impact.

The Climate assessment has been prepared in accordance with the requirements of the TII Project Management Guidelines 2019¹, and the TII Project Manager's Manual, 2019² and the TII Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis PE-PAG-02031, October 2016.

1.2.2 Assessment Criteria

The Climate assessment evaluates potential carbon emissions from road traffic during the operational phase using the traffic data provided for each alternative. In addition, the potential embodied carbon from construction phase of each alternative is assessed. Where the existing online road is being replaced, it is assumed that the reuse of materials will be maximised.

1.3 Corridor Options Assessment

The climate assessment evaluates potential carbon emissions from road traffic during the operational phase while also considering potential embodied carbon from the construction phase of each corridor.

A high-level assessment of the embodied carbon generated for each Corridor Option has been included for Stage 1 of this assessment. A qualitative assessment has been included in Table 1.2 for the potential embodied carbon of each Corridor Option.

From a climate perspective, increases in vehicle kilometres travelled results in an increase in operational carbon emissions. In addition, the more materials required to construct a Corridor Option, the greater the embodied carbon generated for the construction phase.

1.3.1 Corridor Option 1

The construction of Corridor Option 1 requires full road construction to be carried out for widening sections of the existing road, hard shoulders and the installation of emergency refuge areas, as well as pavement overlay works that will be implemented for existing traffic lanes. The works will result in the generation of embodied carbon. As outlined previously, the reuse of materials will be maximised to reduce the generation of embodied carbon. Corridor Option 1 will generate the least amount of embodied carbon in comparison to other Corridor Options and is rated as minor or slightly negative.

In relation to carbon emissions from the operational phase, no increase in vehicle kilometres travelled is predicted compared to Do-Minimum values. As such, no increase in carbon emissions is expected. Therefore, Corridor Option 1 is Preferred, both in relation to construction and operational phases.

¹ Transport Infrastructure Ireland, 2020. Project Management Guidelines PE-PMG-02041. Available from: <https://www.tiipublications.ie/library/PE-PMG-02041-03.pdf> [Accessed: 30th October 2021]

² Transport Infrastructure Ireland (TII), 2019. Project Manger's Manual for Major National Road Projects PE-PMG-02042. Available from <https://www.tiipublications.ie/library/PE-PMG-02042-01.pdf> [Accessed: 30th October 2021]

1.3.2 Corridor Option 2

Corridor Option 2 involves the construction of a new westbound traffic lane in addition to the two bus lanes. The construction works are greater than those required for Corridor Option 1. As outlined previously, the reuse of materials will be maximised to reduce the generation of embodied carbon.

In relation to carbon emissions from road traffic, an increase in traffic volumes is expected relative to the Do-minimum, resulting in an increase in carbon emissions.

Potential impacts on climate are considered as ‘Intermediate’ compared to the other Corridor Options. An impact rating of moderately negative is assigned.

1.3.3 Corridor Option 3

The construction of two new traffic lanes (in addition to the two bus lanes) is proposed for Corridor Option 3. As outlined previously, the reuse of materials will be maximised to reduce the generation of embodied carbon.

In relation to carbon emissions from road traffic, there is a slight increase in carbon emissions predicted to occur due to the implementation of the Corridor Option which includes two new traffic lanes.

Therefore, the construction and the operational stages of this Corridor Option are considered to result in a moderately negative impact on climate. On this basis, Corridor Option 3 is the least preferred.

1.4 Summary

The operational carbon, embodied carbon and climate assessment determinations are outlined in Table 1.2. The results demonstrate that there is predicted to be a slight increase in AADT due to the implementation of Corridor Options 2 and 3. The associated increase in carbon emissions is also provided in the table.

Table 1.2: Climate Assessment Matrix of Options Corridors

Assessment Criteria	Corridor Option 1	Corridor Option 2	Corridor Option 3
Annual Average Daily Traffic	69,801	70,650	71,028
Predicted change in AADT between Do-Minimum and Do-Something	0	849	1,227
Difference between Do-Minimum and Do-Something (per year) (tonnes CO ₂ e)	0	125	439
Estimated Embodied Carbon (qualitative)	New road infrastructure is required for Corridor Option 1, including the widening of sections, the existing	New road infrastructure is required for Corridor Option 2, involving the addition of one full extra lane. This	New road infrastructure is required for Corridor Option 3, with the addition of two extra lanes that will be

Assessment Criteria	Corridor Option 1	Corridor Option 2	Corridor Option 3
	hard shoulder and the emergency refuge areas. Pavement overlay works will also be implemented for lane 1 and lane 2, with materials reused, where possible.	lane will be constructed in the westbound direction of the existing M4, Junction 5 to Junction 7. Materials reused, where possible.	constructed, one in the eastbound direction and one in the westbound direction of the existing M4, Junction 5 to Junction 7. Materials reused, where possible.
Scoring			
Qualitative Assessment	Minor or slightly negative	Moderately negative	Moderately negative
Score/Impact Level	3	2	2
Preference	Preferred	Intermediate	Least Preferred

Corridor Option 1 is ranked as the Preferred as no increase in operational carbon is expected. Corridor Option 2 is predicted to result in a slight increase in operational carbon and is therefore ranked as Intermediate. Corridor Option 3 is ranked as the Least Preferred due to the highest projected increase in carbon emissions. In addition, all options are predicted to generate carbon emissions during the construction phase to varying degrees with Corridor Option 1 requiring the least amount of construction works with Corridor Option 3 requiring the most substantial construction works.

Kildare County Council

Maynooth to Leixlip Project

Options Report - Appendix 5 - Stage
1 Hydrogeology Corridor Options
Assessment

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Table 1.1: Criteria for Rating Impact Significance at Route Selection Stage –
Rating of Significant Environmental Impacts at Route Selection
Stage

Table 1.2: Hydrogeological Assessment Matrix of Corridor Options

1 Stage 1 Hydrogeology Corridor Options Assessment

1.1 Introduction

This section details the Hydrogeological assessment of the Stage 1 Corridor Options with respect to the hydrogeology constraints identified in the Constraints Report.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

This assessment was prepared in accordance with the requirements of the Transport Infrastructure Ireland (TII), formerly National Roads Authority (NRA) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, NRA 2009¹.

In line with these Guidelines, the assessment study area for this Phase 2 Stage 1 Corridor Options Assessment encompasses three proposed Corridor Options along the M4/N4 between Maynooth and Leixlip.

The NRA Guidelines¹ provide criteria for ranking of the identified hydrogeological constraints within the assessment study area (herein referred to as Criteria) that are presented in the Constraints Report. Criteria for rating an impact significance that may arise at each hydrogeological constraint are provided within Box 4.4 of the NRA Guidelines¹ and in Table 1.1. The impact significance assessment considers the attribute importance and the predicted scale and duration of the likely impacts.

¹ TII (2009) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes. Available from: <https://www.tii.ie/technical-services/environment/planning/Guidelines-on-Procedures-for-Assessment-and-Treatment-of-Geology-Hydrology-and-Hydrogeology-for-National-Road-Schemes.pdf>

Table 1.1: Criteria for Rating Impact Significance at Route Selection Stage – Rating of Significant Environmental Impacts at Route Selection Stage

Impact Level	Attribute Importance				
	Extremely High*	Very High	High	Medium	Low
Profound	Any permanent impact on attribute	Permanent impact on significant proportion of attribute			
Significant	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on Significant proportion of attribute		
Moderate	Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute	
Slight		Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute
Imperceptible			Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute

**In rating impacts on an 'European site' account must be taken of Article 6(3) and 6(4) of the Habitats Directive (Council Directive 92/43/EEC). Also see guidance contained within Guidelines for Assessment of Ecological Impacts of National Road Schemes (Rev 2, National Roads Authority, 2008)*

1.3 Corridor Options Assessment

1.3.1 Aquifer Classification and Groundwater Bodies

The potential impact on the aquifers along each Corridor Option is a combination of the type and extent of the aquifer, aquifer vulnerability and presence of deep cuttings (removal of soil and/or rock to road design elevations) along each Corridor Option.

Corridor Option 1, Corridor Option 2 and Corridor Option 3 are predominantly underlain by Dinantian Upper Impure Limestone. The bedrock aquifer is classified as a Locally Important Aquifer where the bedrock which is moderately productive only in local zones (LI) except for a narrow band (approximately 300m wide) located 1.6km to the east of Junction 7 Maynooth which is classified as a Poor Aquifer where the bedrock is generally unproductive except for local zones (PI).

The western part of the three Corridor Options overlies Dinantian Pure Unbedded Limestone which is classified as a Locally Important Aquifer where the bedrock is moderately productive only in local zones (LI).

In this assessment the aquifer extent and type for the Corridor Options are compared by the depth of cutting in each aquifer type. Cuts between 5 and 10m in depth are considered to be a permanent impact on a small proportion of the aquifer. Cuts greater than 10m in depth are considered to be a permanent impact on a significant proportion of the aquifer.

Roads constructed in deep cuttings can impact on the groundwater by causing dewatering of the groundwater in the vicinity. The deeper the cutting the more significant and more extensive the impact. In addition, the removal of the soil and bedrock in the excavation will increase the vulnerability of the aquifer at that location, as vulnerability is largely dependent on the depth and permeability of subsoil above the aquifer.

There are no cuttings deeper than 0.5m in the three Corridor Options. Therefore, with regard to aquifers and groundwater bodies, the impact is considered to be imperceptible resulting in a PAG ranking of not significant or neutral (4) for all three Corridor Options.

1.3.2 Karst Features

Karst features located within the three Corridors Options have the potential to be impacted by removal of the feature or modification of the flow to or from the feature. Therefore, where a karst feature is located within a Corridor Option, it is considered a permanent impact on a significant proportion of the attribute.

There are no karst features recorded within the extent of the three Corridor Options. Therefore, with regard to karst features all the Corridors Options are considered neutral. However, the underlying bedrock geology may be susceptible to karst as karst features were recorded in the same formations outside of the extent of the three Corridor Options.

1.3.3 Groundwater Sources

Groundwater sources include springs, wells or boreholes which are used for groundwater abstraction by domestic, agricultural, commercial, industrial, local authority or group water scheme users. Groundwater sources can be impacted by lowering of the water-table which may reduce the supply available and by accidental spillages or releases of contaminants which may impact the water quality.

Source Protection Zone (SPZ) reports have been produced by the GSI and EPA. The reports aim to guide development planning and regulation to provide protection to groundwater sources. There are no high yield water supply springs and wells i.e. public water supplies or group water scheme supplies along the three Corridor Options. No Source Protection Zones associated with public or group groundwater supply schemes are located along the three Corridor Options.

Nine boreholes or springs from the GSI database have been identified within the extent of the three Corridor Options. These groundwater abstraction wells identified within the three Corridor Options are of low importance. The NRA Guidelines¹ suggests that little or no weighting should be given to the number of such wells along each Corridor Option and/or their distance from the centreline when assessing relative impacts. In the case of low yielding water supply wells, the ranking of the level of potential impact is unnecessary, as wells will either have to be replaced or removed. Therefore, with regard to groundwater sources all the Corridor Options are considered neutral.

1.3.4 Groundwater Flooding

There are no areas of historic groundwater flooding within any of the three Corridor Options. Therefore, with regard to groundwater flooding all the corridors are considered neutral.

1.3.5 Groundwater Discharge Licenses

Kildare County Council and South Dublin County Council have been consulted for their records of groundwater discharge licences within the extent of the three Corridor Options. There are no licences to discharge to groundwater identified within the extent of the three Corridor Options. Therefore, with regard to groundwater discharge licenses all the corridors are considered neutral.

1.3.6 Hydro-ecology

Biodiversity impacts on groundwater dependent habitats are assessed as part of the biodiversity assessment detailed in Chapter 6 of this report. The hydrogeological assessment of groundwater dependent habitats focuses on the groundwater components of the features i.e. changes to groundwater level which may impact recharge to the feature, or changes to groundwater quality.

The proximity of the habitat to the Corridor Option is considered with regard to increased pollution risk from untreated surface water run-off or accidental spillage of fuel from the road affecting groundwater quality. However, as per Section 4.4 of the NRA Guidelines, the assessment has considered the application of standard mitigation and best practice during construction is unambiguous and success is highly likely. Therefore, it is assumed that standard drainage measures will be put in place to reduce the risk of run-off from the road affecting groundwater quality, reducing this risk.

A conservative approach was taken regarding water dependent habitats. In advance of a detailed survey at environmental impact assessment stage, features are considered as if they are dependent on both surface water and groundwater.

There are no groundwater dependant habitats within the extent of the three Corridor Options. The Liffey Valley pNHA is located within 100m of the three Corridor Options. However, as there are no cuttings greater than 0.5m in depth associated with any of the Corridor Options, the impact from all three Corridor Options on the pNHA is considered to be neutral.

1.4 Summary

The three Corridor Options have been assessed for the hydrogeological constraints identified within each Corridor Option.

There are no cuttings greater than 0.5m in depth associated with the three Corridor Options and therefore the impact on the aquifers and groundwater dependant habitats outside the Corridor Options is considered to be neutral.

There are no karst features, groundwater dependant habitats, groundwater discharge licenses or records of historical groundwater flooding identified within the Corridor Options. There are also no groundwater sources or groundwater abstractions which are considered greater than low importance within the Corridor Options. Therefore, these features are all considered neutral when comparing the Corridor Options.

Based on the assessment of the three Corridor Options on the hydrogeological constraints the PAG ranking is considered to be not significant or neutral (4) for all three Corridor Options and they are all considered to be Preferred.

Table 1.2: Hydrogeological Assessment Matrix of Corridor Options

Assessment Criteria	Corridor 1	Corridor 2	Corridor 3
Karst	No Karst Features identified. Impact is not significant or neutral.	No Karst Features identified. Impact is not significant or neutral.	No Karst Features identified. Impact is not significant or neutral.
Aquifer classification/Vulnerability	No cuttings >5m in depth and no change in vulnerability. Cuttings are not deeper than 0.5m. Impact is not significant or neutral.	No cuttings >5m in depth and no change in vulnerability. Cuttings are not deeper than 0.5m. Impact is not significant or neutral.	No cuttings >5m in depth and no change in vulnerability. Cuttings are not deeper than 0.5m. Impact is not significant or neutral.
Groundwater Sources/Resources	No features impacted. Impact is not significant or neutral.	No features impacted. Impact is not significant or neutral.	No features impacted. Impact is not significant or neutral.
Groundwater flooding	No groundwater flooding areas. Impact is not significant or neutral.	No groundwater flooding areas. Impact is not significant or neutral.	No groundwater flooding areas. Impact is not significant or neutral.
Hydro-ecology	No groundwater habitats impacted. Impact is not significant or neutral.	No groundwater habitats impacted. Impact is not significant or neutral.	No groundwater habitats impacted. Impact is not significant or neutral.
Scoring			
Qualitative Assessment	Not significant or neutral	Not significant or neutral	Not significant or neutral
Score/ Impact Level	4	4	4
Preference - Professional Judgement	Preferred	Preferred	Preferred

Kildare County Council

Maynooth to Leixlip Project

Options Report - Appendix 5 - Stage
1 Hydrology - Corridor Options
Assessment

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Table 1.1: Rating of Significant Environmental Impacts from Box 4.4 of the Guidelines

Table 1.2: TII PAG Impact Scoring Criteria

Table 1.3: Correlation of NRA Guidelines Significance Rating to an Equivalent NRA PAG Score

Table 1.4: Impacts Scores Relating to the Individual Hydrological Attributes

Table 1.5: Hydrology Assessment Summary Matrix

1 Stage 1 Hydrology Corridor Options Assessment

1.1 Introduction

This section details the Stage 1 Hydrology assessment of the Corridor Options with respect to the Hydrology constraints identified in the Constraints Report.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

This assessment was prepared in accordance with the requirements of the TII, formerly NRA Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, NRA 2009¹.

The NRA Guidelines provide criteria for ranking the identified hydrology constraints within the study area. These criteria are presented in Chapter 4 (Route Corridor Selection) of the NRA Guidelines. Criteria for rating an impact significance that may arise at each hydrology constraint are provided within Box 4.4 of the NRA Guidelines and are reproduced in Table 1.1. The impact significance assessment considers the attribute importance and the predicted scale and duration of the likely impacts.

Table 1.1: Rating of Significant Environmental Impacts from Box 4.4 of the Guidelines

Impact Level	Attribute Importance				
	Extremely High*	Very High	High	Medium	Low
Profound	Any permanent impact on attribute	Permanent impact on significant proportion of attribute			
Significant	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on Significant proportion of attribute		
Moderate	Temporary impact on	Temporary impact on	Permanent impact on	Permanent impact on	

¹ TII (2009) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes. Available from: <https://www.tii.ie/technical-services/environment/planning/Guidelines-on-Procedures-for-Assessment-and-Treatment-of-Geology-Hydrology-and-Hydrogeology-for-National-Road-Schemes.pdf>

Impact Level	Attribute Importance				
	Extremely High*	Very High	High	Medium	Low
	small proportion of attribute	significant proportion of attribute	small proportion of attribute	significant proportion of attribute	
Slight		Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute
Imperceptible			Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute

*In rating impacts on an 'European site' account must be taken of Article 6(3) and 6(4) of the Habitats Directive (Council Directive 92/43/EEC). Also see guidance contained within Guidelines for Assessment of Ecological Impacts of National Road Schemes (Rev 2, National Roads Authority, 2008)

The TII Project Appraisal Guidelines for National Roads (PAG) Unit 7.0 - Multi-Criteria Analysis² provide a qualitative and quantitative procedure for scoring each option against the assessment criteria, as shown in **Table 1.2**.

Table 1.2: TII PAG Impact Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

The significance rating of environmental impacts from the NRA Guidelines have been correlated with the equivalent qualitative and quantitative assessment scores from the TII Project Appraisal Guidelines, as shown in Table 1.3.

² TII (2016) Project Appraisal Guidelines for National Roads Unit 7.0 Multi Criteria Analysis. Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

Table 1.3: Correlation of NRA Guidelines Significance Rating to an Equivalent NRA PAG Score

Significance Rating (NRA Guidelines)	Equivalent PAG (description)	Impact	Score
Profound	Major or highly negative	Results in loss of attribute and /or quality and integrity of attribute	1
Significant	Major or highly negative	Results in loss of attribute and /or quality and integrity of attribute	1
Moderate	Moderately negative	Results in impact on integrity of attribute or loss of part of attribute	2
Slight	Minor or slightly negative	Results in minor impact on integrity of attribute or loss of small part of attribute	3
Imperceptible	Not significant or neutral	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	4

The final stage of the assessment methodology was to ensure that the requirements of the TII PAG Unit 7.0 - multi-criteria analysis were met by assigning a score to each corridor option based on the scoring procedure within these Guidelines. Using the impact scores and professional judgement, Preferred, Intermediate or Least Preferred rankings were assigned to each of the corridor options.

1.3 Corridor Options Assessment

Each Corridor Option was scored by how it was deemed to impact the identified hydrological constraints using the methodology previously outlined. This assessment is detailed in Table 1.4.

Table 1.4: Impacts Scores Relating to the Individual Hydrological Attributes

Corridor Option	Feature	Description	Attribute Importance	Magnitude of Impact	Score
Corridor Option 1	River Lyreen and its tributary the Meadowbrook	The River Lyreen is a watercourse in the Liffey and Dublin Bay Catchment Surface water runoff from the M4 discharges to the Meadowbrook River, approximately 3km upstream of the Rye Water Valley SAC	High Flood Relief Scheme and floodplains protecting between 5 and 50 residential or commercial properties from flooding	Not significant or neutral Negligible change in predicted peak flood level. Calculated risk of serious pollution incident.	4
	River Liffey and its tributary the Kilmacredock Upper	The River Liffey is the primary watercourse in the Liffey and Dublin Bay Catchment	High River Waterbody Risk Projection: Under review Q value status: Good	Not significant or neutral Negligible change in predicted peak flood level. Calculated risk of serious pollution incident.	4
	Leixlip Reservoir	Manmade reservoir on the River Liffey	Very High River Waterbody Risk Projection: Under review WFD status: assumed good based on River Liffey values Abstraction for Drinking water	Not significant or neutral Negligible change in predicted peak flood level. Calculated risk of serious pollution incident.	4
Corridor Option 2 and 3	The features and impact scores for Option 2 are deemed to be the same as Option 1 above				

All three Corridor Options involve increasing the paved area of the carriageway and by doing so they may:

- Increase pollutant concentrations draining to watercourses during both the construction and operational phases;
- Increase sediment loads to watercourses during construction; and
- Alter the catchment characteristics resulting in an increase in both pluvial flood risk to the M4/N4 and fluvial flood risk on downstream watercourses.

The estimated increases in paved area for the respective options are:

- Option 1: > 9% increase in paved area;
- Option 2: > 25% increase in paved area; and
- Option 3: > 41% increase in paved area.

It should be noted that mitigation measures such as pollution controls and attenuation tanks can decrease the aforementioned risks.

1.4 Summary

The different Corridor Options are similar, primarily differentiated by the arrangement of lanes and subsequent width of the carriageway. As a result, the determined impacts of each Corridor Option on the hydrological features are similar.

The impacts of each Corridor Option on the hydrological features of the study area is summarised in Table 1.5. Preference has been given to the Corridor Options with the least amount of paved area.

Table 1.5: Hydrology Assessment Summary Matrix

Assessment Criteria	Corridor Option 1	Corridor Option 2	Corridor Option 3
River Lyreen and its tributary the Medowbrook	Not significant or neutral	Not significant or neutral	Not significant or neutral
River Liffey and its tributary the Kilmacredock Upper	Not significant or neutral	Not significant or neutral	Not significant or neutral
Leixlip Reservoir	Not significant or neutral	Not significant or neutral	Not significant or neutral
Scoring			
Qualitative Assessment	Not significant or neutral	Not significant or neutral	Not significant or neutral
Score/ Impact Level	4	4	4
Preference	Preferred	Intermediate	Least Preferred

Kildare County Council

Maynooth to Leixlip Project

Appendix 5 - Stage 1 Landscape and
Visual - Corridor Options
Assessment

Draft 1 | 30 April 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Landscape and Visual Assessment Matrix of Corridor Options

1 Stage 1 Landscape and Visual Corridor Options Assessment

1.1 Introduction

This section details the Landscape and Visual assessment of the Stage 1 Corridor Options with respect to the Landscape and Visual constraints identified in the Constraints Report. It assesses the potential significance of effects on landscape receptors and visual receptors, positively or negatively, based on its sensitivity and the magnitude of change.

Section 6.5.1.5.2 outlines the methodology that was used to carry out the assessment, Section 6.5.1.5.3 details the Landscape and Visual Corridor Options assessment and Section 6.5.1.5.4 summarises the results of the assessment.

1.2 Methodology

The landscape and visual constraints assessment involved desktop studies where the Landscape and Visual specialist has developed an understanding of the character of the existing landscape through study of the Landscape Character Assessment incorporated into the Kildare County Development Plan 2017-2023, South Dublin County Council Development Plan 2016 -2022, Fingal Development Plan 2017-2023 and Meath County Development Plan 2013-2019 (carried through to the Development Plan 2020-2026) as well as other landscape and visual references in the County Development Plans and to review of the landscape and visual environment based on other principal sources of information.

The assessment has had regard to the following documents:

- Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Specified Infrastructure Projects – Overarching Technical Document (PE-ENV-01101), December 2020 TII;
- Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Proposed National Roads - Standard (PE-ENV-01102), December 2020 TII;
- Draft Advice Notes for Preparing Environmental Impact Statements, Draft September 2015 Environmental Protection Agency;
- Guidelines on the information to be contained in Environmental Impact Assessment Reports, Draft August 2017 EPA;
- Guidelines for Landscape and Visual Impact Assessment, 3ed. April 2013 Landscape Institute & Institute of Environmental Management and Assessment;
- Kildare County Development Plan 2017-2023, Kildare County Council, 2017;
- South Dublin Development Plan 2016-2022, South Dublin County Council, 2016;

- Celbridge Local Area Plan 2017-2023, Kildare County Council, 2017; and
- Maynooth Local Area Plan 2013-2019 (As Amended), Kildare County Council, 2017.
- Leixlip Local Area Plan 2020-2023, Kildare County Council, 2019.

Other principal sources of information were:

- Ordnance Survey Ireland Geohive (<http://map.geohive.ie/mapviewer.html>);
- Environmental Protection Agency GIS Mapping (<https://gis.epa.ie/EPAMaps/>);
- Heritage Council GIS Mapping (<https://heritagemaps.ie>);
- National Biodiversity Data Centre (<https://data.gov.ie/organization/national-biodiversity-data-centre>); and
- Google Aerial Photography and Mapping (<https://www.google.ie/maps>).

1.2.1 Scoring Procedure

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG scoring procedure. The PAG seven-point scale scoring procedure is shown in Table 1.1.

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Using a combination of the impact scores and professional judgement, a determination as to the level of the impact of each Corridor Option was provided.

Using the impact scores and the professional judgement of the specialist, a determination is made as to whether each Corridor Option that is assessed is either:

- Preferred;
- Intermediate; or
- Least Preferred.

1.3 Corridor Options Assessment

1.3.1 Corridor Option 1

Corridor Option 1 will have impacts on roadside verges, trees and other vegetation on both the eastbound and westbound carriageway. This has potential for localised impacts on landscape and visual receptors through reduction in the screening effect of roadside vegetation, particularly where visual receptors may gain views of the carriageway and traffic movement and noise may become more apparent.

Moderate negative effects are most likely to occur for residential receptors at Griffin Rath Manor where a proposed emergency refuge area will necessitate earthworks and associated tree removal from the roadside planting to the south of the residences, where the road is in an elevated position. There is also potential for moderate negative effects, resulting from provision of an emergency refuge area and loss of roadside vegetation, at the Wonderful Barn and environs, which are the focus of objective BH1.6 of Leixlip Local Area Plan: *“To promote The Wonderful Barn as an integrated tourism attraction including the restoration of the main features of the complex and its historical landscape”*.

As works will be largely within the footprint of existing road infrastructure, Option 1 is not likely to result in significant landscape and visual effects. There will be no notable change to the character of the road corridor with this Corridor Option. Nevertheless, there is potential for moderate negative effects on nearby landscape or visual receptors, where screening vegetation is removed from the roadside. In these cases, mitigation through provision of replacement planting, where feasible, will be important in order to reduce these effects. Due to the generally young age of roadside vegetation, these measures would be likely to be effective in neutralising effects in the short to medium-term.

1.3.2 Corridor Option 2

The impact on vegetation for this Corridor Option will be greater than for Corridor Option 1, due to the greater width of the proposed corridor, and the resulting effects on some receptors to the south of the road corridor will be greater, although they are unlikely to exceed a moderate negative effect, at most. The greater width of this option, with the additional westbound traffic lane, will result in a reduced amenity of the road corridor itself in comparison to Corridor Option 1. However, the receptors using the road are deemed to be low sensitivity due to speed of travel and mode of transport, and the resulting effect would be negligible / slight, negative.

1.3.3 Corridor Option 3

Corridor Option 3 will necessitate more significant pavement widening into verges and substantially more loss of roadside planting for regrading. There would be considerably greater loss of vegetation including loss of the complete width of roadside tree planting in some locations; this is most notable in two locations on the north side of the road corridor between the River Liffey and the R404 Celbridge Road Overbridge, leading to potential significant effects on the Liffey Valley Character Area, which is defined in the Kildare County Development Plan as having “*low capacity to accommodate uses without significant adverse effects on the appearance or character of the landscape having regard to special sensitivity factors*”.

Due to the increased loss of vegetation from this Corridor Option, there would be a greater potential impact on the receptors impacted by Corridor Option 1, which may result in moderate / substantial, negative effects. This Corridor Option would also lead to the biggest degradation in the amenity of the road corridor itself from the greatest proposed corridor width and greatest loss of vegetation, with a visual impact on receptors using the road, however, these receptors are deemed to be low sensitivity and the resulting effect would be slight, negative. The increased pavement width would limit the space for any mitigation planting and would therefore reduce the effectiveness of these measures in re-establishing roadside screening and would likely require additional landtake from surrounding areas to provide an adequate width of planting.

1.4 Summary

A summary of the landscape and visual effects for each assessment criteria, as rated from least to most impact is presented, in Table 6.1.

Corridor Option 1 is not expected to have significant landscape and visual effects. There is potential for moderate negative effects on some receptors such as Griffin Rath Manor and the Wonderful Barn and environs due to removal of roadside vegetation, as well as lesser effects on some other surrounding receptors. This Corridor Option is preferred in terms of landscape and visual impacts.

Corridor Option 2 is not expected to have significant landscape and visual effects. There is potential for moderate negative effects on the same receptors as for Corridor Option 1, with a slightly greater impact on receptors to the south. This Corridor Option is intermediate in terms of landscape and visual impacts.

Corridor Option 3 has potential for significant negative effects on the Liffey Valley Character Area, and there are also likely to be moderate / substantial, negative effects on some receptors. This Corridor Option is least preferred in terms of landscape and visual impacts.

There is potential for neutralisation of some effects with adequate replacement planting. A good quality and considered landscape planting scheme should be developed and implemented with the Corridor Options to help incorporate and enhance the proposed development into the landscape / townscape. Micro-siting of the proposed emergency refuge areas may also potentially reduce impacts by repositioning areas of tree loss to limit impacts on sensitive receptors. Potential for adequate mitigation is greatest for Corridor Option 1, secondly for Corridor Option 2, with Corridor Option 3 presenting the least potential for adequate mitigation.

Table 1.2: Landscape and Visual Assessment Matrix of Corridor Options

Assessment Criteria	Corridor Option 1	Corridor Option 2	Corridor Option 3
Designated Landscapes / Amenities	1	2	3
Archaeological Features	0 (No Impact)	0 (No Impact)	0 (No Impact)
Architectural Heritage Features	1	2	3
Natural Landscape Features topographical features, rivers, trees/hedgerows	1	2	3
Demesne Features	0 (No Impact)	0 (No Impact)	0 (No Impact)
Landscape Scoring	3	6	9
Residential Properties/ Visual Receptors	1	2	3
Designated views/scenic routes/areas	1	2	3
Visual Scoring	2	4	6
Qualitative Assessment	Moderate negative. Some loss of vegetation/hedgerows for introduction of refuge areas and cut and fill, with resulting impacts on surrounding landscape and visual receptors.	Moderate negative. Overall marginally greater impacts than Option 1. Some loss of vegetation/hedgerows for introduction of refuge areas, westbound lane and cut and fill, with resulting impacts on surrounding landscape and visual receptors.	Moderate to significantly negative. Greatest loss of vegetation/hedgerows with resulting highest impacts on landscape and visual receptors.
Score/ Impact Level	2	2	1
Preference	Preferred	Intermediate	Least Preferred

Kildare County Council

Maynooth to Leixlip Project

Options Report - Appendix 5 - Stage
1 Material Assets Corridor Options
Assessment

Draft 1 | 30 April 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Corridor Options Pavement Width

Table 1.3: Criteria for Assessing the Significance of Impact on Properties and Land Use

Table 1.4: Criteria for Assessing the Significance of Impact on Services and Utilities

Table 1.5: Properties and Land Use Assessment

Table 1.6: Utilities and Services Assessment

Table 1.7: Material Assets Summary

1 Stage 1 Material Assets Corridor Options Assessment

1.1 Introduction

This section details the Stage 1 assessment of the Corridor Options in the context of Material Assets constraints identified in the Constraints Report.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

The following guidelines and legislation were referred to when undertaking this assessment:

- European Union (2018) (Planning and Development) (Environmental Impact Assessment) Regulations. (SI 296 of 2018);
- Environmental Protection Agency (EPA) (August 2017) Guidelines on the Information to be contained in Environmental Impact Assessment Reports¹; and
- Transport Infrastructure Ireland (TII) (2016) Project Appraisal Guidelines Unit 7.0 - Multi Criteria Analysis, PE-PAG-02031².

This assessment is a desktop assessment of available data sources. The desktop study considered the following sources of information i.e. aerial mapping / photography³, Property Registration Authority of Ireland (PRAI)⁴ database and data regarding agriculture in County Kildare and County Dublin from the Central Statistics Office (CSO) as referred to in the Constraints Report.

1.2.1 Scoring Procedure

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG scoring procedure. The PAG seven-point scale scoring procedure is shown in Table 1.1.

¹ Environmental Protection Agency (EPA) (August 2017) Guidelines on the Information to be contained in Environmental Impact Assessment Report. Available from: <https://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf> [Accessed 3rd March 2022]

² Transport Infrastructure Ireland (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf> [Accessed: 3rd March 2022]

³ Google Aerial Mapping (2022). Available from: <https://www.google.com/maps> [Accessed: November 2020 to March 2022]

⁴ Property Registration Authority (2021). Available from <https://www.landdirect.ie/index> [Accessed in 2021 and 2022]

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Following the individual criterion assessments, an overall assessment score was assigned to each Corridor Option based on the TII PAG seven-point scale scoring procedure, and the overall preference for each Corridor Option of Preferred, Intermediate, or Least preferred was assigned using the assessment criteria results and professional judgement.

1.2.2 Assessment Criteria Overview

Overall pavement width is the primary differentiator between the three Corridor Options. These pavement widths are summarised in Table 1.2. This criteria is used to carry out the assessment on Properties and Land Use and Utilities and Services, and also to determine a preferred Corridor Option.

Table 1.2: Corridor Options Pavement Width

Corridor Option 1	Overall Pavement Width
Corridor Option 1	29m
Corridor Option 2	30.5m
Corridor Option 3	34m

1.2.3 Assessment Criteria for Properties and Land Use

For the purposes of assessing direct impacts on properties, the extent of each Corridor Option is considered to include all lands required for the construction and operation of new infrastructure. All three Corridor Options are online options and share the same centreline and therefore it can be deemed appropriate to examine all three corridors together.

All three corridor options are considered to have a similarly minor impact from a properties and utilities perspective primarily because they are all within the existing M4/N4 corridor. However, given that Corridor Option 1 has the narrowest footprint it is considered to be Preferred. Corridor Option 2 has a footprint wider than

Corridor Option 1, therefore is considered to be Intermediate. Corridor Option 3 has the widest footprint, therefore is considered to be the Least Preferred.

The potential impact of the Corridor Options on properties is assessed according to the significance criteria detailed in Table 1.3.

Table 1.3: Criteria for Assessing the Significance of Impact on Properties and Land Use

Significance Level/ Degree of Impact	Definition
Major or Highly Negative Profound	A non-agricultural property of national or regional importance is fully within the option extent and will be removed by the proposed option
Moderately Negative	A non-agricultural property or other material asset is fully within the option extent and may result in the demolition or acquisition of a dwelling or, or where acquisition of a property results in loss of employment and total or partial loss of the business
Minor or Slightly Negative	Part of a non-agricultural property or other material asset is within the option extent
Not Significant or Neutral	An impact on a property which is currently occupied by a public right-of-way, e.g., a road or the non-agricultural property or other material asset is in the vicinity of the option but outside the option extent

1.2.4 Assessment Criteria for Utilities and Services

The locations of existing utilities were requested from relevant utility service providers. Key utilities and services have been identified and used to inform this assessment.

Low voltage ESB lines which service homes and businesses within the vicinity of the Corridor Options were evident, however these are considered to be a minor constraint and may be readily diverted where necessary. In addition, it would not be a differentiating factor when comparing options. The ESB services that have been assessed (see bulleted list below) are considered to be the major utilities for this service provider and pose more significant constraints for the project. This is because they are high voltage.

Small diameter foul, combined and surface water sewers and watermains throughout the study area have not been fully considered as part of this Stage 1 assessment, as they are not considered significant constraints for the project. Moreover, they are considered to be a minor constraint and could be readily diverted where necessary. The assessment has been carried out based on the larger diameter, more critical services, as detailed in the bulleted list below, as these pose more significant constraints for the Project.

In summary, at Stage 1 in the assessment and comparison of the Corridor Options, impacts on larger utilities and services were considered as high impact and differentiating factors. The following utilities and services were considered:

- ESB High Voltage (i.e., 38kV, 110kV and 220kV) Overhead Lines;
- ESB High Voltage Underground Lines;

- ESB Medium Voltage (i.e., 10kV, 20kV) Overhead Lines;
- ESB Substations;
- Gas Networks Ireland Infrastructure;
- Irish Water watermains;
- Irish Water foul and combined sewers;
- Water/wastewater treatment plants;
- Telecoms Antennas;
- Eir underground services; and
- E-Net services.

The potential impact of the Corridor Options on services and utilities is assessed according to the significance criteria detailed in Table 1.4.

Table 1.4: Criteria for Assessing the Significance of Impact on Services and Utilities

Significance Level/ Degree of Impact	Definition
Major or Highly Negative Profound	Removal of a service or utility that is of national or regional importance
Moderately Negative	Major diversion of High Voltage ESB lines (38kV, 110kV or 220kV) or fibre optic telecoms
Minor or Slightly Negative	Minor diversion of High Voltage ESB lines (38kV, 110kV or 220kV) or fibre optic telecoms
Not Significant or Neutral	The diversion of low and medium voltage ESB network, telecommunications or water supply or foul sewer services

1.3 Corridor Options Assessment

1.3.1 Properties and Land Use

There are no amenities located within the extent of the three Corridor Options.

Adjacent to the Corridor Options there are a number of business parks including the M4 Business Park, the Maynooth Business Campus, and the Liffey Business Campus (former HP site). The Properties and Land Use assessment is summarised in Table 1.5.

Table 1.5: Properties and Land Use Assessment

Assessment Criteria	Corridor Option 1	Corridor Option 2	Corridor Option 3
Residential	There are no impacted residential properties within Corridor Option 1, 2 and 3		
Commercial/ Industrial	There are three business parks adjacent to the Corridor Options, none of which will be directly affected		
Amenity	There are no impacted amenities within Corridor Option 1, 2 and 3		

Assessment Criteria	Corridor Option 1	Corridor Option 2	Corridor Option 3
Other	N/A		
Qualitative Assessment	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Score/ Impact Level	4	4	4
Preference	Preferred	Intermediate	Least Preferred

1.3.2 Utilities and Services

Storm watermains are located in much of the existing M4/N4 mainline, from Junction 7 Maynooth to Junction 5 Leixlip.

Numerous watermains are evident throughout the extent of the Corridor Options, running adjacent to the M4/N4 mainline. Watermains cross the M4/N4 at various locations, usually utilising an existing overbridge although also traversing under the M4/N4 mainline at times. There is a reservoir located east of Junction 7 Maynooth with various watermain inlets and outlets.

Leixlip Hydro Station and Leixlip Drinking Water Treatment Plant are situated west of Junction 5 Leixlip.

Gravity fed foul wastewater network mainline crossings are evident at Junction 7 Maynooth, the R404 and west of the River Liffey Bridge. There is a combined sewer crossing at Junction 5 Leixlip.

There is one overhead HV ESB line within the extent of the Corridor Options. This is located east of Junction 7 Maynooth. Underground HV lines are located adjacent to the Ballygoran Road and end at a sub-station also located on the Ballygoran Road.

There is a LV/MV overhead crossing located between Junction 6 Celbridge and Junction 5 Leixlip.

Decommissioned gas infrastructure is evident west of Junction 6 Celbridge. Low pressure gas infrastructure is evident east of Junction 6 Celbridge. Medium pressure gas infrastructure is evident throughout the extent of the Corridor Options with an underground mainline crossing east of the R405 Ballygoran Road Overbridge and a mainline crossing on the R404 Celbridge Road Overbridge.

Numerous EIR infrastructure is evident within the extent of the Corridor Options with at-grade crossings at Junction 7 Maynooth and Junction 5 Leixlip.

Mainline crossings are also evident at the M4 Business Park, the R404 Celbridge Road Overbridge and east of Junction 5 Leixlip.

There is a small quantity of BT infrastructure located at Junction 6 Celbridge and adjacent to Barnhall Road. Further BT infrastructure crosses the mainline on the R404 Celbridge Road Overbridge.

UPC infrastructure is evident throughout the extent of the Corridor Options with mainline crossings located at Junction 6 Celbridge, the R405 Ballygoran Road Overbridge, the R404 Celbridge Road Overbridge, Junction 5 Leixlip and east of Junction 5 Leixlip.

The assessment is summarised in Table 1.6.

Table 1.6: Utilities and Services Assessment

Assessment Criteria	Corridor Option 1	Corridor Option 2	Corridor Option 3
ESB High Voltage (i.e., 38kV, 110kV and 220kV) Overhead Lines (HV OH)	East of Junction 7		
ESB High Voltage Underground Lines (HV UG)	East of Ballygoran Road		
ESB Medium Voltage (i.e., 10kV, 20kV) Overhead Lines (MV OH)	Junction 6 and Junction 5		
ESB Substations	Ballygoran Road		
Gas Networks Ireland MP gas mains	Located Throughout Corridor Option 1 with Crossings R405 Ballygoran Road Overbridge and Mainline Crossing at R404 Celbridge Road		
Gas Networks Ireland LP gas mains	East of Junction 6		
Irish Water watermains	Located Throughout Corridor Option 1, 2 and 3		
Irish Water foul or combined sewers	Combined Sewer Crossing at Junction 5. 3x no. Mainline Crossings		
Water/wastewater treatment plants	Leixlip Drinking Water Treatment Plant		
Eir underground services	At Grade Crossings at Junction 5 and Junction 7. Mainline EIR Crossings at M4 Business Park, R404 Celbridge Road Overbridge and East of Junction 5		
Other	BT Infrastructure at Junction 6 and Adjacent to Barnhall Road. R404 Overbridge Crossing. UPC Infrastructure Mainline Crossings at Junction 6, R405, R404, Junction 5 and East of Junction 5		
Qualitative Assessment	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Score/ Impact Level	3	3	3
Preference	Preferred	Intermediate	Least Preferred

1.4 Summary

The overall ranking preferences for the Corridor Options in terms of material assets are shown in Table 1.7.

All three corridor options are considered to have a similarly minor impact from a properties and utilities perspective primarily because they are all within the existing M4/N4 corridor.

However, given that Corridor Option 1 has the narrowest footprint it is considered to be Preferred. Corridor Option 2 has a footprint wider than Corridor Option 1, therefore is considered to be Intermediate. Corridor Option 3 has the widest footprint, therefore is considered to be the Least Preferred.

Table 1.7: Material Assets Summary

Assessment Criteria	Corridor Option 1	Corridor Option 2	Corridor Option 3
Properties	There are 3 business parks that are not significant near Corridor Option 1, 2 and 3		
Utilities	There are numerous utilities crossing the mainline, both overhead and underground in Corridor 1, 2 and 3		
Qualitative Assessment	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Score/ Impact Level	3	3	3
Preference	Preferred	Intermediate	Least Preferred

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Maynooth to Leixlip Project

Options Report - Appendix 5 - Stage
1 Noise and Vibration Corridor
Options Assessment

Draft 1 | 30 April 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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1 Stage 1 Noise and Vibration Corridor Options Assessment

1.1 Introduction

This report details the Noise and Vibration assessment of the Stage 1 Corridor Options with respect to the Noise and Vibration constraints identified in the Constraints Report.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

1.2.1 Data Sources

For guidance on the Noise and Vibration impact assessment, reference has been made to the following guidance documents:

- Section 5.0 of the Guidelines for the Treatment of Noise and Vibration in National Road Schemes (TII Noise Guidelines 2004)¹;
- Section 2 of the 2014 Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (TII Noise Guidelines 2014)²; and
- The Design Manual for Roads and Bridges (DMRB) (UKHA, 2020)³.

This assessment has also been carried out in accordance with the requirements of the TII Project Management Guidelines 2019⁴ and the TII Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis PE-PAG-02031, October 2016⁵.

¹ Transport Infrastructure Ireland, Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2004. Available from: https://www.tii.ie/technical-services/environment/planning/Guidelines_for_the_Treatment_of_Noise_and_Vibration_in_National_Road_Schemes.pdf

² Transport Infrastructure Ireland, Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes, 2014. Available from: https://www.tii.ie/technical-services/environment/planning/Good_Practice_Guidance_for_the_Treatment_of_Noise_during_the_Planning_of_National_Road_Schemes.pdf

³ Design Manual for Roads and Bridges (DMRB) (UKHA, 2020). Available from <https://www.standardsforhighways.co.uk/prod/attachments/cc8cfcf7-c235-4052-8d32-d5398796b364?inline=true>

⁴ Transport Infrastructure Ireland, Project Management Guidelines PE-PMG-02041, 2020. Available from: <https://www.tiipublications.ie/library/PE-PMG-02041-03.pdf>

⁵ Transport Infrastructure Ireland, Project Appraisal Guidelines for National Road Schemes Unit 7.0 – Multi Criteria Analysis, October 2016. Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

1.2.2 Noise

In terms of operational noise, the TII Noise Guidelines 2004¹ and TII Noise Guidelines 2014² consider it appropriate to set the design goal for road traffic noise for new national roads in Ireland as follows:

- Day-evening-night 60 dB L_{den} (free field).

The following three conditions must be satisfied under the TII guidelines for noise mitigation to be provided:

- The combined expected maximum traffic noise level, i.e., the relevant noise level, from the proposed corridor option together with other traffic in the vicinity is greater than the design goal of 60 dB L_{den};
- The relevant noise level is at least 1 dB more than the expected traffic noise level without the proposed corridor option in place; and
- The contribution to the increase in the relevant noise level from the proposed corridor option is at least 1 dB.

Both of the TII documents referred to above acknowledge that it may not always be sustainable to achieve this design goal. In such circumstances, nevertheless, a structured approach should be taken to ameliorate as far as practicable road traffic noise through the consideration of measures such as alignment changes, barrier type (e.g., earth mounds) or low noise road surfaces.

It has been assumed for the purpose of this assessment that existing noise barriers or earth embankments along the existing M4/N4 shall be replaced with an equal or enhanced construction depending on identified impacts during the detailed design assessment in areas where widening into the verge is required.

1.2.3 Vibration

In terms of vibration, the TII Noise Guidelines 2004 and TII Noise Guidelines 2014 note that road traffic along normal well-maintained surfaces, in line with Corridor Options, generates very low levels that are normally not perceptible to building occupants. Vibration magnitudes from road traffic are also orders of magnitude below those associated with any form of cosmetic damage to buildings and vulnerable structures. For the purposes of this assessment, therefore, it is assumed that all Corridor Options will have a comparable low vibration impact during their operational phase and vibration is not assessed further from a ranking point of view.

1.2.4 Construction Noise and Vibration Impacts

The potential noise or vibration impacts of the Stage 1 Corridor Options during the construction phase relate to the works required to incorporate the hard shoulder bus priority measures, and, where relevant an additional third lane in the eastbound and westbound directions. This will require widening into the central reserve and into the verges in addition to general road works. These works will be required along the full extent of the Corridor Options, with Corridor Option 3 requiring the greatest extent of widening into the central reserve and the existing verges in both directions.

The potential noise and vibration impacts associated with the construction phase of the Corridor Options will be of short-term duration. The construction phase for each Corridor Option will be undertaken using standard road construction techniques and will be controlled through the use of construction noise limits.

During the construction phase, there is potential for minor vibration levels to be generated depending on the works involved, however the magnitude of which will be orders of magnitude below those associated with any form of building or structure cosmetic damage. Any construction activity will be controlled through strict vibration limits.

No further consideration has therefore been given to the construction phase to differentiate either Corridor Option.

1.2.5 Assessment Methodology

The assessment of potential noise impacts and ranking of Corridor Options is based upon property counts and on the calculated change in traffic noise levels as a result of alignment changes and any forecast changes in traffic flows. The assessment also considers the likely requirement for noise mitigation measures based on triggering the three conditions for noise mitigation discussed above. The following steps have been taken to assess the impact rating of each of the Corridor Options under consideration:

- Property counts have been conducted within four bands from the edge of each corridor option, i.e., 0 to 50m, 50 to 100m, 100 to 200m and 200 to 300m. Using this information, the Potential Impact Ratings (PIR) for each Corridor Option were established;
- The change in noise level between the Do-Minimum and Do-Something scenario at the closest noise sensitive locations (NSLs) for each Corridor Option was established considering the horizontal alignments, projected future traffic flows and traffic speed for the Corridor Options; and
- An assessment of the potential number of properties likely to be increased by 1dB, and hence require noise mitigation was determined.

In summary, the potential noise impacts and ranking of Corridor Options is based on the following assessment criteria:

- Potential Impact Rating (PIR) (Quantitative);
- Potential Changes in Traffic Noise Levels (Quantitative); and
- Likely need for Noise Mitigation (Qualitative).

Each of the above criteria for each of the Corridor Options are outlined below.

1.2.5.1 Potential Impact Rating (PIR)

A Potential Impact Rating (PIR) based upon property counts for each Corridor Option has been used to determine which Corridor Option has the lowest nominal potential impact on existing properties.

The number of properties potentially sensitive to noise and/or vibration within 300m of each of the proposed Corridor Options has been identified. For this assessment, property counts include existing residential properties, hospitals and medical buildings, educational buildings and religious buildings which were identified using OS mapping data and GIS data provided by the design team.

Property counts have been undertaken for four bands from the centreline of each Corridor Option, i.e., 0 to 50m, 50 to 100m, 100 to 200m and 200 to 300m. A weighting value for each distance band has been applied with a weighting factor of 4 for the closest distance band (0 to 50m) down to 1 for the furthest distance band (200 to 300m). For the Potential Impact Rating assessment, the calculated weighted value for each distance band is summed to obtain a total Potential Impact Rating value. The Corridor Option with the lowest Potential Impact Rating has the lowest nominal potential noise impact on existing noise sensitive receptors.

1.2.5.2 Assessment of Change in Traffic Noise Levels and Likely Need for Noise Mitigation

The potential noise levels associated with each Corridor Option have been calculated using the alignments provided, projected traffic volumes and traffic speed. This review has been undertaken to assess the change in noise levels between the Do-Minimum scenario and each of the Corridor Options.

For this Stage 1 assessment, traffic flows in Annual Average Daily Traffic (AADT) flows, percentage Heavy Goods Vehicles (HGVs) and indicative working horizontal alignments have been provided by the design team.

Proprietary noise calculation software, SoftNoise Predictor, was used to calculate traffic noise levels at the closest NSLs for each of the Corridor Options. The software calculates traffic noise levels in accordance with Calculation of Road Traffic Noise (CRTN) and TII guidance using the following methodology:

- The potential traffic noise levels at affected noise sensitive receptors associated with each Corridor Option has been established considering the indicative horizontal alignments in addition to Annual Average Daily Traffic flows (AADT) and percentage HGV for the future year provided by the design team.
- Noise levels were calculated at the same assessment locations for the Do Minimum scenario. This was undertaken to calculate changes in traffic noise at properties along each Corridor Option and to determine likely requirements for noise mitigation.

- A standard hot rolled asphalt road surface was used for all Corridor Options. A traffic speed of 120km/hr was modelled for the Do-Minimum scenario and each Corridor Option. In addition, a speed of 100km/hr was then modelled for the three Corridor Option mainlines and hard shoulder bus priority measure in line with a proposed speed reduction between Junction 7 and Junction 5 as part of the Corridor Options design. Table 1.1 presents the AADT flows that were used for noise calculations.

Table 1.1: Summary of AADT Data used for Stage 1 Assessment

Location	M4 West of Junction 7		M4 Between Junction 7 and Junction 6		M4 Between Junction 6 and Junction 5		M4 East of Junction 5	
	AADT	% HGV	AADT	% HGV	AADT	% HGV	AADT	% HGV
Do-Minimum	53,679	8.2%	69,801	7.5%	77,656	7.0%	86,507	7.0%
Corridor Option 1	53,679	8.2%	69,801	7.5%	77,656	7.0%	86,507	7.0%
Corridor Option 2	53,782	8.2%	70,650	7.4%	78,091	6.9%	86,668	7.0%
Corridor Option 3	53,760	8.2%	68,996	7.2%	77,778	7.0%	86,727	7.0%

In the absence of Irish guidelines or standards relating to assessing the effects associated with changes in road traffic noise levels, reference is made to the UK's Design Manual for Roads and Bridges (DMRB) LA 111 Noise and vibration (2020)³. This document provides suggested magnitude rating tables relating to changes in noise levels associated with road traffic noise.

The magnitude of impacts is assessed by comparing the Do-Minimum noise level against the Do-Something scenario. The calculated road traffic noise levels used in this study relate to the future design year, hence in line with the DMRB guidance, the following magnitude of change is applied for the long-term period (design year) as reproduced in Table 1.2.

Table 1.2: Classification of magnitude of traffic noise impacts in long term (DMRB 2020)

Long-term Magnitude	Long term noise change, dB
Major	Greater than or equal to 10.0
Moderate	5.0 to 9.9
Minor	3 to 4.9
Negligible	Less than 3.0

For each of the Corridor Options, the calculated change in traffic noise level has been determined and ranked in accordance with Table 1.2. The change can be related to either positive changes (decrease in noise levels) or negative changes (increase in noise levels).

1.2.6 Impact Score

The comparative evaluation of Corridor Options has been assisted by scoring of impacts for each of the Corridor Options using a summary assessment matrix broadly based on Table 7.1.2 of the Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis (TII PAG).

Each impact is scored based on the PAG seven-point scale (listed below) and a number assigned according to the level of significance of the impacts.

Table 1.3: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

The PAG score assigned to each Corridor Option is based on a comparison of that Corridor Option with the Do-Minimum Scenario.

Following the assessment methodology process outlined in this section, a determination is made as to whether each Corridor Option is either Preferred, Intermediate or Least Preferred based on a combination of the assigned impact scores and professional judgement and compares each of the Corridor Options against each other.

1.3 Corridor Option Assessments

1.3.1 Overview

1.3.1.1 Potential Impact Rating (PIR)

An assessment of the potential noise impact based on the number of noise sensitive receptors within specified distance bands of each of the Corridor Options under consideration as per the methodology in Section 1.2 is set out below. Table 1.4 presents the Potential Impact Rating values for Corridor Options 1 to 3.

Table 1.4: Potential Impact Rating values for Corridor Options

Corridor Option	PIR 0-50m Band	PIR 50-100m Band	PIR 100-200m Band	PIR 200-300m Band	Total PIR
Corridor Option 1	88	183	802	522	1,595
Corridor Option 2	108	174	876	415	1,573
Corridor Option 3	116	171	962	515	1,764

Corridor Option 1 and 2 have comparable total Potential Impact Rating values. Corridor Option 1 has the lowest Potential Impact Rating value in the 0 to 50m band, thus with a lower potential noise impact at properties closest to the road edge. Corridor Option 3 has the highest Potential Impact Rating when compared to the other two corridor options due to the overall width of this Corridor Option. Based on the Potential Impact Rating assessment in isolation, Corridor Option 3 would be least preferred and Corridor Option 1 and 2 would be Intermediate.

A total of 84 receiver locations representative of the closest NSLs were modelled along the extent of Corridor Option 1, 2 and 3 and also for the Do-Minimum scenario.

1.3.2 Corridor Option 1

The difference in noise levels between the Do-Minimum and Do-Something scenarios was determined. The assessment concluded that the operation of a new hard shoulder bus priority measure in the eastbound and westbound direction results in a negligible change in traffic noise levels at the modelled NSLs compared to the Do-Minimum scenario.

The difference in traffic noise level is calculated between +0.2 and +0.3 dB at the modelled NSLs with an operational speed at 120km/h during both scenarios. The negligible change is due to the road traffic remaining dominated by traffic along the mainline traffic lanes which comprises significantly higher volumes of cars, light good vehicles (LGVs) and heavy goods vehicles (HGVs) compared to the small volume of buses along the priority bus lanes.

Reducing the operational speed along the mainline and the proposed hard shoulder bus priority measures to 100km/h results in a reduction in traffic noise level between of -1dB and -1.3 dB at the modelled locations when compared to the Do-Minimum scenario, thus resulting in a negligible (positive) change.

Reference to Table 1.2 confirms the change in noise level is negligible. The overall noise and vibration impact for Corridor Option 1 is Not significant or Neutral.

1.3.3 Corridor Option 2

The difference in noise levels between the Do-Minimum and Do-Something scenarios was determined. The assessment concluded that the operation of new hard shoulder bus priority measures in the eastbound and westbound direction and the addition of a third lane in the westbound direction results in a negligible change in traffic noise levels at the modelled NSLs compared to the Do-Minimum scenario.

The difference in traffic noise level is calculated between +0.3 and +0.8 dB at the modelled NSLs with an operational speed at 120km/h during both scenarios.

Reducing the operational speed along the mainline and the proposed hard shoulder bus priority measures to 100km/h results in a reduction in traffic noise level between -0.5 to -1 dB at the modelled locations when compared to the Do-Minimum scenario, thus resulting in a negligible (positive) change.

As per Corridor Option 1, the change in noise level is negligible and the overall noise and vibration impact for Corridor Option 2 is Not significant or Neutral.

1.3.4 Corridor Option 3

The difference in noise levels between the Do-Minimum and Do-Something scenarios was determined. The assessment concluded that the operation of new hard shoulder bus priority measures in the eastbound and westbound direction and the addition of a third lane in the eastbound and westbound direction results in a negligible change in traffic noise levels compared to the Do-Minimum scenario.

The difference in traffic noise level is calculated between +0.3 and +1 dB at the modelled NSLs with an operational speed at 120km/h during both scenarios. Under this scenario, five of the modelled properties would experience an increase in traffic noise level of 1 dB thus potentially triggering a requirement for noise mitigation.

Reducing the operational speed along the mainline and the proposed hard shoulder bus priority measures to 100km/h results in a reduction in traffic noise level between -0.5 to -1 dB at the modelled locations when compared to the Do-Minimum scenario, thus resulting in a negligible (positive) change. Under this scenario, no properties would trigger a requirement for noise mitigation in accordance with the TII Noise Guidelines.

As per Corridor Option 1 and 2, the change in noise level is negligible and the overall noise and vibration impact for Corridor Option 3 is Not significant or Neutral.

1.4 Summary

All corridor options have been scored equally as Not Significant or Neutral (PAG Score 4). The scoring is balanced based on the view that whilst all Corridor Options result in reconfigured alignments of traffic lanes and the introduction of hard shoulder bus priority measures, the change in traffic noise levels compared to the Do-Minimum scenario is Not significant. For all three Corridor Options, the proposal to reduce traffic speeds to 100km/h between Junction 7 Maynooth and

Junction 5 Leixlip results in a reduction in a traffic noise at the closest NSLs to the road edge.

In terms of preference, Corridor Option 1 is marginally preferred over the other two options due to the lower number of properties within 0 – 50m of the road edge compared to the other two Corridor Options and a greater reduction in traffic noise levels at the closest NSLs compared to the other two Corridor Options. The difference between all three options, is however noted to be marginal. A summary is included in Table 1.5.

Table 1.5: Noise and Vibration Assessment Matrix of Corridor Options

Assessment Criteria	Corridor Option 1	Corridor Option 2	Corridor Option 3
Potential Impact Rating (PIR)	1,595	1,573	1,764
No of properties likely to require noise mitigation	0	0	0
Change in Noise Level (dB) DMRB long term rating	Negligible	Negligible	Negligible
Scoring			
Qualitative Assessment	Not significant or neutral	Not significant or neutral	Not significant or neutral
Score/ Impact Level	4	4	4
Preference	Preferred	Intermediate	Intermediate

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Options Report - Appendix 5 - Stage
1 Population Corridor Options
Assessment

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Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Corridor Options Population Assessment Summary

1 Stage 1 Population Corridor Options Assessment

1.1 Introduction

This section details the Population and Human Health assessment of the Stage 1 Corridor Options with respect to the Population and Human Health constraints identified in the Constraints Report.

This is a broad ranging topic which “*covers the existence, activities and health of people, usually considering people as groups or ‘populations’*” (EPA 2015)¹. Aspects examined in this section primarily relate to potential impacts on socio-economic activities (settlement patterns, population characteristics, activities, and economic) and social well-being and health of people at a community level.

Criteria relevant to the assessment of Population are of a socio-economic nature and include Journey Characteristics, Journey Amenity, General Amenity, Community Severance, and Economic effects relating to business, tourism and employment. A more detailed assessment of these criteria will be conducted in the Stage 2 Assessment.

Human Health impacts are primarily considered through an assessment of the environmental pathways by which health can be affected including air, noise, vibration, water and soils. Therefore, the health assessment draws on these findings as necessary to examine whether the effects arising from any identified impacts may have a health impact and to ensure that the effects which may have a health impact are fully considered.

The health assessment also considers health improvement and improvement to services. Other aspects, such as changes in traffic flows which are dealt with in Chapter 3 Traffic Assessment and Cross-Section, have also been considered in relation to the assessment of both Population and Human Health impacts. All environmental aspects are relevant to both general amenity and health.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

The methodology aligns with the Project Appraisal Guidelines for National Roads Unit 7.0 – Multi-Criteria Analysis (PAG, 2016). The assessment is based on sub-criteria, scored on a seven-point scale. The number and significance of individual effects are assessed against the five criteria listed in Section 1.3 for the assessment of potential impacts relevant to Population and converted to the assessment scores provided in Table 1.1.

¹ Extracted from the Advice Notes for Preparing Environmental Impact Statements (EPA draft September 2015)

Equal importance weighting is applied to the five criteria. The corridor options are rated relative to the baseline environment using qualitative as well as quantitative analysis and professional judgement of their significance.

1.2.1 Scoring Procedure

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG scoring procedure. The PAG seven-point scale scoring procedure is shown in Table 1.1.

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Following the individual criterion assessments, an overall assessment score was assigned to each Corridor Option based on the TII PAG seven-point scale scoring procedure, and the overall preference for each Corridor Option of Preferred, Intermediate, or Least preferred was assigned using the assessment criteria results and professional judgement.

1.3 Corridor Options Assessment

1.3.1 Corridor Option 1

- **Journey Characteristics**

Corridor Option 1 will enable more reliable journey times for bus passengers especially at peak times. Journey characteristics in the form of consistency of speed and the potential for delay would be an issue during the construction phase despite the maintenance of two lanes at peak times. If lane closures are needed at other times, this would represent a negative impact.

- **Journey Amenity**

If, during operation, a vehicle were to be stopped temporarily in the hard shoulder due to an emergency, buses would be required to move into the traffic lanes where they may potentially interfere with traffic flow. This would represent a negative impact on journey amenity as it would require drivers to respond by possibly braking or changing lanes if they are travelling at the speed limit or if traffic volumes are close to the capacity of the road.

This situation applies to all of the Corridor Options, but especially Option 1 as, being restricted to two main traffic lanes in each direction, the ease with which drivers can move into another lane is more limited. This eventuality will be minimised by the availability of proposed emergency refuge areas located at circa 500m spacings in both directions.

Drivers will need to pay attention to the possible presence of buses when crossing the hard shoulder to reach junction diverges and to cross this same lane when converging with moving traffic on the M4/N4. The proposed lane design will mitigate this issue.

During construction, the issue of vehicle break downs will be managed through the provision of a breakdown service to remove such vehicles from the carriageway as quickly as possible.

- **General Amenity**

Although some pavement widening of the road will be needed in places, including through the use of cut, this is not sufficient to have an impact on general amenity.

- **Community Severance**

There are no issues of community severance associated with Corridor Option 1.

- **Economic**

The infrastructure will permit more reliable journey times for long distance buses, and potentially for more frequent local services in the event that this Corridor Option increases demand. This will have a positive impact in terms of social inclusion given that lower income groups are more likely to use public transport. Potentially, it will enable prospective employees to access to a wider area for employment, and likewise benefit employers through access to a geographically larger labour catchment. More generally, it will have a positive impact at an economic level by reducing the duration and increasing the reliability of long distance journeys. There would also be a positive impact from any reduction in traffic congestion on economic activity generally, but especially for businesses located along the M4/N4 corridor within the extent of the Corridor Option.

1.3.2 Corridor Option 2

- **Journey Characteristics**

Given the greater construction works necessary to construct the additional third traffic lane in the westbound direction, the impact is more significant than for Corridor Option 1.

- **Journey Amenity**

Journey amenity impacts are as per Corridor Option 1 above, except that during operation the implications of buses needing to leave the hard shoulder bus priority measure in the event of a stationary vehicle being located in the hard shoulder are less because of the inclusion of an additional lane in the westbound direction. This will provide for easier movement of buses into the traffic lanes and an easier movement of other vehicles from lane 2 to lane 3.

- **General Amenity**

This is as per Corridor Option 1.

- **Community Severance**

This is as per Corridor Option 1.

- **Economic**

Given the addition of a third lane in the westbound carriageway, this would have a positive effect on commuter travel and the accessibility of local businesses when compared to Corridor Option 1 as it may assist to relieve congestion and improve journey times relative to the existing two traffic lanes.

1.3.3 Corridor Option 3

- **Journey Characteristics**

Given the greater construction works necessary to construct the additional third traffic lane in the eastbound and westbound directions, the impact is more significant than for Corridor Option 1 or Corridor Option 2.

Construction works at the R405 Ballygoran Road Overbridge and R404 Celbridge Road Overbridge may have a temporary impact on regional road traffic movements at these locations.

- **Journey Amenity**

This is as per Corridor Option 1 and Corridor Option 2, except that the implications of buses needing to leave the hard shoulder bus priority measure in the event of a stationary vehicle being located in the hard shoulder are less because of the inclusion of an additional lane in both the eastbound and westbound directions. This will provide for easier movement of buses into the traffic lanes or an easier movement of other vehicles from lane 2 to lane 3.

- **General Amenity**

This is as per Corridor Option 1 and Corridor Option 2, except there may be more environmental impacts associated with noise and visual. However, the impact is only at a private residential level and not at a community level.

- **Community Severance**

This is as per Corridor Option 1 and Corridor Option 2, with the possible exception of Cooldrinagh Lane Footbridge where severance may be required during the construction phase.

- **Economic**

This is similar to Corridor Option 1 and Corridor Option 2. However, given the addition of a third lane in both the eastbound and westbound carriageway, this could have a further positive effect on commuter travel and the accessibility of local businesses when compared to Corridor Option 1 or 2 as it would help to relieve congestion in the existing two traffic lanes and improve journey times in both the eastbound and westbound carriageway.

During construction, an imperceptible to slight negative impact is likely on Ray Crofton Motors located to the south of the existing M4 between Junction 7 Maynooth and Junction 6 Celbridge. This is also the case for McCoy Motors located to the southeast of Junction 5.

1.4 Summary

The overall ranking preferences for the Corridor Options in terms of population are shown in Table 1.2.

Table 1.2: Corridor Options Population Assessment Summary

Assessment Criteria	Corridor Option 1	Corridor Option 2	Corridor Option 3
Journey Characteristics	Use of hard shoulder for bus priority measures will permit more consistency of vehicle journey time at times when traffic is moving freely while the removal of buses from the existing lanes at busy times will permit more journey reliability for bus passengers.	Use of hard shoulder for bus priority measures will permit more consistency of vehicle journey time at times when traffic is moving freely while the removal of buses from the existing lanes at busy times will permit more journey reliability for bus passengers.	Use of hard shoulder for bus priority measures will permit more consistency of vehicle journey time at times when traffic is moving freely while the removal of buses at busy times from the existing lanes will permit more journey reliability for bus passengers. Possible impact during construction to traffic on the R405 Ballygoran Road Overbridge and R404 Celbridge Road Overbridge.
Journey Amenity	Potential journey amenity issues where a bus is required to leave the hard shoulder bus priority measure due to a vehicle located in the hard shoulder because of an emergency	Less potential journey amenity issues in the westbound direction where a bus is required to leave the hard shoulder bus priority measure due to a vehicle located in the hard shoulder because of an emergency as a result of the inclusion of a third lane in the westbound direction.	Less potential journey amenity issues in both the eastbound and westbound directions where a bus is required to leave the hard shoulder bus priority measure due to a vehicle located in the hard shoulder because of an emergency as a result of the inclusion of a third lane in both the eastbound and westbound direction.
General Amenity	No significant impact	No significant impact	Imperceptible to slight negative impact on two car sales businesses
Community Severance	No impact	Possible temporary severance due to works at Cooldrinagh Lane Footbridge	Possible temporary severance due to works at Cooldrinagh Lane Footbridge
Economic	Will provide positive impact due to more reliable long distance bus services	Will provide positive impact due to more reliable long distance bus services	Will provide positive impact due to more reliable long distance bus services
Scoring			
Qualitative Assessment	Neutral	Minor or Slightly positive	Moderately positive
Score/ Impact Level	4	5	6
Preference	Least preferred	Intermediate	Preferred

Kildare County Council

Maynooth to Leixlip Project

Options Report - Appendix 5 - Stage
1 Soils and Geology Corridor
Options Assessment

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This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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1 Stage 1 Soils and Geology Corridor Options Assessment

1.1 Introduction

This section details the Soils and Geology assessment for the Stage 1 Corridor Options with respect to the Soils and Geology constraints identified in the Constraints Report

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

The Stage 1 assessment has been prepared in accordance with the following guidance:

- Transport Infrastructure Ireland (TII) guidance, formally National Roads Authority (NRA) guidance, Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology on National Road Schemes (herein referred to as NRA Guidelines)¹
- The Environmental Protection Agency (EPA) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports²
- Transport Infrastructure Ireland (TII) guidance, formally National Roads Authority (NRA). Environmental Impact Assessment of National Road Schemes – a Practical Guide³

The NRA Guidelines provide useful criteria for rating of the identified Soils and Geology constraints (herein referred to as Criteria) that are presented in the Soils and Geology section of the Constraints Report. Each criterion comprises of individual attributes which have been assigned an Importance using Box 4.1 of the NRA Guidelines. The Importance ratings are listed in Table 1.1.

¹ National Roads Authority, 2009. Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, Ireland: s.n. Available at: <https://www.tii.ie/technical-services/environment/planning/Guidelines-on-Procedures-for-Assessment-and-Treatment-of-Geology-Hydrology-and-Hydrogeology-for-National-Road-Schemes.pdf>

² Environmental Protection Agency, 2017. Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, Draft. Available at: <https://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf> [Accessed: 17 February 2021]

³ National Roads Authority, 2008. Environmental Impact Assessment of National Road Schemes – a Practical Guide. Available at: <https://www.tii.ie/technical-services/environment/planning/Environmental-Impact-Assessment-of-National-Road-Schemes-Practical-Guide.pdf>

Table 1.1: Rating of Significant Environmental Impacts ¹

Importance of Attribute	Magnitude of Impact			
	Negligible	Small Adverse	Moderate Adverse	Large Adverse
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant / Moderate	Profound / Significant	Profound
High	Imperceptible	Moderate / Slight	Significant / Moderate	Severe / Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

The ‘Magnitude of Impact’ assesses the impact that each Corridor Option has on each criterion attribute, a ‘Magnitude of Impact’ is assigned using Box 5.1 of the NRA Guidelines as presented in the table above. The magnitude of the potential impacts that arise for each criterion attribute have been assessed based on the information that is currently available.

A ‘Significance of Impact’ has then been determined from the table above based on the ‘Importance of Attribute’ and the ‘Magnitude of Impact’.

Once a significance of impact is determined for each associated criterion attribute for each Corridor Option, an overall impact rating was assigned to that criterion using the TII Project Appraisal Guidelines (PAG) for National Roads Unit 7.0 – Multi-Criteria Analysis (MCA)⁴. The following scoring system as outlined in Section 2.4 of the TII PAG was then used to score the Corridor Options:

Table 1.2: PAG Scoring System used in Ranking

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

⁴ Transport Infrastructure Ireland, 2016. Project Appraisal Guidelines for National Roads Unit 7.0 - Multi-Criteria Analysis. Available at: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

1.2.1 Assessment Criteria

The soils and geology criteria which have been considered as part of this assessment are as follows:

- Soil Deposits comprising well drained soil types which are important for agriculture;
- Contaminated Sites which comprise the horizontal extent of Made Ground;
- Bedrock Geology comprising areas where bedrock outcrops and sub crops are recorded;
- Soft Soils comprising alluvium deposits (soft ground);
- Earthworks comprising bulk cut and fill volumes and the cut/fill balance.

Each of these criteria are impacted by the Corridor Options and are considered to be differentiators in the assessment of options.

The following constraints identified in the Soils and Geology section of the Constraints Report have been excluded from this Stage 1 assessment for the following reasons:

- **Glacial Till:** Glacial Till is widespread throughout the study area and common to all alternatives it is not considered a differentiator and was eliminated from the analysis under the Subsoil criterion
- **Bedrock Karst:** There are no karst features identified within the study area;
- **Landslide Susceptibility:** No areas of moderately high to high landslide susceptibility noted on the GSI Landslide Susceptibility are impacted by the Stage 1 Corridor Options;
- **Historic industrial sites, pits, quarries and mines:** These features are not impacted by the Corridor Options;
- **Industrial facilities:** There are no industrial facilities impacted by the Corridor Options;
- **Prospecting Licences:** There are two prospecting licences between Junction 7 and Junction 5 that are common to all options and not considered a differentiator between Corridor Options; and
- **Economic Geology:** It is unlikely that the high to very high crushed rock aggregate potential that has been identified immediately adjacent to the existing M4 east and west of the R405 Ballygoran Overbridge and from the River Liffey Bridge to Junction 5 will be a viable economic resource due to its location. For this reason, it has been excluded from the Stage 1 assessment.

The criterion of Soft Soils will be assessed as an attribute under the criterion of Earthworks for this assessment as it is considered in terms of material management requirements and not in terms of subsoil importance.

1.2.2 Assumptions

- All excavated material from the Corridor Options will be taken off site to an appropriate licenced facility;
- Earthwork volumes (i.e. bulk cut/fill and surplus/deficit volumes) have been estimated based on the indicative designs with the following assumptions;
 - Cut volumes are based on 1V:2H slopes;
 - Fill volumes are based on 1V:2H slopes;
 - Volumes are based on 100mm depth of topsoil on slopes and verges;
 - Volumes reported are for the mainline of the Corridor Options (i.e. volumes exclude side roads, junctions, excavated material for utilities, gantries, and structures);
 - Volumes do not consider topsoil removal, over-excavation in soil and rock, temporary works, or construction compounds;
 - Bulk earthwork volumes do not include for excavate and replace volumes associated with soft soils and made ground areas;
 - Volumes relate to in-situ volumes only, material bulking factors have not been applied; and
 - Volumes have been rounded up to the nearest 100m³.

1.3 Corridor Options Assessment

All the Soils and Geology criteria are considered of high importance (high quality/significance/value on a local scale) aside from Earthworks which is considered to be of medium importance as it has medium significance on a local scale.

Corridor Option 1 follows the footprint of the existing M4/N4 (with the exception of the proposed emergency refuge areas), therefore the impact on Soils and Geology for this Corridor Option for Soil Deposits, Bedrock Geology and Contaminated Sites criteria is negligible. The impact for the Earthworks criterion for this Corridor Option is considered small adverse as cut and fill will only be undertaken in the emergency refuge areas. There are the 16 emergency refuge areas of which eight are located adjacent to the westbound carriageway and eight are located adjacent to the eastbound carriageway.

Corridor Option 2 has a greater impact on the soils and geology due to the addition of a westbound lane of the M4/N4. The impact of Corridor Option 2 on the criteria of Soil Deposits and Bedrock Geology is small adverse. The impact of Corridor Option 2 on Contaminated Sites is negligible as very little of the Made Ground attribute that comes under this criterion is impacted. The Earthworks criterion has a small adverse impact from Corridor Option 2 as the additional lane and construction of the emergency refuge areas results in a small volume of bulk cut and fill.

Corridor Option 3 has the greatest impact due to the addition of both a westbound and eastbound lane. The impact of Corridor Option 3 on the criteria of Soil Deposits and Bedrock Geology is small adverse. The impact of Corridor Option 3 on Contaminated Sites is small adverse as some of the Made Ground attribute that comes under this criterion is impacted. The Earthworks criterion has a small adverse impact from Corridor Option 3 as the additional lanes and construction of the emergency refuge areas results in a small volume of bulk cut and fill.

The assessment of the Soils and Geology criteria are presented in the tables below.

Table 1.3: Soil Deposits

Option Corridor	Criterion	Criterion Attributes	Description	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall Qualitative Assessment
Option 1	Soil Deposits	EPA National Soils Important for Agriculture	Soils Important for Agriculture	High	Negligible	Imperceptible	Not Significant or Neutral
Option 2	Soil Deposits	EPA National Soils Important for Agriculture	Soils Important for Agriculture	High	Small Adverse	Moderate / Slight	Minor or Slightly Negative
Option 3	Soil Deposits	EPA National Soils Important for Agriculture	Soils Important for Agriculture	High	Small Adverse	Moderate / Slight	Minor or Slightly Negative

Table 1.4: Contaminated Sites

Option Corridor	Criterion	Criterion Attributes	Description	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall Qualitative Assessment
Option 1	Contaminated Sites	Made Ground	Extent of impact on Made Ground Deposits	High	Negligible	Imperceptible	Not Significant or Neutral
Option 2	Contaminated Sites	Made Ground	Extent of impact on Made Ground Deposits	High	Negligible	Imperceptible	Not Significant or Neutral
Option 3	Contaminated Sites	Made Ground	Extent of impact on Made Ground Deposits	High	Small Adverse	Moderate / Slight	Minor or Slightly Negative

Table 1.5: Bedrock Geology

Corridor Option	Criterion	Criterion Attributes	Description	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall Qualitative Assessment
Option 1	Bedrock Geology	GSI Shallow Bedrock	Shallow Bedrock 0 to 5m Below Ground Surface	High	Negligible	Imperceptible	Not Significant or Neutral
Option 2	Bedrock Geology	GSI Shallow Bedrock	Shallow Bedrock 0 to 5m Below Ground Surface	High	Small Adverse	Moderate / Slight	Minor or Slightly Negative
Option 3	Bedrock Geology	GSI Shallow Bedrock	Shallow Bedrock 0 to 5m Below Ground Surface	High	Small Adverse	Moderate / Slight	Minor or Slightly Negative

Table 1.6: Earthworks

Corridor Option	Criterion	Criterion Attributes	Description	Volume (m ³) or Quantity	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall Qualitative Assessment
Option 1	Earthworks	Bulk Earthworks	Cut (m ³)	18,119	Medium	Small Adverse	Moderate / Slight	Minor or Slightly Negative
			Fill (m ³)	2,154		Negligible	Imperceptible	
			Surplus (m ³)	15,965		Small Adverse	Moderate / Slight	
			Soft Deposits	Not impacted		-	-	
Option 2	Earthworks	Bulk Earthworks	Cut (m ³)	37,036	Medium	Small Adverse	Moderate / Slight	Minor or Slightly Negative
			Fill (m ³)	2,309		Negligible	Imperceptible	
			Surplus (m ³)	34,728		Small Adverse	Moderate / Slight	
			Soft Deposits	Impacted		Negligible	Imperceptible	
Option 3	Earthworks	Bulk Earthworks	Cut (m ³)	67,748	Medium	Small Adverse	Moderate / Slight	Minor or Slightly Negative
			Fill (m ³)	5,378		Negligible	Imperceptible	
			Surplus (m ³)	62,370		Small Adverse	Moderate / Slight	
			Soft Deposits	Impacted		Negligible	Imperceptible	

1.4 Summary

Table 1.7: Soils and Geology Assessment Matrix of Corridor Options

Assessment Criteria	Corridor Option 1	Corridor Option 2	Corridor Option 3
Soil Deposits	Not Significant or Neutral	Minor or Slightly Negative	Minor or Slightly Negative
Contaminated Site	Not Significant or Neutral	Not Significant or Neutral	Minor or Slightly Negative
Bedrock Geology	Not Significant or Neutral	Minor or Slightly Negative	Minor or Slightly Negative
Earthworks	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Overall Qualitative Assessment	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Score/ Impact Level	3	3	3
Preference	Preferred	Intermediate	Least Preferred

Corridor Options 1, 2 and 3 are considered to have a minor or slightly negative impact on the soils and geology of the study area which is reflected in the scoring of each of the soils and geology criteria. Corridor Option 3 is the least preferred as it marginally has more of an impact than Corridor Options 1 and 2. Corridor Option 1 is preferred as it has the least impact on soils and geology even though the impact level difference between the Corridor Options is insignificant.



MAYNOOTH TO LEIXLIP PROJECT

Appendix 5.6B
Stage 1 Sift 3 POA
Environmental Assessments -
Junctions

Kildare County Council

Maynooth to Leixlip Project

Options Report - App 5 - Stage 1
Material Assets – Agriculture -
Junction Options Assessment

Draft 1 | 31 July 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Assessment Matrix of Junction 7 Options

Table 1.3: Assessment Matrix of Junction 5 Options

1 Stage 1 Material Assets – Agriculture – Junction Options Assessment

1.1 Introduction

This section details the Stage 1 Material Assets Agricultural assessment of the Junction 7 Maynooth and Junction 5 Leixlip Options with respect to the Material Assets Agriculture constraints identified in the Constraints Report.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

1.2.1 Guidelines and Data Sources

The following guidelines and legislation were referred to when undertaking this Phase 1 Alternatives Assessment:

- European Union (2018) (Planning and Development) (Environmental Impact Assessment) Regulations. (SI 296 of 2018)
- Environmental Protection Agency (EPA) (May 2022) Guidelines on the Information to be contained in Environmental Impact Assessment Reports¹
- Transport Infrastructure Ireland (TII) (2016) Project Appraisal Guidelines Unit 7.0 - Multi Criteria Analysis, PE-PAG-02031²

This assessment is a combination of a desktop assessment of available data sources combined with the on-site surveys conducted in January 2021. The desktop study considered the following sources of information;

- Aerial mapping / photography³;
- Property Registration Authority of Ireland (PRAI)⁴ database;
- Soil mapping data from the Teagasc Irish Soil Information System⁵; and,

¹Environmental Protection Agency (EPA) (May 2022) Guidelines on the Information to be contained in Environmental Impact Assessment Reports. Available from:

<https://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf> [Accessed 20 May 2022]

² Transport Infrastructure Ireland (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf> [Accessed: 09 April 2020]

³ Google Aerial Mapping. Available from: <https://www.google.com/maps> [Accessed: Nov - Dec 2020 and April 2022]

⁴Property Registration Authority (2021). Available from <https://www.landdirect.ie/index> [Accessed in 2021]

⁵Teagasc, Irish Soil Information System. Available from <http://gis.teagasc.ie/soils/> [Accessed: 07 January 2021]

- Data regarding agriculture in County Kildare from the Central Statistics Office (CSO) as referred to in the Constraints Report. In addition to CSO data, the preliminary 2020 Agricultural Census⁶ data results were referred to in this assessment to provide more up to date data on average farm size and farm type in County Kildare.

1.2.2 Assessment Criteria

Five criteria are assessed as per Section 3.1.5 of 2016 PAG Guidelines i.e. farm size, farm type, landtake, severance (with mitigation) and viability.

Farm Size

The farm size within the study area, taken from the 2020 Agricultural Census and the 2020 Agricultural Census, is used to determine trends farm sizes for junction options.

Farm Type

The farm type along options is assessed by comparing the number of highly sensitive enterprises (dairy and equine).

Landtake

The landtake impact is assessed by considering the following sub-criteria;

- Landtake of agricultural land. For each junction option the landtake of agricultural land⁷ within the option is measured;
- Overall length of the junction option;
- The number of farmyards within each junction option; and
- The quality of the landtake is also considered. Reference is made to soil types as described in the Constraints Report. The main soil type of the western part of the study area (i.e. west of junction 7 is a surface water gley and main soil type of the western part of the study area is a Luvisol. While the land quality associated with the surface water gley soil type is reasonably good, the land quality in the east of the study area is better i.e. a Luvisol soil type).

Severance (with mitigation)

The severance of agricultural holdings is assessed by measuring the off-line lengths of the junction options.

⁶ 2020 Agricultural Census – preliminary results, accessed in April 2022. Available at: <https://www.cso.ie/en/releasesandpublications/ep/p-coa/censusofagriculture2020-preliminaryresults/>

⁷ Agricultural land is mapped based on Corine 2018 data which was edited to further exclude forestry, woodland, scrub, existing roads and urban land which was mapped using DAFM Forestry Viewer and Aerial photography (Google Earth)

Viability

Viability is defined as the ability to survive, grow and be sustained. In relation to agriculture high viability is represented by large farms, good agricultural land, intensive farm practices (high stocking rates, high crop yields) and highly sensitive enterprises such as dairy, equine, pigs and horticulture – as defined in the Constraints Report. Low viability is represented by small farms, poor quality land, extensive farm practices (low stocking rates, low crop yields) and low and medium sensitivity farm enterprises such as beef, sheep and rough grazing.

1.2.3 Scoring Procedure

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG scoring procedure. The PAG seven-point scale scoring procedure is shown in Table 1.1.

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

For each option, the criteria as set out in Section 3.1.5 of the 2016 PAG Guidelines (i.e. farm size, farm types, landtake, severance and viability) are assessed from a qualitative and quantitative perspective and scored according to the PAG Unit 7.0 seven-point Likert scale. Finally an overall score is given to each option based on the seven-point Likert scale.

1.3 Junction Options Assessment

1.3.1 Junction 7 Maynooth Options

1.3.1.1 Location A – Junction West of Millfarm

Location A is 8.5km in length with link roads to the north and south. The area of agricultural land⁷ within the indicative footprint of this option is approximately 9.3 hectares – mainly Surface Water Gley type soil. This location will have a low impact at the edge of one farmyard and the northern link road will cross one small high sensitive enterprise (equine).

1.3.1.2 Location B – Junction between Millfarm and Newtown Road

Location B includes link roads to the north and south of the M4. The area of agricultural land within the indicative footprint of this location is approximately 6.5 hectares – mainly Surface Water Gley type soil. There are no farmyards or high sensitive enterprises within the indicative footprint of the location.

1.3.1.3 Location C – Junction between Newtown Road and R406 Straffan Road

Location C includes link roads to the north and south of the M4. The area of agricultural land within the indicative footprint of this location is approximately 10.1 hectares – mainly Surface Water Gley type soil. There is one farmyard and no high sensitive enterprises within the indicative footprint of the junction location.

1.3.1.4 Location D – Junction West of Existing Ballygoran Overbridge

Location D includes two partially off-line link roads to the north and south of the M4. The area of agricultural land within the indicative footprint of this location is approximately 3.3 hectares – mainly Surface Water Gley type soil. There are no farmyards or high sensitive enterprises within the indicative footprint of the location.

1.3.1.5 Location E – Junction reusing Existing Ballygoran Overbridge

Location E is effectively online and utilises existing infrastructure. The area of agricultural land within the indicative footprint of this location is approximately 1.8 hectares – mainly Luvisol type soil. There are no farmyards within the indicative footprint of the location. This location will have an imperceptible ‘edge’ impact on a high sensitivity stud farm.

1.3.1.6 Location F – Junction East of Existing Ballygoran Overbridge

Location F includes link roads to the north and south of the M4. The area of agricultural land within the indicative footprint of this location is approximately 3.5 hectares – mainly Luvisol type soil. There are no farmyards within the indicative footprint of the location. This location will have a moderately negative severance impact on a high sensitivity stud farm.

1.3.2 Junction 7 Maynooth Conclusion

Locations D and E are preferred with low potential landtake and low severance impacts. Locations A, B, C and F have comparatively higher landtake and severance impacts and are least preferred.

Table 1.2: Assessment Matrix of Junction 7 Options

Criteria	Location A	Location B	Location C	Location D	Location E	Location F
Assessment Criteria 1 Farm Size	50.6ha	50.6ha	50.6ha	50.6ha	50.6ha	50.6ha
Assessment Criteria 2 Farm Type – Number of High Sensitive Enterprises affected	1	0	0	0	1	1
Assessment Criteria 3 Landtake						
Landtake sub-criteria – overall length (length on-line)	8.5km (7.7km)	8.4km (7km)	10.9 km (7km)	7.7km (7.4km)	7.2km (7.2km)	8.2km (7.4km)
Landtake sub-criteria - landtake of agricultural land	9.3ha	6.5ha	10.1ha	3.3ha	1.8ha	3.5ha
Landtake sub-criteria – land quality	Good quality (Surface Water Gley)	Good quality (Surface Water Gley)	Good quality (Surface Water Gley)	Good quality (Surface Water Gley)	Very Good quality (Luvisol)	Very Good quality (Luvisol)
Landtake sub-criteria - number of farmyards within corridor (number of high sensitivity yards)	1 (0)	0 (0)	1 (0)	0 (0)	0 (0)	0 (0)
Assessment Criteria 4 Severance (length off-line)	0.8km	1.4km	3.9km	0.3km	1.8km	0.8km
Assessment Criteria 5 Viability – number of high sensitive enterprises within location (Generally high viability in the baseline)	1	0	0	0	1	1
Qualitative Assessment	Minor or slightly negative due to severance by link roads	Minor or slightly negative due to severance by link roads	Minor or slightly negative due to severance by link roads	Not significant or neutral (with some negative landtake impacts)	Not significant or neutral (with some negative landtake impacts)	Minor or slightly negative due to severance by link roads. Severance in a high sensitive stud farm.
Score/Impact Level	3	3	3	4	4	3
Preference - Professional Judgement	Least Preferred	Least Preferred	Least Preferred	Preferred	Preferred	Least Preferred

1.3.3 Junction 5 Leixlip Options

1.3.3.1 Location A – Junction reusing existing R404 Overbridge

Location A is on-line and utilises existing infrastructure. The area of agricultural land within the indicative footprint of this location is approximately 2.5 hectares – mainly Luvisol type soil. There are no farmyards or high sensitive enterprises within the indicative footprint of the location.

1.3.3.2 Location B – Junction between Liffey River Bridge and Existing Junction 5

Location B includes off-line link roads to the north and south of the M4/N4. The area of agricultural land within the indicative footprint of this location is approximately 1.9 hectares – mainly Luvisol type soil. There are no farmyards within the indicative footprint of the location. This location will have a highly negative severance impact on a high sensitivity stud farm.

1.3.4 Junction 5 Leixlip Conclusion

Location A, while having a higher landtake is preferred because its impacts are online (no severance impacts) and there are no high sensitive enterprise impacts. Location B will have a highly negative severance impact on a high sensitivity stud farm.

Table 1.3: Assessment Matrix of Junction 5 Options

Criteria	Location A	Location B
Assessment Criteria 1 Farm Size	50.6ha	50.6ha
Assessment Criteria 2 Farm Type – Number of High Sensitive Enterprises affected	0	1
Assessment Criteria 3 Landtake		
Landtake sub-criteria – overall length (length on-line)	3.1km (3.1km)	3.3km (0.6km)
Landtake sub-criteria - landtake of agricultural land	2.5ha	1.9ha
Landtake sub-criteria – land quality	Very Good quality (Luvisol)	Very Good quality (Luvisol)
Landtake sub-criteria - number of farmyards within corridor (number of high sensitivity yards)	0 (0)	0 (0)
Assessment Criteria 4 Severance (length off-line)	0km	0.6km
Assessment Criteria 5 Viability – number of highly sensitive enterprises (Generally high viability in the baseline)	1	1
Qualitative Assessment	Neutral overall (with some negative landtake impacts)	Minor adverse due to severance by link roads. Severance in a high sensitive enterprise.
Score/Impact Level	4	3
Preference - Professional Judgement	Preferred	Least Preferred

1.4 Summary

Impacts on material assets agriculture are generally low, ranging from minor adverse to neutral at both Junction 7 and Junction 5. This is because the proposed locations are mainly on-line. Adverse impacts will mainly arise due to the severance and landtake impacts of the link roads.

At Junction 7, Locations D and E have the lowest potential impacts due to the short link roads and these locations are preferred and other locations are least preferred.

At Junction 5 Location A has the lowest potential impacts due to the short link roads while Location B has longer link roads that cross agricultural land. The landtake is low in both locations (although it is lowest for Location B). Location A is preferred because of lower potential severance impacts.

Kildare County Council

Maynooth to Leixlip Project

Options Report - Appendix 5 - Stage
1 Air Quality- Junction Options
Assessment

Draft 1 | 31 July 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Air Quality Assessment Table – Junction 7

Table 1.3: Air Quality Assessment Table – Junction 5

1 Stage 1 Air Quality Junction Options Assessment

1.1 Introduction

This section details the Stage 1 Air Quality assessment of the Junction Options with respect to the Air Quality constraints identified in the Constraints Report.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

The multi-criteria air assessment was undertaken with reference to the Transport Infrastructure Ireland (TII) Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes and in accordance with the requirements of the TII Project Management Guidelines 2019, and the TII Project Manager's Manual, 2019 and the TII Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis PE-PAG-02031, October 2016. An air quality specialist is required to define their assessment methodology and assessment sub-criteria based on their expert opinion and best practice. The assessment includes both a quantitative and qualitative element. Each impact is scored qualitatively based on the PAG seven-point scale and an integer is assigned according to the impact level as shown in Table 1.1.

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Using a combination of the impact scores and professional judgement, a determination as to the level of the impact of each Junction Option was provided. The Environmental Protection Agency (EPA) (May 2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports were also referred to when undertaking this assessment, particularly Table 3.3 in determining the significance of the impact.

Using the impact scores and the professional judgement, a determination is made as to whether each Junction Option that is assessed is either:

- Preferred;
- Intermediate; or
- Least Preferred.

The Junction Options are weighted against each other in the assessment matrix. An overall matrix will be included at the conclusion of each assessment providing an overall summary of the assessment for the three Junction Options.

1.2.1 Assessment Criteria

The Air Quality assessment is based on the number of sensitive receptors in proximity to each junction option and the projected traffic volumes accessing the junctions during the operational phase. The construction phase is assessed through the consideration of the number of sensitive properties located in proximity to the likely construction works where dust impacts may be experienced.

Section 2.3, Route Selection Process Stage 1 Preliminary Options Assessment, of the NRA, 2011 Guidelines¹ includes the initial steps to assess air quality within a study area as follows:

“The specific objectives of the air quality input to the Stage 1 Preliminary Options Assessment of the Route Selection Process are to characterise the existing and ambient air quality in the study area and to initially identify all sensitive receptor locations within the study area likely to be impacted by the proposed scheme before feasible route options are identified. Once feasible route options are identified and in order to undertake the preliminary options assessment, the total number of sensitive receptors (e.g. residential properties) within 50m of the carriageway of each feasible route option should be recorded with a view to eliminating those routes with the greater number of sensitive receptors likely to be impacted by the proposed scheme.”

The existing and ambient air quality and the initial identification of sensitive receptor locations within the study area are included in the Air Quality Constraints in the Constraints Report. The air quality conditions for this assessment are in line with the baseline conditions set out in the Constraints Report.

The scope of the air quality assessment is described in Section 2.3 of the NRA, 2011 Guidelines¹ as follows:

“Identify and record all sensitive receptor locations within the study area and all sensitive receptors within 50 m of the carriageway of each feasible route option that are, or have the potential to be significantly affected by a proposed scheme”

In line with the NRA, 2011 Guidelines¹, a quantitative assessment of potential air quality impacts on existing and potential sensitive receptors was undertaken.

Sensitive receptor locations are defined in the NRA, 2011 Guidelines¹ as residential housing, schools, hospitals, places of worship, sports centres, and shopping areas, i.e. locations where members of the public are likely to be regularly present. In addition, planning applications give an indication to the potential number of future sensitive receptors adjacent to corridors.

Traffic data projections are provided for each Junction Option for the year 2047. This data is considered in the assessment of options.

1.2.2 Scoring Procedure

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG scoring procedure. The PAG seven-point scale scoring procedure is shown in Table 1.1 in Section 1.2.

In the first instance, individual assessments were carried out on each criterion followed by an overall assessment. A score was assigned to each Junction Option based on the TII PAG seven point scale, and the overall preference for each Junction Option of Preferred, Intermediate, or Least Preferred was assigned using a combination of the assessment criteria results and professional judgement.

1.3 Junction Options Assessment

The number of existing and potential sensitive receptors in proximity to each Junction Option determines local air quality impacts. The zone of interest for the assessment is 0-50m from each junction option potential road footprint. This is an offset from the edge of the potential road footprint of each junction option and assumes that properties within the potential footprint would be acquired and would therefore not be counted as receptors.

The numbers of sensitive receptors in proximity to each Junction Option, the traffic volumes, and the subsequent air quality assessment determinations are outlined in Table 1.2 for Junction 7 and Table 1.3 for Junction 5.

The predicted AADT volumes listed for Junction 7 Options are taken from the same section of the M4 between Junction 7 Maynooth and Junction 6 Celbridge for each Junction Option. The AADT volumes listed for Junction 5 Options are taken from the same section of the M4 between Junction 6 and Junction 5 for each Junction Option, as each of these areas is within proximity to the junction options.

Corridor Option 1 has been utilised for the junction designs, which includes a hard shoulder bus priority measure in both the eastbound and westbound directions. Corridor Option 1 has been used as it includes bus priority measures in both the eastbound and westbound directions but excludes additional traffic lanes in either the eastbound or westbound directions. This is deemed to be the most appropriate proposed corridor option cross section.

1.3.1 Junction 7 Maynooth Options

The numbers of sensitive receptors in proximity to each Junction 7 Option, the traffic volumes, and the subsequent air quality assessment determinations are outlined in Table 1.2. The 'Do-Minimum' scenario refers to the maintenance of the existing M4/N4 as well as planned and committed projects in the study area. This scenario provides the baseline for establishing the environmental impacts of all other options.

1.3.1.1 Location A – Junction West of Millfarm

Location A is likely to result in a negative impact to air quality due to increased traffic volumes in proximity to sensitive receptors along the existing M4 and three new sensitive receptors introduced from the link roads of this Junction Option. This Option progresses mainly through agricultural land, with a small number of single residential developments within 50m of the Junction Option. The number of sensitive receptors in proximity is not substantial however, there is an increase from the Do-Minimum scenario. Overall increases in traffic volumes are likely with Location A in comparison to the Do-Minimum scenario.

Location A consists of the construction of a new grade separated junction, associated works and new link roads. The construction stage is expected to result in short term adverse impacts due to construction dust. However, the operational phase is expected to result in long term negative impacts on air quality due to an increase in traffic volumes.

Both the construction and the operational stages of this junction location are predicted to result in Minor or Slightly Negative impacts (PAG Score: 3) to air quality.

1.3.1.2 Location B – Junction between Millfarm and Newtown Road

Location B is likely to result in a negative impact to air quality due to increased traffic volumes in proximity to sensitive receptors along the existing M4, relative to the Do-Minimum scenario. The same number of sensitive receptors will be impacted in this Option, relative to the Do-Minimum scenario. This location has the lowest number of sensitive receptors in proximity, relative to all other Junction Options.

Location B consists of the construction of a new grade separated junction, associated works and new link roads. The construction stage is expected to result in short term adverse impacts due to construction dust. However, the operational phase is expected to result in long term negative impacts on air quality due to predicted increases in traffic volumes.

Both the construction and the operational stages of this location are predicted to result in Minor or Slightly Negative impacts (PAG Score: 3) to air quality.

1.3.1.3 Location C – Junction between Newtown Road and R406 Straffan Road

Location C is likely to result in a positive impact to air quality in proximity to sensitive receptors adjacent to the junction due to a slight reduction in traffic volumes, relative to the Do-minimum scenario. However, this location will include the construction of two new link roads which will pass in proximity to clustered housing developments. This location will increase traffic volumes in proximity to a large number of new sensitive receptors as a result, and thus potentially decrease air quality in these locations.

Location C consists of substantial new infrastructure relative to all other locations and the Do-Minimum scenario. A new grade separated junction and new two link roads will be incorporated. The construction stage is expected to result in short term adverse impacts due to construction dust and these impacts are likely to be more significant relative to all other Junction Options. The operational phase of this location is expected to result in positive impacts to air quality due to slight decreases in traffic volumes on the mainline. However, relative to the Do-Minimum scenario, the decreases in traffic volumes are not significant and therefore are unlikely to result in a significant positive impact to air quality. The incorporation of new link roads in this location is likely to increase traffic volumes in proximity to a large number of new sensitive receptors, and thus will potentially decrease air quality on these link roads.

Both the construction and the operational stages of this location are predicted to result in a Minor or Slightly Negative impact (PAG Score: 3) to air quality.

1.3.1.4 Location D – Junction West of Existing Ballygoran Overbridge

Location D is likely to result in a negative impact to air quality due to increased traffic volumes in proximity to sensitive receptors along the existing M4, relative to the Do-Minimum scenario. This location progresses mainly through agricultural land, with a small number of single residential developments within 50m of the Junction Option. The number of sensitive receptors in proximity is not substantial however, there is an increase from the Do-Minimum scenario. Within the total number of sensitive receptors in proximity to this junction, one new sensitive receptor will be introduced as a result of the new link roads in this location

Location D will consist of a new grade separated junction and a new links adjacent to the Ballygoran Reservoir. This location is expected to result in short term adverse impacts to air quality due to construction dust. The operational phase of this location is expected to result in negative impacts to air quality due to increased traffic volumes on the mainline, whilst also increasing traffic volumes in proximity to one new sensitive receptor on the link roads.

Both the construction and the operational stages of this location are predicted to result in Minor or Slightly Negative impact (PAG Score: 3) to air quality.

1.3.1.5 Location E – Junction reusing Existing Ballygoran Overbridge

Location E is likely to result in a negative impact to air quality due to increased traffic volumes in proximity to sensitive receptors along the existing M4, relative to the Do-Minimum scenario. This location progresses mainly through agricultural land, with a small number of single residential developments within 50m of this location. The number of surrounding sensitive receptors is not substantial however, there is a higher number than in the Do-Minimum scenario. No new sensitive receptors will be introduced as a result of new link roads in this location, as this location reuses existing infrastructure.

Moderate new infrastructure is required for Location E as this Location will reuse the existing overbridge infrastructure. Location E is expected to result in the least significant and short term adverse impacts to air quality due to construction dust, relative to all other locations. The operational phase of this location is expected to result in negative impacts to air quality due to increases in traffic volumes on the mainline and existing link roads that are in proximity to sensitive receptors.

Both the construction and the operational stages of this Location are predicted to result in Minor or Slightly Negative impact (PAG Score: 3) to air quality.

1.3.1.6 Location F – Junction East of Existing Ballygoran Overbridge

Location F is likely to result in a negative impact to air quality due to increased traffic volumes in proximity to sensitive receptors along the existing M4, relative to the Do-Minimum scenario. This location progresses mainly through agricultural land, with a small number of single residential developments within 50m of this location. The number of sensitive receptors in proximity is not substantial however, there is an increase from the Do-Minimum scenario. Within the total number of sensitive receptors in proximity to this junction, three new sensitive receptors will be introduced to increased traffic volumes as a result of the new link roads and thus there is potential to decrease air quality on these new link roads. The total number of sensitive receptors in proximity to this location are second highest out of all locations. Location F is predicted to generate the highest traffic volumes out of all the locations.

Location F will consist of a new grade separated junction and a new link road east of the Ballygoran Overbridge. This location is expected to result in short term adverse impacts to air quality due to construction dust. The operational phase of this location is expected to result in negative impacts to air quality due to increases in traffic volumes on the mainline, whilst also increasing traffic volumes in proximity to new sensitive receptors on the link roads.

Both the construction and the operational stages of this junction location are predicted to result in Minor or Slightly Negative impact (PAG Score: 3) to air quality.

1.3.1.7 Junction 7 Maynooth Conclusion

Location C and Location F are the Least Preferred. Location C is Least Preferred because it will increase traffic volumes in proximity to a large number of new sensitive receptors adjacent to new link roads, and so there is the potential to decrease air quality in proximity to link roads even though overall traffic volumes are predicted to reduce. Location C is in proximity to the highest number of sensitive receptors relative to the Do-Minimum scenario and other junction locations. Location F is also ranked as a Least Preferred Location as it is likely to generate the highest increases in traffic volumes relative to all other locations and the Do-Minimum scenario. This location is in proximity to the second highest number of sensitive receptors in this assessment.

All Locations have been assessed as likely to result in a Minor to Slightly Negative impact (PAG Score: 3) to air quality.

Locations D and E are ranked as Intermediate with slightly lower traffic volumes and sensitive receptors, relative to Locations D and E.

Locations A and B are ranked as the Preferred Locations, with the difference in preference between Locations A, B D and E is marginal.

Table 1.2: Air Quality Assessment Table – Junction 71

Assessment Criteria	Do-Minimum	Location A	Location B	Location C	Location D	Location E	Location F
Property counts – existing sensitive receptors (0 - 50m)	2	4	1	68	4	6	10
Property counts – granted planning applications for sensitive receptor developments (0 – 50m)	N/A	0	1	1	0	0	0
Total No. of Receptors within 0-50m	2	4	2	69	4	6	10
Annual Average Daily Traffic	69,801	71,541	71,541	67,666	72,118	72,118	74,054
Summary	N/A	Minor or Slightly Negative due to the traffic volumes in proximity to sensitive receptors. Increased traffic volumes from Do-Min scenario are likely to see Minor or slightly negative to air quality.	Minor or Slightly Negative due to the traffic volumes in proximity to sensitive receptors. Increased traffic volumes from Do-Min scenario. Minor or Slightly Negative due to the traffic volumes in proximity to sensitive receptors. Increased traffic volumes from Do-Min values are likely to see Minor or	Decreased traffic volumes from the Do-Minimum scenario. However, Minor or Slightly Negative due to increased traffic volumes in proximity to new sensitive receptors on the link roads. Location C is in	Minor or Slightly Negative due to the traffic volumes in proximity to sensitive receptors. Increased traffic volumes from Do-Min values are likely to see Minor or slightly negative to air quality.	Minor or Slightly Negative due to the traffic volumes in proximity to sensitive receptors. Increased traffic volumes from Do-Min values are likely to see Minor or slightly negative to air quality.	Minor or Slightly Negative due to the traffic volumes in proximity to sensitive receptors. Increased traffic volumes from Do-Min values are likely to see Minor or slightly negative to air quality.

¹ The area used for AADT values for the Junction 7 Assessment was ‘M4 Between J7 and J6’

Assessment Criteria	Do-Minimum	Location A	Location B	Location C	Location D	Location E	Location F
			slightly negative to air quality. are likely to see Minor or slightly negative to air quality.	proximity to the highest number of new and existing sensitive receptors.			
Qualitative Assessment	N/A	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Score / Impact Level	N/A	3	3	3	3	3	3
Preference	N/A	Preferred	Preferred	Least Preferred	Intermediate	Intermediate	Least Preferred

1.3.2 Junction 5 Leixlip Options

The numbers of sensitive receptors in proximity to each Junction 5 Option, the traffic volumes, and the subsequent air quality assessment determinations are outlined in Table 1.3.

1.3.2.1 Location A – Junction reusing existing R404 Overbridge

Location A is likely to result in a slight increase in traffic volumes on the mainline relative to the Do-Minimum scenario. This location progresses mainly through agricultural land and reuses existing overbridge infrastructure. This location is not in proximity to any new or existing sensitive receptors. This location results in lower predicted traffic volumes relative to Location B.

Moderate new infrastructure is required for Location A as the existing overbridge infrastructure will be utilised. This location is expected to result in the least significant and short term adverse impacts to air quality due to construction dust, relative to Location B. The operational phase is expected to result in negative impacts to air quality due to increases in traffic volumes.

Both the construction and the operational stages, this location is predicted to result in Minor to Slightly Negative impacts (Pag Score: 3) to air quality.

1.3.2.2 Location B – Junction between Liffey River Bridge and Existing Junction 5

Location B is likely to result in a slight increase in traffic volumes on the mainline, relative to the Do-Minimum scenario and Location A. Location B will consist of a new grade separated junction located between the Liffey River Bridge and the existing Junction 5 and a new link road. This location progresses mainly through agricultural land, with a small number of single residential developments within 50m of the Junction Option. This location is in proximity to a significantly higher number of sensitive receptors relative to Location A, due to the incorporation of a new link road and thus, there is potential for decreased air quality to sensitive receptors on this new link road.

Location B consists of the construction of a new grade separated junction and link road. This location is expected to result in short term adverse impacts to air quality due to construction dust. The operational phase is expected to result in long term adverse impacts to air quality due to increases in traffic volumes.

Both the construction and the operational stages are predicted to result in Minor to Slightly Negative impacts (Pag Score: 3) to air quality.

1.3.3 Junction 5 Leixlip Conclusion

Location A is ranked as Preferred as it is not in proximity to any new or existing sensitive receptors and is likely to result in lower traffic volumes relative to Location B. Location B is ranked as Least Preferred as it is in proximity to a higher number of sensitive receptors and is likely to result in higher traffic volumes relative

to Location A. An impact level of Minor or Slightly Negative (Pag Score: 3) is assigned to both junction locations as both locations are likely to attract relatively high traffic volumes.

Table 1.3: Air Quality Assessment Table – Junction 52

Assessment Criteria	Do-Minimum	Location A	Location B
Property counts – existing sensitive receptors. 0 - 50m	31	0	22
Property counts – granted planning applications for sensitive receptor developments. 0 – 50m	N/A	0	0
Total No. of Receptors within 0-50m	31	0	22
Annual Average Daily Traffic	77,656	79,102	79,869
Qualitative Assessment	N/A	Minor or Slightly Negative	Minor or Slightly Negative
Score / Impact Level	N/A	3	3
Preference	N/A	Preferred	Least Preferred

² The area used for AADT values for the Junction 5 Assessment was ‘M4 Between Junction 6 and Junction 5’.

1.4 Summary

Junction 7

Locations A and B are Preferred, Locations D and E are Intermediate, and Locations C and F are Least Preferred.

Junction 5

Location A is Preferred, and Location B is Least Preferred.

Kildare County Council

Maynooth to Leixlip Project

Options Report - Appendix 5 - Stage
1 Archaeological Junction Options

Draft 1 | 31 July 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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1 Stage 1 Archaeological, Architectural and Cultural Heritage Junction Options Assessment

1.1 Introduction

This section details the Archaeological, Architectural and Cultural Heritage assessment of the Stage 1 Junction Options with respect to the constraints identified in the Constraints Report.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

In order to produce a meaningful assessment in relation to the Archaeological, Architectural and Cultural Heritage resource, a preliminary design of the junction options has been used to assess for potential direct and indirect impacts on the Archaeological, Architectural and Cultural Heritage constraints. A study area of 200m from the edge of designed option has been utilised to assess for potential direct and indirect impacts upon same. Measurements are made from the edge of the option to the upstanding remains of the archaeological, architectural, or cultural heritage constraint. If no remains are upstanding, the measurement is made to the centre of the site.

Each key constraint within 200m of the junction option is tabulated with measurements from the option included. The impact type is then defined (direct, indirect, no impact, positive, negative, neutral) based on whether the constraint will be physically affected or not by the junction option. Dependant on the how the constraint will be affected will define the potential impact on the constraint (significant, very significant, profound). The impact types and the definition of the significance of effects are included below. Any option that results in a high amount of direct negative impacts on the key Archaeological, Architectural and Cultural Heritage constraints, are deemed to be Least Preferred.

Based on the above therefore, the assessment comprises the calculation and definition of the potential direct and indirect impacts upon the Archaeological, Architectural and Cultural Heritage resource associated with each junction option and the potential significance of those impacts. This results in the overall ranking of the options in order of preference.

The assessment of the junction options is focused on the key Archaeological, Architectural and Cultural Heritage constraints, identified during the overall constraints study for the project. These consist of the following:

- Recorded Monuments & Places (RMP) (AH sites);
- Sites and Monuments Record (SMR) (AH sites);

- National Monuments (AH sites);
- Monuments protected with a Preservation Order (AH sites);
- Protected Structures (BH sites);
- National Inventory of Architectural Heritage (BH sites);
- Architectural Conservation Areas (ACA);
- Designed Landscapes (DL); and
- Previous Archaeological Excavations (EX).

The TII Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis was used as a basis for the assessment of potential impacts on the Archaeological, Architectural and Cultural Heritage resource and these have been streamlined with the significance of effects, as contained within the 2022 Environmental Protection Agency (EPA) Guidelines on Information to be contained within an Environmental Impact Assessment Reports. The EPA guidelines are used in the tabulation of the Significance of Effects in all the assessment tables for each junction option. However, in the summary matrix, these significance ratings are realigned to the TII Multi Criteria Analysis as set out in Table 1.1.

Table 1.1: Alignment of TII and EPA Guidelines

TII Multi Criteria Analysis	EPA Guidelines (Significance of Effects)
Majorly or highly positive (7)	Profound positive
	Very significant positive
Moderately positive (6)	Significant positive
	Moderate positive
Minor or slightly positive (5)	Slight positive
	Not significant positive
Not significant or neutral (4)	Imperceptible negative
	Not significant negative
Minor or slightly negative (3)	Slight negative
Moderately negative (2)	Moderate negative
	Significant negative
Major or highly negative (1)	Very significant negative
	Profound negative

The following impact types and definitions (of significance of effect) were used in order to assess the potential impacts of the proposed junction options on each relevant Archaeological, Architectural and Cultural Heritage constraint.

1.2.1 Impact Types

The quality and type of an impact can vary to include the following (as per NRA's Guidelines for the Assessment of Archaeological / Architectural Heritage Impacts of National Road Schemes (NRA, 2005, 25/54) (Table 1.2):

Table 1.2: Types of Impact

Impact Type	Definition
Negative Impact:	A change that will detract from or permanently remove an archaeological / architectural monument/structure from the landscape.
Neutral Impact:	A change that does not affect the archaeological / architectural heritage.
Positive Impact:	A change that improves or enhances the setting of an archaeological / architectural monument/structure.
Direct Impact:	Where an archaeological/architectural feature or site is physically located within the footprint of the option and entails the removal of part, or all of the monument or feature.
Indirect Impact:	Where a feature or site of archaeological / architectural heritage merit or its setting is located in close proximity to the option.
No Predicted Impact:	Where the potential option does not adversely or positively affect an archaeological / architectural heritage site.

It should be noted that whilst impact levels and definitions are applied consistently to the cultural heritage resource, direct impacts on sites that are subject to statutory protection are considered to be of more consequence during the junction options assessment process.

1.2.2 Definition of the Significance of Effects

The definition of the significance of effects is included in the NRA's Guidelines for the Assessment of Archaeological / Architectural Heritage Impacts of National Road Schemes (NRA, 2005, 54/21) (Table 1.3). These have been aligned, and added to, with the more recent Environmental Protection Agency (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.

Table 1.3: Significance of Effect Definitions: Archaeology and Architecture

Significance of Effect	Definitions relating to sites of an archaeological nature	Definitions relating to sites of an architectural nature
Profound negative	Applies where mitigation would be unlikely to remove adverse effects. Reserved for adverse, negative effects only. These effects arise when an archaeological site is completely and irreversibly destroyed by a proposed development.	An impact that obliterates the architectural heritage of a structure or feature of national or international importance. These effects arise where an architectural structure or feature is completely and irreversibly destroyed by the proposed development. Mitigation is unlikely to remove adverse effects.
Very Significant negative	An effect which, by its character, magnitude, duration, or intensity significantly alters the majority of a sensitive aspect of the environment. An impact like this would be where the majority of the site would be permanently impacted upon, leading to a loss of character, integrity, and data about the archaeological feature/site.	An effect which, by its character, magnitude, duration, or intensity significantly alters the majority of a sensitive aspect of the environment. An impact like this would be where the majority of the structure would be permanently impacted upon, leading to a loss of character, integrity, and data about the archaeological feature/site.
Significant negative	An impact which, by its magnitude, duration, or intensity, alters an important aspect of the environment. An impact like this would be where part of a site would be permanently impacted upon, leading to a loss of character, integrity, and data about the archaeological feature/site.	An impact that, by its, magnitude, duration or intensity alters the character and/or setting of the architectural heritage. These effects arise where an aspect or aspects of the architectural heritage is/are permanently impacted upon leading to a loss of character and integrity in the architectural structure or feature. Appropriate mitigation is likely to reduce the impact.
Moderate negative	A moderate impact arises where a change to the site is proposed, which although noticeable, is not such that the archaeological integrity of the site is compromised, and which is reversible. This arises where an archaeological feature can be incorporated into modern day development without damage and that all procedures used to facilitate this are reversible.	An impact that results in a change to the architectural heritage which, although noticeable, is not such that alters the integrity of the heritage. The change is likely to be consistent with existing and emerging trends. Impacts are probably reversible and may be of relatively short duration. Appropriate mitigation is very likely to reduce the impact.
Slight negative	An impact which causes changes to the character of the environment which are not significant or profound and do not directly impact or affect an archaeological feature or monument.	An impact that causes some minor change in the character of architectural heritage of local or regional importance without affecting its integrity or sensitivities. Although noticeable, the effects do not directly impact on the architectural structure or feature. Impacts are reversible and of relatively short duration. Appropriate mitigation will reduce the impact.

Significance of Effect	Definitions relating to sites of an archaeological nature	Definitions relating to sites of an architectural nature
Not Significant negative	An effect which causes noticeable changes in the character of the environment but without noticeable consequences.	An effect which causes noticeable changes in the character of the environment but without noticeable consequences.
Imperceptible negative	An impact capable of measurement but without noticeable consequences.	An impact on architectural heritage of local importance that is capable of measurement but without noticeable consequences.
Imperceptible positive	An impact capable of measurement but without noticeable consequences.	An impact on architectural heritage of local importance that is capable of measurement but without noticeable consequences.
Slight positive	An impact which causes positive changes to the character of the environment which are not significant or profound but enhance the setting of an archaeological feature or monument.	An impact that causes some minor positive change in the character of architectural heritage of local or regional importance enhancing its integrity or sensitivities.

The overall assessment of the junction options has resulted in the identification of low, medium, and high preference assigned to each junction option in relation to the Archaeological, Architectural and Cultural Heritage resource. The results of this assessment are then included in the Multi Criteria Analysis (MCA) for the overall options assessment.

1.3 Junction Options Assessment

1.3.1 Junction 7 Maynooth Options

1.3.1.1 Option A – Junction West of Millfarm

Table 1.4: Assessment of Location A

Site Ref.	Type	Designation	Dist. from Location	Impact Type	Significance of Effect
AH4 (EX1)	Redundant Record	SMR	22m south	None	N/A
BH1	Jackson's Bridge & lock	NIAH	59m south	Indirect	Slight negative

This location will require previously undisturbed greenfield.

1.3.1.2 Location B – Junction between Millfarm and Newtown Road

Table 1.5: Assessment of Location B

Site Ref.	Type	Designation	Dist. from Location	Impact Type	Significance of Effect
AH5 (EX2)	Habitation site	SMR	0m	None	N/A
BH1	Jackson's Bridge & lock	NIAH	176m NNE	Neutral	N/A

This location will require previously undisturbed greenfield.

1.3.1.3 Location C – Junction between Newtown Road and R406 Straffan Road

There are no recorded archaeological, architectural or cultural heritage constraints located within 200m of this junction location. It will require some previously undisturbed greenfield, but less than Locations A and B.

1.3.1.4 Location D – Junction West of Existing Ballygoran Overbridge

Table 1.6: Assessment of Location D

Site Ref	Type	Designation	Dist. from Location	Impact Type	Significance of Effect
EX8	Area where archaeological monitoring carried out but nothing of significance identified.	None	64m south	None	N/A
EX7	Area where archaeological monitoring carried out but nothing of significance identified.	None	0m	None	N/A
AH7 (EX4)	Furnace	SMR	145m north	None	N/a
AH8 (EX4)	Burial Ground	SMR	145m north	None	N/a

A small amount of greenfield land will be required.

1.3.1.5 Location E – Junction reusing Existing Ballygoran Overbridge

Table 1.7: Assessment of Location E

Site Ref	Type	Designation	Dist. from Location	Impact Type	Significance of Effect
EX8	Area where archaeological monitoring carried out but nothing of significance identified.	None	131m SW	None	N/A
EX7	Area where archaeological monitoring carried out but nothing of significance identified.	None	To immediate north	None	N/A

Very minimal greenfield land will be required.

1.3.1.6 Location F – Junction East of Existing Ballygoran Overbridge

Table 1.8: Assessment of Location F

Site Ref.	Type	Designation	Dist. from Location	Impact Type	Significance of Effect
EX7	Area where archaeological monitoring carried out but nothing of significance identified.	None	To immediate north	None	N/A

A small amount of greenfield land will be required.

1.3.2 Junction 7 Maynooth Conclusion

Table 1.9: Assessment Matrix of Junction 7 Options

Criteria	Location A	Location B	Location C	Location D	Location E	Location F
Impacts to number of sites subject to statutory protection	None predicted	None predicted	None predicted	None predicted	None predicted	None predicted
Impacts to number of sites not subject to statutory protection	Indirect slight negative impact (BH1)	None predicted	None predicted	None predicted	None predicted	None predicted
Summary	Requires a moderate amount of previously undisturbed greenfield due to the length of the link road. It has more potential to impact on previously unrecorded archaeological remains.	Requires a moderate amount of previously undisturbed greenfield due to the length of the link road. It has more potential to impact on previously unrecorded archaeological remains.	Requires a moderate amount of previously undisturbed greenfield due to the length of the link road. It has more potential to impact on previously unrecorded archaeological remains.	Requires a small section of previously undisturbed greenfield.	Requires only a very small section of previously undisturbed greenfield as the existing overbridge will be utilised.	Requires a small section of previously undisturbed greenfield.
Qualitative Assessment	Moderately negative	Moderately negative	Moderately negative	Minor or slightly negative	Not significant or neutral	Minor or slightly negative
Score/ Impact Level	2	2	2	3	4	3
Preference	Least Preferred	Least Preferred	Least Preferred	Intermediate	Preferred	Intermediate

1.3.3 Junction 5 Leixlip Options

1.3.3.1 Location A – Junction reusing existing R404 Overbridge

Table 1.10: Assessment of Location A

Site Ref.:	Type	Designation	Dist. from Location	Impact Type	Significance of Effect
DL4	Leixlip Castle demesne	None	0m	Neutral	N/A
BH3	Wonderful Barn	RPS	188m north	Neutral	N/A

1.3.3.2 Location B – Junction between Liffey River Bridge and Existing Junction 5

Table 1.11: Assessment of Location B

Site Ref.	Type	Designation	Dist. from Location	Impact Type	Significance of Effect
DL7	Lucan demesne	None	0m	Neutral	N/A
DL6	Cooldrinagh Lodge demesne	None	0m	Neutral	N/A
AH30	Enclosure	RMP	100m SW	Neutral	N/A
AH29	Ring-ditch	Proposed RMP	118m NE	Neutral	N/A
BH9	Cooldrinagh Lodge	RPS	75m north	Neutral	N/A
BH13	Kiln	RPS	125m ESE	Neutral	N/A

1.3.4 Junction 5 Leixlip Conclusion

Table 1.12: Assessment Matrix of Junction 5 Options

Criteria	Location A	Location B
Impacts to number of sites subject to statutory protection	None predicted	None predicted
Impacts to number of sites not subject to statutory protection	None predicted	None predicted
Scoring	4	3
Summary	Require the least amount of greenfield land and as such has less chance of negatively impacting previously unrecorded archaeological remains.	Requires more greenfield and as such has more chance of negatively impacting previously unrecorded archaeological remains.
Qualitative Assessment	Not significant or neutral	Minor or slightly negative
Score/ Impact Level	4	3
Preference	Preferred	Least Preferred

1.4 Summary

Junction 7

Location E is Preferred, Locations D and F are Intermediate, and Locations A, B and C are Least Preferred.

Junction 5

Location A is Preferred, and Location B is Least Preferred.

Kildare County Council

Maynooth to Leixlip Project

Options Report - Appendix 5 - Stage
1 Biodiversity Junction Options
Assessment

Draft 1 | 31 July 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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Figure 1.1: Junction 7 Maynooth Options Overview

Figure 1.2: Junction 5 Leixlip Options Overview

1 Stage 1 Biodiversity Junction Options Assessment

1.1 Introduction

This section details the Biodiversity assessment of the Stage 1 Junction Options with respect to the Biodiversity constraints identified in the Constraints Report.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment and a summary is presented in Section 1.4.

1.2 Methodology

There are six junction locations for Junction 7 Maynooth and two for Junction 5 Leixlip.



Figure 1.1: Junction 7 Maynooth Options Overview

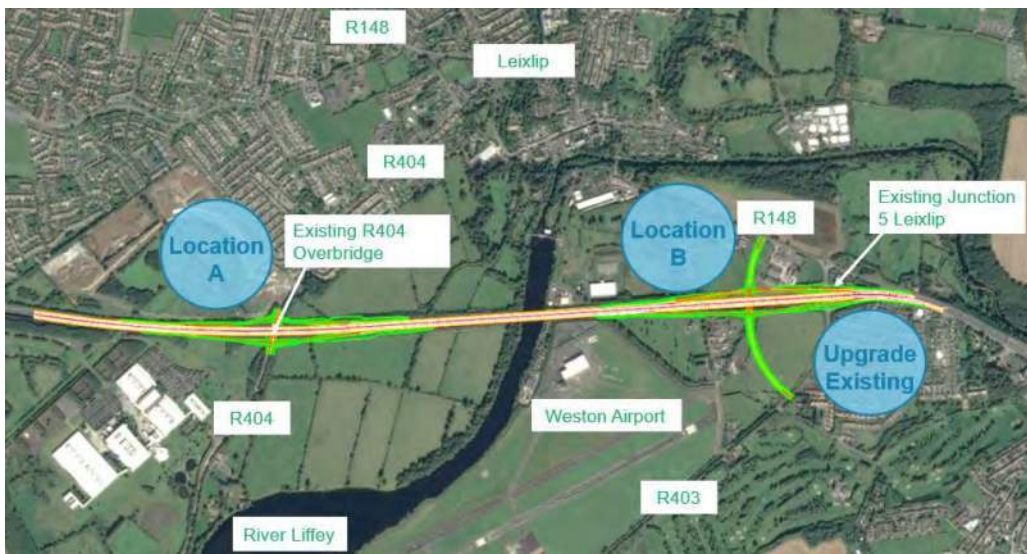


Figure 1.2: Junction 5 Leixlip Options Overview

The principal objectives of this assessment are to:

- Evaluate all junction locations contained within each section, based on ecological criteria, as per the National Road Authority (NRA) *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009)¹ and Chartered Institute for Ecology and Environmental Management (CIEEM) *Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine* (2018)²
- Assess the significance of the likely impacts on each of the biodiversity receptors potentially impacted by each junction location. As per the Transport Infrastructure Ireland (TII)¹ guidance, this step discounted biodiversity receptors or ecological sites where the risk of significant impacts is unlikely considering where the application of standard mitigation and best practice during construction is unambiguous and success is highly likely
- To assess each option in accordance with Transport Infrastructure Ireland's *Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis* (TII, 2016)³.

To fulfil these objectives, an assessment of the likely or potential impacts of each of the junction locations on ecological receptors was carried out so that an informed comparison of the junction locations can be made with cognisance of the potential ecological consequences.

Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. Alongside the term “biodiversity”, the terms “ecology” and “ecological” are also used throughout this section of the report as a broader term to refer to the relationships of biodiversity receptors to one another and to their environment.

1.2.1 Biodiversity Stage 1 Assessment Process

The assessment process is as follows:

- The key ecological receptors within the study area were identified based on a combination of desktop data, consultation (i.e. relevant bodies/organisations) and field surveys;

¹ National Roads Authority (2009) Guidelines for Assessment of Ecological Impacts of National Road Schemes. Available from: <https://www.tii.ie/technical-services/environment/planning/Guidelines-for-Assessment-of-Ecological-Impacts-of-National-Road-Schemes.pdf> [Accessed: May 2022]

² Chartered Institute for Ecology and Environmental Management (CIEEM) (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine. Available from: <https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.1.pdf> [Accessed: May 2022]

³ Transport Infrastructure Ireland (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf> [Accessed: May 2022]

- The key ecological receptors were assigned an ecological value based on a geographic frame of reference ranging from international to local importance;
- The likely impacts of each of the junction locations on the key ecological receptors were identified and assessed, indicating which, if any, of these are likely to be significant, and at what geographical level;
- The impacts of each of the junction locations on the key ecological receptors were scored in accordance with the TII approach⁴, on a seven-point scale ranging from ‘major or highly negative (1)’ to ‘major or highly positive (7)’;
- The overall cumulative impact of each junction location across all the key ecological receptors affected was also scored on the same seven-point scale; and
- The scores attributed to each of junction location were assessed comparatively and assigned a preference ranking.

1.2.2 Key Ecological Receptors

Key ecological receptors are those biodiversity receptors confirmed, or likely to occur, within the study area with an ecological value of local importance (higher value) or greater and, therefore, likely to affect the scoring and ranking of the junction locations. These include:

- Designated sites for nature conservation (e.g. SACs, SPAs, NHAs, pNHAs and Nature Reserves);
- Sensitive habitats (e.g., non-Annex I semi-natural woodland habitats and watercourses⁵);
- Sensitive species (e.g. otter *Lutra lutra*); and
- Ecological sites (identified from a combination of desktop and field assessment).

The key ecological receptors were initially identified in the constraints study detailed in the Constraints Report, based on collation of available existing information from the desk study and consultations with relevant bodies/organisations and focussed on the known/potential ecological value for the habitats/species present. In the case of the ecological sites, the boundaries were initially defined based on interpretation of orthophotography and collation of available existing habitat information.

⁴ TII (2016). Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis Document PE-PAG-02031

⁵ Watercourses are referred to as per the names presented on the EPA’s online Map Viewer. Available from: <https://gis.epa.ie/EPAMaps/> [Accessed May 2022]

Walkover surveys of ecological sites within the wider constraints study area were undertaken in April 2021. This was further supplemented for this Stage 1 assessment with an additional field survey undertaken in December 2021. The purpose of the field surveys was to ground truth and verify the orthophotography interpretation and selection of ecological sites, refine site boundaries, assess the ecological evaluation of each of the identified ecological sites and to detect any additional ecological sites not identified during the desk study. Walkover surveys of ecological sites which were located in proximity to, or overlapped with, one or more of the junction locations, were undertaken during the December 2021 survey.

In some cases, certain sections of the ecological sites (especially those lining the existing M4) were viewed from a distance, owing to limited access or safety issues. However, professional assumptions were made on the value of those ecological sites based on local information gathered during previous constraints field surveys and desk study, as necessary.

Where possible, during the site walkover surveys, habitat types were classified using the *Guide to Habitats in Ireland* (Fossitt, 2000)⁶ and the likelihood/potential for Annex I habitat types was confirmed or inferred based on the professional judgement of the surveyor, with reference to the *Interpretation manual of European Union Habitats EUR 28* (CEC, 2013)⁷. Where it was not possible to confirm the presence of Annex I habitats, a precautionary approach was adopted with regards to the identification of the potential presence of Annex I habitats within an ecological site.

1.2.3 Ecological Valuation

The key ecological receptors identified have been valued with regard to ecological valuation guidance set out in *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009)¹ and *Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine* (CIEEM, 2018)².

The following geographic frame of reference is used when valuing the key ecological receptors:

- International importance;
- National importance;
- County importance; and
- Local importance (higher value).

⁶ Fossitt, J.A. (2000) *A Guide to Habitats in Ireland*. Heritage Council, Kilkenny. Available from: <https://www.npws.ie/sites/default/files/publications/pdf/A%20Guide%20to%20Habitats%20in%20Ireland%20-%20Fossitt.pdf> [Accessed: May 2022]

⁷ CEC. (Commission of the European Communities) (2013) *Interpretation manual of European Union Habitats EUR28*. European Commission, DG Environment. Available from: https://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf [Accessed: May 2022]

All Annex I habitats that lie outside of European sites, are valued as being of at least national importance, given that these habitats are of high conservation concern. Priority Annex I habitat types that lie outside of European sites may be valued as being of international importance given that they are of the highest conservation concern at a European level (i.e., natural habitat types in danger of disappearance⁸). No Annex I habitats, priority or otherwise, have been recorded during the walkover surveys to date.

For individual sites (e.g., designated sites, watercourses or ecological sites identified during the Constraints Study), the overall ecological valuation for each of the key ecological receptors was based upon the highest value receptor known to be present, or potentially present, within the site.

1.2.4 Assessment Criteria

The assessment of each junction location included both a quantitative and qualitative assessment. Firstly, the impact on each key ecological receptor is assessed.

Although a given junction location may impact upon a particular key ecological receptor, the direct impact(s) on the site may not necessarily directly impact on the highest value receptor(s). This is accounted for in the assessment as much as possible, based on the level of ecological information available.

To assess the likely ecological impacts of each junction location on individual key ecological receptors, the following criteria are applied, with the use of professional judgement as to the likelihood of significant effects occurring:

- Potential impacts on an ecological receptor of national / international importance were assessed as being Major or highly negative;
- Potential impacts on an ecological receptor of county importance were assessed as being Moderately negative; and
- Potential impacts on a receptor of local importance (higher value) were assessed as being Minor or slightly negative.

To assess the likely cumulative overall ecological impacts for each junction location, the following criteria were applied, in conjunction with the use of professional judgement as to the likelihood of significant effects occurring:

- Biodiversity impacts are major or highly negative) if:
 - The impact is directly on one or more designated sites valued as international or national importance (i.e. Sac, spa, pnha or nha);

⁸ From the definition of “*priority natural habitat types*” in Article 1(d) of the Habitats Directive (Council Directive 92/43/EEC).

or

- The impacts associated with constructing a road within the junction location would likely result in an adverse effect on the integrity of the SAC/SPA/pnha/NHA site (i.e. For SAC/SPA this could equate to the loss of qualifying interest habitat or undermining the conservation objectives and for pnha/NHA this could relate to the loss of features for which the site is designated).
- Biodiversity impacts are moderately negative if:
 - The impact is directly on one or more non-designated ecological sites valued as national or county importance, or numerous ecological sites valued as local high importance;

or

- The impacts associated with each junction location would likely result in permanent/long-term effects on non-qualifying interest Annex I habitat or on a species population considered to be of national importance.

or

- Impacts associated with a junction location would likely have permanent / long-term effects on a habitat(s) or on a species population considered to be of county/local (high) importance
- Biodiversity impacts are minor or slightly negative if:
 - The impact is directly on a small number of ecological sites valued as local high importance;

or

- The impacts associated with constructing a road within the junction location would likely have permanent/long-term effects on a habitat(s) or on a species population considered to be of local (high) importance.

Considering these cumulative impacts on the key ecological receptors identified, each junction option was scored, based on the seven-point scale below and an integer was assigned according to the impact significance:

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

As all junction locations are likely to have some level of a negative impact on biodiversity, neutral or positive impact scorings do not apply in this assessment, as in the absence of a design and /or mitigation there is no understanding that any option requiring construction could be assessed as neutral or positive.

Each of the junction locations were also comparatively assessed in terms of the overall impact significance, to provide a preference ranking. The preference ranking was as follows:

- Preferred;
- Intermediate; and
- Least Preferred.

In accordance with the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009)¹, key ecological receptors within the study area were not assessed against the junction locations where the risk of significant impacts is unlikely, considering where the delivery of standard mitigation and best practice during construction is unequivocal and success is highly likely. For example, with the application of standard pollution control measures during construction and an operational drainage and pollution control system designed to current standards, sensitive biodiversity receptors downstream of junction locations are not likely to be affected. However, it should be noted that potential watercourse crossings were considered in this assessment, as it cannot be assumed that clear-span crossings will be possible at each crossing point. In addition, potential watercourse crossings will undoubtedly result in indirect impacts on the watercourse in question (e.g. disturbance to QI species, spread of non-native invasive species).

1.3 Biodiversity Junction Option Assessments

1.3.1 Overview

Key ecological receptors which are located within, or partially within, a junction location, and on which the junction locations were assessed, are presented in Table 1.2.

Only direct impacts were considered. Indirect impacts, such as those resulting from air quality impacts/impacts to hydrogeology were not considered at this stage of the assessment.

Table 1.2: Key Ecological Receptors Located within, or partially within, a Junction Location

Site Name	Description	Ecological Value
EC2	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC3	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC5	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC6	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC8	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC9	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC12	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC13	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC14	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC15	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC17	Mixed Broadleaf Woodland (Newtown)	Local importance (higher value)
EC20	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC21	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC22	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC23	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)

Site Name	Description	Ecological Value
EC24	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC29	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC30	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC39	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC40	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC41	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC44	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC45	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC47	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
EC48	Narrow woodland band / treeline lining the existing M4 roadway	Local importance (higher value)
Lyreen Stream	Watercourse joining with the Rye River (a European designated site)	County importance
Taghadoe Stream	A tributary of the Lyreen which eventually joins with the Rye River.	County importance
Gragadder Stream	A tributary of the Lyreen	County importance

A summary of the number of ecological receptors impacted by each Junction Location at Junction 7 Maynooth is shown in Table 1.3.

Table 1.3: Number of Biodiversity Impacts for each Junction Location at Junction 7 Maynooth

Assessment Criteria	Location A	Location B	Location C	Location D	Location E	Location F
Significant impact on sites of International Importance (major or highly negative)	0	0	0	0	0	0
Significant impact on sites of National Importance (major or highly negative)	0	0	0	0	0	0
Significant impact on sites of County Importance (moderately negative)	2	2	4	0	0	0
Significant impact on sites of Local Importance (Higher Value) (minor or slightly negative)	2	10	3	4	5	4

1.3.3 Junction 7 Maynooth Options

Six junction locations have been assessed for Junction 7 Maynooth.

1.3.3.1 Location A – Junction West of Millfarm

Location A is the most westerly and interacts with the following ecological sites; EC02 and EC03, both of which are valued as local importance (higher value).

It also interacts with two watercourses of County importance including the Lyreen Stream and the Gragadder Stream. Both of these watercourses are valued as County importance given the direct connectivity to the River Rye. The Gragadder stream is a tributary of the Lyreen and the Lyreen flows directly into the Rye River southwest of Carton House. Additionally, being part of the overall Liffey system, both watercourses are considered Salmonid.

This is ranked as Least Preferred as it interacts watercourses of County importance, namely the Lyreen River and the Gragadder stream.

1.3.3.2 Location B – Junction between Millfarm and Newtown Road

Location B begins at the existing Millfarm Overbridge where it interacts with ecological sites EC2, EC3, EC5 and EC6, all of which are valued as local importance (higher value) as well as the Lyreen river, a watercourse of County importance. Just east of this overbridge, it extends north of the existing M4 and connects to the L5041 and south of the M4 and connects to the R408. This southern diversion does not interact with any additional ecological sites however, the northern diversion, towards the L5041 intersects the Lyreen stream which is a watercourse of County importance.

It interacts with ecological sites EC08, EC09, EC12 and EC13 prior to reaching the existing R408 Newtown Road Overbridge. This location continues slightly further east past the R408 Newtown Road Overbridge and cuts into a small area of EC14 and EC15. All of the above ecological sites are valued as local importance (higher value).

Location B is ranked as Least Preferred as it interacts with a watercourse of County importance; the Lyreen River and the greatest number of ecological sites of local importance (higher value).

1.3.3.3 Location C – Junction between Newtown Road and R406 Straffan Road

Location C begins east of the existing R408 Newtown Road Overbridge and moves to the east interacting with two ecological sites of local importance (higher value), namely EC14 and EC15. As this option continues east it also interacts with EC17, a mixed broadleaf woodland of local importance (higher value) and one watercourse of County importance; the Taghadoe Stream (a tributary of the Lyreen).

As with the two other watercourses mentioned above the Taghadoe Stream is valued as County importance given its direct connectivity to the River Rye and being part of the overall Liffey system, it is considered Salmonid. This location interacts with the Taghadoe stream at four separate locations and thus each interaction is assessed as an impact.

Although this location interacts with less ecological sites of Local importance (higher value) to Location B described above, given that it will result in a greater number of interactions on a watercourse of County importance (i.e. the Taghadoe stream) it is ranked as the Least Preferred.

1.3.3.4 Location D – Junction West of Existing Ballygoran Overbridge

Location D begins approximately midway between Junction 7 and the R405 Ballygoran Road Overbridge where it interacts with two ecological sites of local importance (higher value) EC20 and EC21. It continues east past the R405 Ballygoran Road Overbridge where it interacts with ecological sites EC22 and EC23, both of which are valued as local importance (higher value). This option includes no watercourse crossings.

Given the low number of ecological sites (all of which are valued as local importance (higher value)) impacted and the fact that this option will require a new junction, Location D is ranked as Intermediate.

1.3.3.5 Location E – Junction reusing Existing Ballygoran Overbridge

Location E is similar to Location D described above except it reuses the existing R405 Ballygoran Overbridge. It interacts with five ecological sites EC20, EC21, EC22 and EC23 as described above as well as an additional site of local importance (higher value) EC24. It includes no watercourse crossings.

Although this location interacts with an additional ecological site (valued as being of Local importance (higher value)) to Locations D and F described above and below, given that it will reuse the existing overbridge it is ranked as the Preferred.

1.3.3.6 Location F – Junction East of Existing Ballygoran Overbridge

As with Locations D and E above, Location F is located within a similar area (i.e. around the R405 Ballygoran Overbridge) and thus interacts with the same ecological sites e.g. EC20, EC21, EC22 and EC23, however this location is located slightly further east than the previous two. This location includes no watercourse crossings.

Given the low number of ecological sites (all of which are valued as local importance (higher value)) impacted and the fact that this option will require a new junction, this Location is ranked as Intermediate.

Table 1.4: Biodiversity Assessment Matrix for Junction 7 Maynooth

Assessment Criteria	Location A	Location B	Location C	Location D	Location E	Location F
Significant impact on sites of International Importance	0 major or highly negative impacts	0 major or highly negative impacts	0 major or highly negative impacts	0 major or highly negative impacts	0 major or highly negative impacts	0 major or highly negative impacts
Significant impact on sites of National Importance	0 major or highly negative impacts	0 major or highly negative impacts	0 major or highly negative impacts	0 major or highly negative impacts	0 major or highly negative impacts	0 major or highly negative impacts
Significant impact on sites of County Importance	2 moderately negative impact	2 moderately negative impact	4 moderately negative impact	0 moderately negative impact	0 moderately negative impact	0 moderately negative impact
Significant impact on sites of Local Importance (Higher Value)	2 minor or slightly negative	10 minor or slightly negative	3 minor or slightly negative	4 minor or slightly negative	5 minor or slightly negative	4 minor or slightly negative
Overall Assessment	There are 2 'moderately negative' and 2 'minor or slightly negative' impacts associated with this junction option	There is 2 'moderately negative' and 10 'minor or slightly negative' impacts associated with this junction option	There is 4 'moderately negative' and 3 'minor or slightly negative' impacts associated with this junction option	There are 4 'minor or slightly negative' impacts associated with this junction option	There are 5 'minor or slightly negative' impacts associated with this junction option	There are 4 'minor or slightly negative' impacts associated with this junction option

Assessment Criteria	Location A	Location B	Location C	Location D	Location E	Location F
Summary	Impacts on the Lyreen river and the Gradadder stream as well as two additional ecological sites of local importance (higher value) both of which consist of treelines and narrow woodland bands lining the existing M4	Impacts on the Lyreen river at two locations and 10 additional ecological sites of local importance (higher value) all of which consist of treelines and narrow woodland bands lining the existing M4	Impacts on the Taghadoe stream at four separate locations and 3 additional ecological sites of local importance (higher value) two of which consist of treelines and narrow woodland bands lining the existing M4 roadway and one of which includes a mixed broadleaf woodland.	Impacts on 4 ecological sites of local importance (higher value) all of which consist of treelines and narrow woodland bands lining the existing M4 roadway	Impacts on 5 ecological sites of local importance (higher value) all of which consist of treelines and narrow woodland bands lining the existing M4 roadway. Although this location interacts with an additional ecological site, given that it will reuse the existing overbridge it is ranked as the Preferred.	Impacts on 4 ecological sites of local importance (higher value) all of which consist of treelines and narrow woodland bands lining the existing M4 roadway
Qualitative Assessment	Moderate Negative	Moderate Negative	Moderate Negative	Minor Negative	Minor Negative	Minor Negative
Score/ Impact Level	2	2	2	3	3	3
Preference	Least Preferred	Least Preferred	Least Preferred	Intermediate	Preferred	Intermediate

1.3.4 Junction 5 Leixlip Options

Two junction locations have been assessed for Junction 5 Leixlip.

1.3.4.1 Location A – Junction reusing existing R404 Overbridge

Location A interacts with the following ecological sites - EC29, EC30 and EC39, all valued as local importance (higher value) prior to reaching the R404 Overbridge. From here, it interacts with two additional ecological sites of local importance (higher value); EC40 and EC41. This location involves no watercourse crossings.

Although this junction option interacts with an additional ecological site (valued as being of Local importance (higher value)) to Location B described below, given that it will reuse the existing overbridge it is ranked as Preferred.

1.3.4.2 Location B – Junction between Liffey River Bridge and Existing Junction 5

Location B interacts with the following ecological sites - EC29, EC30 and EC39, all valued as local importance (higher value) prior to reaching the R404 Overbridge. From here, it interacts with two additional ecological sites of local importance (higher value); EC40 and EC41. This location involves no watercourse crossings.

Given the similarities between both locations, there is very little to distinguish this location from Location A from a biodiversity perspective. However, given that this location will involve constructing a new grade separated junction rather than reusing an existing overbridge, Location B has been ranked as intermediate.

Table 1.5: Number of Biodiversity Impacts for each Junction Location at Junction 5 Leixlip.

Assessment Criteria	Location A	Location B
Significant impact on sites of International Importance (major or highly negative)	0	0
Significant impact on sites of National Importance (major or highly negative)	0	0
Significant impact on sites of County Importance (moderately negative)	0	0
Significant impact on sites of Local Importance (Higher Value) (minor or slightly negative)	5	4

Table 1.6: Biodiversity Assessment Matrix at Junction 5 Leixlip

Assessment Criteria	Location A	Location B
Significant impact on sites of International Importance	0 major or highly negative impacts	0 major or highly negative impacts
Significant impact on sites of National Importance	0 major or highly negative impacts	0 major or highly negative impacts
Significant impact on sites of County Importance	0 moderately negative impact	0 moderately negative impact
Significant impact on sites of Local Importance (Higher Value)	5 minor or slightly negative	4 minor or slightly negative
Overall Assessment	5 'minor or slightly negative' impacts	4 'minor or slightly negative' impacts
Summary	Impacts on 5 ecological sites of local importance (higher value) all of which consist of treelines and narrow woodland bands lining the existing M4/N4. Although this location interacts with an additional ecological site, given that it will reuse the existing overbridge it is ranked as the Preferred.	Impacts on 4 ecological sites of local importance (higher value) all of which consist of treelines and narrow woodland bands lining the existing M4/N4.
Qualitative Assessment	Minor Negative	Minor Negative
Score/ Impact Level	3	3
Preference	Preferred	Intermediate

1.4 Summary

Junction 7 Maynooth

Location E is ranked Preferred, Location D and F are ranked Intermediate, whilst Locations A, B and C are ranked Least Preferred, with Location C ranking the Least Preferable from a biodiversity perspective as it interacts with the Taghadoe stream (a watercourse of County importance) at four separate locations.

Junction 5 Leixlip

There is very little difference between the proposed locations for Junction 5 Leixlip from a biodiversity perspective. However, given that Location B will require a new junction rather than a reuse of the existing R404 Overbridge, Location A is ranked Preferred, whilst the Location B is ranked Intermediate.

Kildare County Council

Maynooth to Leixlip Project

Options Report - Appendix 5 - Stage
1 Climate - Junction Options
Assessment

Draft 1 | 31 July 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Climate Assessment Matrix of Junction 7 Options

Table 1.3: Climate Assessment Matrix of Junction 5 Options

1 Stage 1 Climate Junction Options Assessment

1.1 Introduction

This section details the Stage 1 Climate assessment of the Junction Options with respect to the Climate constraints identified in the Constraints Report.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

1.2.1 Scoring Classification

The multi-criteria climate assessment was undertaken with reference to the TII Project Appraisal Guidelines for National Roads Unit – 7.0 – Multi Criteria Analysis. The assessment includes both a quantitative and qualitative element. Each impact is scored qualitatively based on the seven-point scale below and an integer is assigned according to the impact level as shown in Table 1.1.

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Using the impact scores and professional judgement a determination as to the level of the impact of each alternative was provided. The Environmental Protection Agency (EPA) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports were also referred to when undertaking this assessment, particularly Table 3.3 in determining the significance of the impact.

The Climate assessment has been prepared in accordance with the requirements of the TII Project Management Guidelines 2019¹, and the TII Project Manager's Manual, 2019² and the TII Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis PE-PAG-02031, October 2016.

1.2.2 Assessment Criteria

The Climate assessment evaluates potential carbon emissions from road traffic during the operational phase using the traffic data provided for each alternative. In addition, an assessment of the potential embodied carbon from construction phases of each alternative is assessed. In some cases, there is the potential for significant embodied carbon to be generated during the construction phase. The impacts of this will be short-term in nature and the emissions are a once-off occurrence. If significant reductions in operational carbon are predicted, the effects of this will be long-term in nature. As such, they will aid in offsetting the construction embodied carbon produced.

A qualitative assessment has been included in Table 1.2 and Table 1.3 for the estimated embodied carbon of each Junction Option under assessment.

From a climate perspective, increases in vehicle kilometres travelled results in an increase in operational carbon emissions which is likely to result in a negative impact to climate. An increase in traffic volumes does not necessarily equate to an increase in vehicle kilometres travelled as the traffic may be travelling shorter distances. In addition, the more materials/processes required to construct a Junction Option, the greater the embodied carbon generated for the construction phase. Both of which will be assessed in Table 1.2 and Table 1.3.

1.3 Junction Options Assessment

1.3.1 Location A – Junction West of Millfarm

Significant reductions are expected in operational carbon for this location relative to the Do-Minimum due to the predicted decrease in vehicle kilometres travelled for this location compared to the Do-Minimum.

Significant new infrastructure is required for this location consisting of the construction of a new overbridge, associated works and new link roads. Therefore, the construction phase is expected to generate significant embodied carbon.

Overall, both the construction and operational phase of this location is expected to result in a Minor to Slightly Positive (PAG Score: 5) impact to climate.

¹ Transport Infrastructure Ireland, 2020. Project Management Guidelines PE-PMG-02041. Available from: <https://www.tiipublications.ie/library/PE-PMG-02041-03.pdf> [Accessed: 30th October 2021]

² Transport Infrastructure Ireland (TII), 2019. Project Manger's Manual for Major National Road Projects PE-PMG-02042. Available from <https://www.tiipublications.ie/library/PE-PMG-02042-01.pdf> [Accessed: 30th October 2021]

1.3.1.1 Location B – Junction between Millfarm and Newtown Road

Significant reductions are expected in operational carbon for this location relative to the Do-Minimum due to the predicted decrease in vehicle kilometres travelled for this location compared to the Do-Minimum.

Significant new infrastructure is required for this location consisting of the construction of a new overbridge, associated works and new link roads. Therefore, the construction phase is expected to generate significant embodied carbon.

Overall, both the construction and operational phase of this location is expected to result in a Minor to Slightly Positive (Pag Score: 5) impact to climate.

1.3.1.2 Location C – Junction between Newtown Road and R406 Straffan Road

The most significant reductions in operational carbon are predicted for this location compared to the Do-Minimum and other locations. This is due to a reduction in the percentage heavy goods vehicles (HGV) compared to the Do-Minimum scenario, however vehicle kilometres travelled for this location are predicted to increase from the Do-Minimum. Overall, there is significant reductions in operational carbon predicted for this location.

Significantly more new infrastructure is required for this location relative to other locations. Location C will consist of a new overbridge, associated works, and the addition of two new connector roads north and south of the junction. Therefore, the construction phase is expected to generate the most significant embodied carbon relative to the other locations.

Overall, both the construction and operational phase of this location is expected to result in a Moderately Positive (PAG Score: 6) impact to climate.

1.3.1.3 Location D – Junction West of Existing Ballygoran Overbridge

Location D is likely to result in reductions in operational carbon, relative to the Do-Minimum scenario. However, relative to all other locations, Location D is predicted to result in the lowest reductions in operational carbon. Vehicle kilometres travelled for Location D are predicted to increase from the Do-Minimum scenario, however, the percentage of heavy goods vehicles (HGV) relative to the percentage of HGV in the Do-Minimum scenario is predicted to decrease. Overall, there is significant reductions in operational carbon predicted for this location.

Significant new infrastructure is required for this location. Location D will consist of a new overbridge, associated works and the addition of a new link road. Therefore, the construction phase is expected to generate significant embodied carbon relative to the Do-Minimum.

Overall, both the construction and operational phase of this location are expected to result in a Minor to Slightly Positive (Pag Score: 5) impact to climate.

1.3.1.4 Location E – Junction reusing Existing Ballygoran Overbridge

Location E is likely to result in reductions in operational carbon, relative to the Do-Minimum scenario. However, relative to all other locations, Location E is predicted to result in the lowest reductions in operational carbon. Vehicle kilometres travelled for Location E are predicted to increase from the Do-Minimum scenario, however, the percentage of heavy goods vehicles (HGV) relative to the percentage of HGV in the Do-Minimum scenario is predicted to decrease. Overall, there is significant reductions in operational carbon predicted for this Location.

Moderate new infrastructure is required for this location, as it utilises the existing Ballygoran Overbridge. However, embodied carbon is likely to be produced relative to the Do-Minimum.

Overall, both the construction and operational phase of this location are expected to result in a Moderately Positive (PAG Score: 6) impact to climate.

1.3.1.5 Location F – Junction East of Existing Ballygoran Overbridge

Significant reductions are expected in operational carbon generated from this location relative to the Do-Minimum. This is due to reductions in vehicle kilometres travelled, relative to the Do-Minimum scenario.

Significant new infrastructure is required for this location. Location F will consist of a new overbridge, associated works and the addition of a new link road. Therefore, the construction phase is expected to generate significant embodied carbon relative to the Do-Minimum.

Overall, both the construction and operational phase of this location are expected to result in a Minor to Slightly Positive (PAG Score: 5) impact to climate.

1.3.2 Junction 7 Maynooth Conclusion

The difference between the Do-Minimum and Do-Something for operational carbon (per year), qualitative embodied carbon and subsequent climate assessment determinations are outlined in Table 1.2. The results demonstrate that there is predicted to be a slight increase in traffic volumes due to the implementation of Locations A, B, D, E and F and a slight decrease in traffic volumes due to the implementation of Location C. The associated operational carbon emissions for all Locations in this assessment are likely to result in decreases, relative to the Do-Minimum scenario. Location C, D and E are likely to result in decreases in operational carbon as a result of the predicted decreased HGV percentages relative to the Do-Minimum scenario. Locations A, B and F are likely to result in decreases in operational carbon as a result of the predicted reductions in vehicle kilometres travelled relative to the Do-Minimum scenario. Locations D and E are both likely to result in the lowest reductions in operational carbon out of all locations as both are predicted to generate the same number of vehicle kilometres travelled and HGV percentages, therefore, the same level of operational carbon is predicted.

Location D is ranked as Least Preferred relative to Location E, by marginal amounts, as less infrastructure is required, although the same levels of operational carbon are likely to be generated.

Locations A, B and F are ranked as Intermediate where significant reductions in operational carbon are predicted. Location A and B are likely to result in the same levels and operational carbon and levels of required infrastructure. Location F is likely to result in marginally lower reductions in operational carbon, relative to Location A and B.

Location C and E are ranked as Preferred. Location C is likely to see the most substantial reductions in operational carbon, although significant levels of embodied carbon are likely to be produced in this location, the significant reductions in operational carbon will outweigh the levels of embodied carbon in the long-term. Location E is likely to result in substantial reductions in operational carbon and is likely to result in the lowest levels of embodied carbon as moderate new infrastructure is required, relative to all other locations.

Table 1.2: Climate Assessment Matrix of Junction 7 Options

Assessment Criteria	Do-Minimum	Location A	Location B	Location C	Location D	Location E	Location F
Difference between Do-Minimum and Do-Something Operational Carbon (per year) (kg CO2e)	N/A	-10,492,402	-10,492,402	-34,975,938	- 4,929,524	- 4,929,524	- 10,284,347
Estimated Embodied Carbon (Qualitative)	N/A	Significant new infrastructure is required. Substantial level of embodied carbon, as a result of construction.	Significant new infrastructure is required. Substantial level of embodied carbon, as a result of construction.	Requires the most significant amount of new infrastructure. Therefore, it also results in the most substantial level of embodied carbon, as a result of construction.	Significant new infrastructure is required. Substantial level of embodied carbon, as a result of construction.	Moderate new infrastructure is required. Reduced level of embodied carbon, as a result of construction, relative to Locations D and F.	Significant new infrastructure is required. Substantial level of embodied carbon, as a result of construction.
Scoring							
Qualitative Assessment	N/A	Minor to Slightly Positive	Minor to Slightly Positive	Moderately Positive	Minor to Slightly Positive	Moderately Positive	Minor to Slightly Positive
Score/Impact Level	N/A	5	5	6	5	6	5
Preference	N/A	Intermediate	Intermediate	Preferred	Least Preferred	Preferred	Intermediate

1.3.3 Junction 5 Leixlip Options

1.3.3.1 Location A – Junction reusing existing R404 Overbridge

Significant reductions are expected in operational carbon relative to the Do-Minimum scenario, as vehicle kilometres travelled are predicted to decrease from the Do-Minimum scenario.

Moderate new infrastructure is required for this location, as it incorporates the use of existing overbridge infrastructure. The construction phase is expected to generate significantly less embodied carbon relative to Location B.

Overall, both the construction and operational phase of this location are expected to result in a Minor or Slightly Positive (PAG Score: 5) impact to climate.

1.3.3.2 Location B – Junction between Liffey River Bridge and Existing Junction 5

Significant reductions are expected in operational carbon generated relative to the Do-Minimum scenario. This is due to a reduction in the percentage heavy goods vehicles (HGV) compared to the Do-Minimum scenario, however vehicle kilometres travelled for this location are predicted to increase from the Do-Minimum. Overall, there is significant reductions in operational carbon predicted for this Location.

Significantly more new infrastructure is required relative to Location A. Location B will consist of a new overbridge, associated works and the addition of a new link road. Therefore, the construction phase is expected to generate significant embodied carbon relative to the Do-Minimum scenario.

Overall, both the construction and operational phase of this location are expected to result in a Minor or Slightly Positive (Pag Score: 5) impact to climate.

1.3.4 Junction 5 Leixlip Conclusion

The difference between the Do-Minimum and Do-Something for operational carbon (per year), qualitative embodied carbon and subsequent climate assessment determinations are outlined in Table 1.3. The results demonstrate that the implementation of Locations A and B is likely to result in a slight increase in traffic volumes, relative to the Do-Minimum scenario, however reductions in HGV percentages are also likely relative to the Do-Minimum scenario. Therefore, the associated operational carbon emissions for both locations are likely to result in decreases, relative to the Do-Minimum scenario.

The difference between Location A and B is marginal. Location A is likely to result in substantially less embodied carbon than Location B. However, Location B is likely to result in larger reductions in operational carbon generated than Location A.

Table 1.3: Climate Assessment Matrix of Junction 5 Options

Assessment Criteria	Do-Minimum	Location A	Location B
Difference between Do-Minimum and Do-Something Operational Carbon (per year) (kg CO ₂ e)	N/A	-5,346,279	-10,081,571
Estimated Embodied Carbon (qualitative)	N/A	Moderate new infrastructure is required. Significantly less embodied carbon is likely to be produced from construction.	Significant new infrastructure is required. Construction periods are likely to result in a substantial level of embodied carbon as a result of construction materials used.
Scoring			
Qualitative Assessment	N/A	Minor or Slightly Positive	Minor or Slightly Positive
Score/Impact Level	N/A	5	5
Preference	N/A	Preferred	Least Preferred

1.4 Summary

Junction 7

Location C and E are Preferred, Locations A, B and F are Intermediate, and Location D is Least Preferred.

Junction 5

Location A is Preferred, and Location B is Least Preferred.

Kildare County Council

Maynooth to Leixlip Project

Options Report - Appendix 5 - Stage
1 Hydrogeology Junction Options
Assessment

Draft 1 | 31 July 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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Table 1.2: TII Project Appraisal Guidelines Scoring Criteria

Table 1.3: Correlation of NRA Guidelines Significance Rating to an Equivalent TII PAG Score

Table 1.4: Hydrogeology Assessment Criteria Summary

Table 1.5: Groundwater Sources within Junction 7 Maynooth Options

Table 1.6: Groundwater Sources within Junction 5 Leixlip Options

Table 1.7: Hydro-Ecology Assessment for Junction 7 Maynooth and 5 Leixlip

Table 1.8: Hydrogeological Assessment Matrix of Junction 7 Maynooth

Table 1.9: Hydrogeological Assessment Matrix of Junction 5 Leixlip

1 Stage 1 Hydrogeology Junction Options Assessment

1.1 Introduction

This section details the Hydrogeology assessment of the Stage 1 Junction Options with respect to the Hydrogeology constraints identified in the Constraints Report.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

The Stage 1 assessment has been prepared in accordance with the following guidance:

- Transport Infrastructure Ireland (TII) guidance, formally National Roads Authority (NRA) guidance, Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology on National Road Schemes (herein referred to as NRA Guidelines)¹
- The Environmental Protection Agency (EPA) (May 2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports²
- Transport Infrastructure Ireland (TII) guidance, formally National Roads Authority (NRA). Environmental Impact Assessment of National Road Schemes – a Practical Guide³

In line with these guidelines, the assessment study area for the Stage 1 Preliminary Junction Options for the Maynooth to Leixlip Project includes the extents of the possible works associated with each Junction Option (Junction 7 Maynooth and Junction 5 Leixlip). A total of six junction locations for Junction 7 Maynooth and two junction locations for Junction 5 Leixlip have been assessed.

¹ National Roads Authority, 2009. Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, Ireland: s.n. Available at: <https://www.tii.ie/technical-services/environment/planning/Guidelines-on-Procedures-for-Assessment-and-Treatment-of-Geology-Hydrology-and-Hydrogeology-for-National-Road-Schemes.pdf>

² Environmental Protection Agency, 2022. Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. Available at: <https://www.epa.ie/pubs/advice/ea/EPA%20EIA%20Guidelines.pdf> [Accessed: 20 May 2022]

³ National Roads Authority, 2008. Environmental Impact Assessment of National Road Schemes – a Practical Guide. Available at: <https://www.tii.ie/technical-services/environment/planning/Environmental-Impact-Assessment-of-National-Road-Schemes-Practical-Guide.pdf>

The NRA Guidelines¹ provide criteria for ranking of the identified hydrogeological constraints within the assessment study area (herein referred to as Criteria) that are presented in Section 4 Hydrogeology. Criteria for rating an impact significance that may arise at each hydrogeological constraint are provided within Box 4.4 of the NRA Guidelines¹ and in Table 1.1 below. The impact significance assessment considers the attribute importance and the predicted scale and duration of the likely impacts.

Table 1.1: Rating of Significant Environmental Impacts (Box 4.4 of the NRA Guidelines¹).

Impact Level	Attribute Importance				
	Extremely High**	Very High	High	Medium	Low
Profound	Any permanent impact on attribute	Permanent impact on significant proportion of attribute			
Significant	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on Significant proportion of attribute		
Moderate	Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute	
Slight		Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute
Imperceptible			Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute

***In rating impacts on an 'European site' account must be taken of Article 6(3) and 6(4) of the Habitats Directive (Council Directive 92/43/EEC). Also see guidance contained within Guidelines for Assessment of Ecological Impacts of National Road Schemes (Rev 2, National Roads Authority, 2008)*

The NRA Guidelines¹ qualitative significant rating of environmental impacts have been correlated with the equivalent qualitative and quantitative assessment scores from the TII Project Appraisal Guidelines for National Roads (PAG) Unit 7.0 - Multi-Criteria Analysis⁴, as shown in Table 1.2.

⁴ TII (2016) Project Appraisal Guidelines for National Roads Unit 7.0 Multi Criteria Analysis. Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

It should be noted that only negative potential impacts are considered in the NRA Guidelines¹ whereas the TII PAG⁴ multi-criteria assessment is based on the seven-point scale presented below:

Table 1.2: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Table 1.3: Correlation of NRA Guidelines Significance Rating to an Equivalent TII PAG Score

Significance Rating (NRA Guidelines)	Equivalent PAG (Description)	Equivalent PAG (Value)
Profound	Major or highly negative	1
Significant	Major or highly negative	1
Moderate	Moderately negative	2
Slight	Minor or slightly Negative	3
Imperceptible	Not significant or neutral	4

The final stage of the assessment methodology was to ensure that the requirements of the TII PAG Unit 7.0 - Multi-Criteria Analysis, were also met by assigning a score to each junction option alternative based on the scoring procedure within these Guidelines. Where a positive score is assigned, they are from the TII PAG scoring system.

This assessment was based on a desk study and collating hydrogeological information available.

It should be noted that the Junction Options are assessed separately in their own right as stand-alone entities and are not assessed against each other as these could be implemented as standalone measures or implemented as complementary measures.

1.2.1 Assessment Criteria

In line with NRA Guidelines¹, the hydrogeological attributes which are considered in the assessment of the junction options are presented in Table 1.4. This table also outlines the assessment criteria that will be applied to each of these features.

Additional lower importance hydrogeological features were gathered during the desk study phase of the assessment other than those included in the impact assessment. This information was gathered to provide the wider context of the project, however, the features listed in Table 1.4 have been used in this assessment to identify potential impacts.

Table 1.4: Hydrogeology Assessment Criteria Summary

Hydrogeological Features to be assessed	Means of assessment of potential impacts
<p><i>Groundwater Flow, Levels and Aquifer Vulnerability</i></p> <p>The classification and extent of aquifers underlying each alternative and increased risk presented to them by each alternative</p>	<p>Aquifer classification.</p> <p>Extent of aquifer – assessed as the extent underlain by a particular aquifer classification.</p> <p>Aquifer vulnerability – assessed as the extent underlain by aquifer which is classified as extreme or high vulnerability.</p> <p>Removal of subsoil cover or part of aquifer (cuttings associated with an alternative) which may give rise to changes in groundwater level and change in aquifer vulnerability.</p>
<p><i>Karst</i></p> <p>Karst features and the risk presented to them by each alternative</p>	<p>The proximity to the feature.</p> <p>The extents of the alternative within feature protection zone or zone of contribution.</p>
<p><i>Groundwater Sources</i></p> <p>High yielding water supply wells and springs and increased risk presented by each alternative</p> <p><i>Groundwater Contamination</i></p> <p>Groundwater discharges and emissions have the potential to impact groundwater quality.</p> <p><i>Groundwater Flooding</i></p> <p>Historic groundwater flooding located within a fenceline, or junction have a potential to be impacted.</p>	<p>The proximity to the feature.</p> <p>The extent of the alternative within protection zone or zones of contribution.</p>
<p><i>Hydro-Ecology</i></p> <p>Groundwater dependent habitats and the risk presented to them by each alternative</p>	<p>The proximity and the position (upgradient or downgradient) to the feature.</p> <p>Removal of subsoil cover or part of aquifer (cuttings along junctions) which may give rise to changes in groundwater level.</p> <p>Removal of part of the habitat by an alternative.</p>

1.3 Junction Options Assessment

1.3.1 Aquifer Classification and Groundwater Bodies

The potential impact on the aquifers at each junction location is a combination of the type and extent of the aquifer, aquifer vulnerability and presence of deep cuttings (removal of soil and/or rock to road design elevations).

The junction locations for both Junctions 7 and Junction 5 are predominantly underlain by Dinantian Upper Impure Limestone. The bedrock aquifer is classified as a Locally Important Aquifer where the bedrock is moderately productive only in local zones (L1), except for two narrow bands (approximately 300m wide) within the Junction 7 Maynooth which is classified as a Poor Aquifer, where the bedrock is generally unproductive except for local zones (P1).

There are no cuttings deeper than 5m in any of the junction locations. Junction 7 Maynooth only will have minor cuttings at Locations D, E and F, while Location A, B and C will not have any cuttings. At Junction 5, Location A and B will not have any cuttings. Therefore, with regard to aquifers and groundwater bodies the impact is considered to be imperceptible resulting in a PAG ranking of not significant or neutral (4) for all the junction locations.

1.3.2 Karst

There are no karst features recorded within the study area. Therefore, all junction locations for both Junction 7 Maynooth and Junction 5 Leixlip are assessed as being not significant or neutral, given a PAG score of 4.

The closest karst features are located approximately 1.5km from the northeast of Junction 7 Maynooth and 1km to the north of Junction 5 Leixlip. However, the underlying bedrock geology may be susceptible to karst as karst features were recorded in the same formations outside of the study area.

1.3.3 Groundwater Sources

There are no industrial, public supply boreholes, abstraction points or source of protection areas within Junction 7 Maynooth or Junction 5 Leixlip. There are only domestic and agricultural boreholes and springs identified as low importance, as summarized in Table 1.5 and Table 1.6.

Table 1.5: Groundwater Sources within Junction 7 Maynooth Options

Option	BH ID	Source use	Attribute importance	Significance Rating (NRA Guidelines)	Equivalent PAG (Description)	PAG (Value)
A	2923SWW158 Spring	Source: domestic use only	Low	Imperceptible	Not significant or neutral	4
	2623SEW269 Spring *Approx. 100m from the junction A	Source: domestic use only	Low	Imperceptible	Not significant or neutral	4
D *2 more boreholes with unknown use	2923SWW123 Borehole	Source: agriculture use only	Low	Slight	Minor or slightly Negative	3
	2923SWW181 Borehole (50m of accuracy) *Approx. 80m from the junction D	Source: agriculture and domestic use	Low	Slight	Minor or slightly Negative	3
E *2 more boreholes with unknown use	2923SWW182 Borehole (50m of accuracy) *Approx.150m from the junction D	Source: agriculture and domestic use	Low	Slight	Minor or slightly Negative	3
	2923SWW123 Borehole (2km of accuracy)	Source: agriculture use only	Low	Slight	Minor or slightly Negative	3
F *2 more boreholes with unknown use	2923SWW182 Borehole (50m of accuracy) *Approx. 50m from the junction E	Source: agriculture and domestic use	Low	Slight	Minor or slightly Negative	3
	2923SWW123 Borehole (2km of accuracy)	Source: agriculture use only	Low	Slight	Minor or slightly Negative	3

Option	BH ID	Source use	Attribute importance	Significance Rating (NRA Guidelines)	Equivalent PAG (Description)	PAG (Value)
	2923SWW182 Borehole (50m of accuracy) *Approx. 30m from Location F	Source: agriculture and domestic use	Low	Slight	Minor or slightly Negative	3

Table 1.6: Groundwater Sources within Junction 5 Leixlip Options

Junction	BH ID	Source use	Attribute importance	Significance Rating (NRA Guidelines)	Equivalent PAG (Description)	PAG (Value)
A *2 more boreholes with unknown use	2923SWW186 Spring (50m of accuracy) *Approx. 20m from Location A	Source: agriculture use only	Low	Slight	Minor or slightly Negative	3

1.3.4 Groundwater Contamination

It is assumed that where a contaminated site with the risk to impact the groundwater quality is located within a junction option, this is considered to be a permanent impact on a small proportion of the attribute. There are no contaminated sites which could impact the groundwater quality located within both Junction 7 Maynooth and Junction 5 Leixlip junction options.

1.3.5 Groundwater Flooding

The GSI Groundwater Flood Data Maps⁵ have identified two areas of historic groundwater flooding or potential groundwater flooding approximately 150m from the Junction C of the 7 Maynooth Option. As both areas are not located within the junction fenceline, the impact is imperceptible and considered to be not significant or neutral, which result in a PAG score 4. There are no historic/groundwater flooding in the Junction 5 Leixlip Option.

1.3.6 Hydro-Ecology

The main groundwater dependent habitats, identified during the Constraints Study and which are present within the assessment area for this study include:

- Royal Canal (pNHA);
- Liffey Valley (pNHA) and;
- Rye Water (SAC pNHA).

Only the Royal Canal (pNHA) and Liffey Valley (pNHA) are located close to Junction 7 Maynooth and Junction 5 Leixlip locations, respectively.

The assessed impacts to groundwater dependent habitats are outlined below and summarized in Table 1.7.

⁵ Groundwater Flood Data

<https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228> [Accessed: 25/04/2022]

Table 1.7: Hydro-Ecology Assessment for Junction 7 Maynooth and 5 Leixlip

Junction	Site Code	Description	Importance Ranking	Junction	Impact	Justification for Impact	Box 4.4 Impact level	PAG qualitative ranking and PAG Score
Junction 7	002103	Royal Canal pNHA	Very High	A	The habitat is located within 100m, but it does not have cuttings	No impact	Imperceptible	Not significant or neutral (4)
				B	The habitat is located within 150m, and it does not have cuttings	No impact	Imperceptible	Not significant or neutral (4)
Junction 5	000128	Liffey Valley pNHA	Very High	B	The habitat is located within 150m, and it does not have cuttings	No impact	Imperceptible	Not significant or neutral (4)

1.3.7 Junction 7 Maynooth Options

1.3.7.1 Location A – Junction West of Millfarm

Location A is predominantly underlain by the Dinantian Upper Impure Limestone bedrock as a Locally Important Aquifer (LI). There are no cuttings within this junction. Therefore, with regard to aquifers and groundwater bodies the impact is considered to be imperceptible resulting in a PAG ranking of not significant or neutral (4). No karst features were identified within the study area.

There are no industrial and public supply boreholes, abstraction points or source of protection areas within Location A. Only one spring from domestic use is located within this junction and one additional spring, also from domestic use is located approximately 100m distant. This is considered to be an imperceptible impact, resulting in a PAG ranking of not significant or neutral (4).

There are no contaminated sites which could impact the groundwater quality and no historic/groundwater flooding located within Location A.

The Royal Canal (pNHA) is located within 100m of Location A. As there are no cuttings, the impact is imperceptible, being assessed as not significant or neutral and given a PAG score of 4.

1.3.7.2 Location B – Junction between Millfarm and Newtown Road

Location B is predominantly underlain by the Dinantian Upper Impure Limestone bedrock classified as a Locally Important Aquifer (LI) and as a Poor Aquifer (PI). There are no cuttings within this junction. Therefore, with regard to aquifers and groundwater bodies the impact is considered to be imperceptible resulting in a PAG ranking of not significant or neutral (4). No karst features were identified within the study area.

There are no industrial, public supply boreholes, abstraction points or source of protection areas within Location B.

There are no contaminated sites which could impact the groundwater quality and no historic/groundwater flooding located within this junction.

The Royal Canal (pNHA) is located approximately 150m from Location B. There are no cuttings, and the impact is imperceptible, resulting in a PAG ranking of not significant or neutral (4).

1.3.7.3 Option C – Junction between Newtown Road and R406 Straffan Road

Location C is predominantly underlain by the Dinantian Upper Impure Limestone bedrock classified as a Locally Important Aquifer (LI). There are no cuttings within this junction. Therefore, with regard to aquifers and groundwater bodies the impact is considered to be imperceptible resulting in a PAG ranking of not significant or neutral (4). No karst features were identified within the study area.

There are no industrial, public supply boreholes, abstraction points or source of protection areas within Location C.

There are no contaminated sites which could impact the groundwater quality located within this junction location.

The GSI Groundwater Flood Data Maps⁶ have identified only two areas of historic groundwater flooding or potential groundwater flooding, both approximately 150m from Location C. As both areas are not located within the junction fenceline and there are no cuttings, the impact is imperceptible, being assessed as not significant or neutral and given a PAG score of 4.

There are no hydro-ecology sites identified within this study area.

1.3.7.4 Location D – Junction West of Existing Ballygoran Overbridge

Location D is predominantly underlain by the Dinantian Upper Impure Limestone bedrock classified as a Locally Important Aquifer (LI) and as a Poor Aquifer (PI). There are no cuttings deeper than 5m. Therefore, with regard to aquifers and groundwater bodies the impact is considered to be imperceptible resulting in a PAG ranking of not significant or neutral (4). No karst features were identified within the study area.

There are no industrial, public supply boreholes, abstraction points or source of protection areas. Only one borehole from agriculture use was registered within this junction and one additional borehole from agriculture and domestic use, located approximately 80m from the junction location. This is considered to be a slight impact, resulting in a PAG ranking of minor or slightly negative (3).

There are no contaminated sites which could impact the groundwater quality and no historic/groundwater flooding located within Location D.

There are no hydro-ecology sites identified within this study area.

1.3.7.5 Location E – Junction reusing Existing Ballygoran Overbridge

Location E is predominantly underlain by the Dinantian Upper Impure Limestone bedrock classified as a Locally Important Aquifer (LI) and as a Poor Aquifer (PI). There are no cuttings deeper than 5m. Therefore, with regard to aquifers and groundwater bodies the impact is considered to be imperceptible resulting in a PAG ranking of not significant or neutral (4). No karst features were identified within the study area.

There are no industrial, public supply boreholes, abstraction points or source of protection areas. Only one borehole from agriculture use was registered within this junction and one additional borehole from agriculture and domestic use, located

⁶ Groundwater Flood Data

<https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228> [Accessed: 25/04/2022]

approximately 150m from the junction. This is considered to be a slight impact, resulting in a PAG ranking of minor or slightly negative (3).

There are no contaminated sites which could impact the groundwater quality and no historic/groundwater flooding located within Location E.

There are no hydro-ecology sites identified within this study area.

1.3.7.6 Location F – Junction East of Existing Ballygoran Overbridge

Location F is predominantly underlain by the Dinantian Upper Impure Limestone bedrock classified as a Locally Important Aquifer (LI) and as a Poor Aquifer (PI). There are no cuttings deeper than 5m. Therefore, with regard to aquifers and groundwater bodies the impact is considered to be imperceptible resulting in a PAG ranking of not significant or neutral (4). No karst features were identified within the study area.

There are no industrial, public supply boreholes, abstraction points or source of protection areas within Location F. Only one borehole from agriculture use was registered within this junction and one additional borehole from agriculture and domestic use, located approximately 50m from the junction. This is considered to be a slight impact, resulting in a PAG ranking of minor or slightly negative (3).

There are no contaminated sites which could impact the groundwater quality and no historic/groundwater flooding located within the Location F.

There are no hydro-ecology sites identified within this study area.

1.3.8 Junction 5 Leixlip Options

1.3.8.1 Location A

Location A is predominantly underlain by the Dinantian Upper Impure Limestone bedrock classified as a Locally Important Aquifer (LI). There are no cuttings within this junction. Therefore, with regard to aquifers and groundwater bodies the impact is considered to be imperceptible resulting in a PAG ranking of not significant or neutral (4). No karst features were identified within the study area.

There are no industrial, public supply boreholes, abstraction points or source of protection areas. Only one spring from agricultural is located approximately 20m from the Location A. This is considered to be a slight impact, resulting in a PAG ranking of minor or slightly negative (3).

There are no contaminated sites which could impact the groundwater quality and no historic/groundwater flooding located within this junction.

No hydro-ecology sites were identified within this study area.

1.3.8.2 Location B

Location B is predominantly underlain by the Dinantian Upper Impure Limestone bedrock classified as a Locally Important Aquifer (LI). There are no cuttings within this junction. Therefore, with regard to aquifers and groundwater bodies the impact

is considered to be imperceptible resulting in a PAG ranking of not significant or neutral (4). No karst features were identified within the study area.

There are no industrial, public supply boreholes, abstraction points or source of protection areas within this junction.

There are no contaminated sites which could impact the groundwater quality and no historic/groundwater flooding located within this junction.

The Liffey Valley (pNHA) is located approximately 150m from Location B. There are no cuttings, resulting in an imperceptible impact and being assessed as not significant or neutral, given a PAG score of 4.

1.4 Summary

1.4.1 Junction 7 Maynooth

All the junction locations have been assessed for the hydrogeological constraints identified. The assessments and subsequent summary for each junction is presented in Table 1.8.

This assessment shows that the hydrogeological criteria which have been considered presented similar results for the junction locations analyzed, with some minor variations, as summarized in Table 1.8.

Locations A, B and C are preferred as there are fewer impacts and is assessed as being not significant or neutral and given a PAG score of 4.

Locations D, E and F are considered to be intermediate, as there are minor cuttings (less than 5m in depth) within these junction locations and there are some agricultural boreholes, which resulted in a moderate impact and a PAG ranking of minor or slightly negative (3).

None of the locations presented major or highly negative impacts regarding the hydrogeological constraints assessed.

Table 1.8: Hydrogeological Assessment Matrix of Junction 7 Maynooth

Assessment Criteria	Location A	Location B	Location C	Location D	Location E	Location F
Karst	No karst features Not significant or neutral PAG: 4	No karst features Not significant or neutral PAG: 4	No karst features Not significant or neutral PAG: 4	No karst features Not significant or neutral PAG: 4	No karst features Not significant or neutral PAG: 4	No karst features Not significant or neutral PAG: 4
Aquifer classification	No cuttings Not significant or neutral PAG: 4	No cuttings Not significant or neutral PAG: 4	No cuttings Not significant or neutral PAG: 4	No cuttings >5m in depth Not significant or neutral PAG: 4	No cuttings >5m in depth Not significant or neutral PAG: 4	No cuttings >5m in depth Not significant or neutral PAG: 4
Groundwater Contaminated Sites	No contaminated sites Not significant or neutral PAG: 4	No contaminated sites Not significant or neutral PAG: 4	No contaminated sites Not significant or neutral PAG: 4	No contaminated sites Not significant or neutral PAG: 4	No contaminated sites Not significant or neutral PAG: 4	No contaminated sites Not significant or neutral PAG: 4
Groundwater Resources	No industrial and public supply groundwater abstractions Not significant or neutral PAG: 4	No industrial and public supply groundwater abstractions Not significant or neutral PAG: 44	No industrial and public supply groundwater abstractions Not significant or neutral PAG: 4	2 domestic and agricultural boreholes Minor or slightly negative PAG: 3	2 domestic and agricultural boreholes Minor or slightly negative PAG: 3	2 domestic and agricultural boreholes Minor or slightly negative PAG: 3
Groundwater flooding	No groundwater flooding areas Not significant or neutral PAG: 4	No groundwater flooding areas Not significant or neutral PAG: 4	2 areas of groundwater flooding app. 150m and no cuttings PAG: 4	No groundwater flooding areas Not significant or neutral PAG: 4	No groundwater flooding areas PAG: 4	No groundwater flooding areas Not significant or neutral PAG: 4
Hydro-ecology	1 No. habitat of national importance app. 100m and no cuttings Not significant or neutral PAG: 4	1 No. habitat of national importance app. 150m and no cuttings Not significant or neutral PAG: 4	No groundwater dependent habitats Not significant or neutral PAG: 4	No groundwater dependent habitats Not significant or neutral PAG: 4	No groundwater dependent habitats Not significant or neutral PAG: 4	No groundwater dependent habitats Not significant or neutral PAG: 4
Scoring						
Qualitative Assessment	Not significant or neutral	Not significant or neutral	Not significant or neutral	Minor or slightly negative	Minor or slightly negative	Minor or slightly negative
Score/ Impact Level	4	4	4	3	3	3
Preference	Preferred	Preferred	Preferred	Intermediate	Intermediate	Intermediate

1.4.2 Junction 5 Leixlip

All the junction locations have been assessed for the hydrogeological constraints identified. The assessments and subsequent summary for each junction is presented in Table 1.9.

This assessment shows that the hydrogeological criteria which have been considered presented similar results for the two junction locations analyzed, with some minor variations, as summarized in Table 1.9.

Location A is the preferred junction as there are fewer impacts and is assessed as being not significant or neutral and given a PAG score of 4. Location B is considered to be intermediate, as there is one agricultural spring, which resulted in a moderate impact and a PAG ranking of minor or slightly negative (3).

None of the locations presented major or highly negative impacts regarding the hydrogeological constraints assessed.

Table 1.9: Hydrogeological Assessment Matrix of Junction 5 Leixlip

Assessment Criteria	Location A	Location B
Karst	No karst features Not significant or neutral PAG: 4	No karst features Not significant or neutral PAG: 4
Aquifer classification	No cuttings Not significant or neutral PAG: 4	No cuttings Not significant or neutral PAG: 4
Groundwater Contaminated Sites	No contaminated sites Not significant or neutral PAG: 4	No contaminated sites Not significant or neutral PAG: 4
Groundwater Resources	No industrial and public supply groundwater abstractions Not significant or neutral PAG: 4	1 agricultural use spring Minor or slightly negative PAG: 3
Groundwater flooding	No groundwater flooding areas Not significant or neutral PAG: 4	No groundwater dependent habitats Not significant or neutral PAG: 4
Hydro-ecology	No groundwater dependent habitats Not significant or neutral PAG: 4	1 No. habitat of national importance app. 150m and no cuttings PAG: 4
Scoring		
Qualitative Assessment	Not significant or neutral	Minor or slightly negative
Score/ Impact Level	4	3
Preference	Preferred	Intermediate

Kildare County Council

Maynooth to Leixlip Project

Location Selection Report -
Appendix 5 - Stage 1 Hydrology –
Junction Assessments

Draft 1 | 31 July 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Table 1.1: TII PAG Impact Scoring Criteria

Table 1.2: Junction 7 Scoring Matrix

Table 1.3: Junction 5 Scoring Matrix

1 Stage 1 Hydrology Junction Option Assessments

1.1 Introduction

This section details the Stage 1 Hydrology assessment of the Junction Options with respect to the Hydrology constraints identified in the Constraints Report.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the junction assessment, and a summary is presented in Section 1.4.

1.2 Methodology

The junction options were assessed in accordance with Project Appraisal Guidelines for National Roads Unit 7.0 -Multi Criteria Analysis (TII, 2016). The potential impacts were assessed in accordance with the TII’s Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes. In determining the preferred option from a hydrology perspective, consideration was given to the following:

- The number of river/stream crossings with hydrologic connection to protected areas (SAC) and to drinking water abstraction points with a potential to impact on water quality,
- The risk of flooding to the works and its potential to increase the risk elsewhere.

1.2.1 Data Sources

Data used for the assessment was obtained from the following online sources:

- EPA Water Online map: <https://gis.epa.ie/EPAMaps/Water;>
- OPW online flood map: [https://www.floodinfo.ie/map/floodmaps/;](https://www.floodinfo.ie/map/floodmaps/) and
- FSU Web Portal: <https://opw.hydronet.com>.

The above sources were accessed in May 2022.

1.2.2 Assessment Criteria

The scoring utilised is based on the TII seven-point scoring system as below:

Table 1.1: TII PAG Impact Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive

Assessment Score	Description
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

1.3 Junction Locations Assessment

1.3.1 Junction 7 Maynooth Locations

A total of 6 locations were assessed for Junction 7, i.e., Location A, B, C, D, E, and F.

1.3.1.1 Location A – Junction West of Millfarm

Location A involves construction of a new grade separated junction west of the existing Millfarm Overbridge. It will connect to the R408 (Newtown Road) via the L5042 local road and to the south to the R148 via the L5041 local road near Jackson’s Bridge.

Works at Location A, just before connecting to the R148, is in proximity to a tributary of the Lyreen River. The Lyreen River is a tributary of the Rye Water which is a Rye Water Valley/ Carton SAC (Site Code 001398). This section is also in Flood Zone A (1% AEP) and Flood Zone B (0.1% AEP) from fluvial sources.

1.3.1.2 Location B – Junction between Millfarm and Newtown Road

Location B is a new grade separated junction on the M4 between the existing Millfarm Overbridge and R408 (Newtown Road) Overbridge. It will connect to the R408 (Newtown Road) to the south and to the R148 via the L5041 local road near Jackson’s Bridge to the north.

The northern end of this junction location crosses the Lyreen River, a tributary of the Rye Water Valley / Carton SAC (Site Code 001398). A significant proportion of this junction location is within the floodplain (i.e., Flood Zone A and Flood Zone B) of the Lyreen River.

1.3.1.3 Location C – Junction between Newtown Road and R406 Straffan Road

Location C is a new grade separated junction between the R408 (Newtown Road) and the R406 (Straffan Road). It will connect to the R408 south of Maynooth Lodge Nursing Home and the R406 south of the Straffan Road Roundabout via a new connector road, as part of a potential western orbital (LAP). To the north, it will connect to the R408 Newtown Road near Newtown Crescent Housing Estate and

the R406 Straffan Road near Bartons Transport via the potential western orbital connector road (LAP).

The southern end of the Location C junction crosses the Taghadoe Stream, a tributary of the Lyreen River. This junction location also involves works in the floodplain of the Taghadoe Stream.

1.3.1.4 Location D – Junction West of Existing Ballygoran Overbridge

Location D is a proposed grade separated junction located west of the existing Ballygoran Overbridge. It will connect to the Ballygoran Road via a new link adjacent to the Ballygoran Reservoir and to the R405 Ballygoran Road at its southern end.

No stream crossing is required for this location. Additionally, the works are not located on a floodplain.

1.3.1.5 Location E – Junction reusing Existing Ballygoran Overbridge

Location E is a new grade separated junction whereby the existing overbridge is reused, utilising existing infrastructure. To the south, it will connect to the Ballygoran View. To the north, it will connect directly to the R405 Ballygoran Road.

No stream crossing is required for this location. Additionally, the works are not located on a floodplain.

1.3.1.6 Location F – Junction East of Existing Ballygoran Overbridge

Location F is a new grade separated junction located east of the existing Ballygoran Overbridge. To the south, it will connect to Ballygoran View and the R405 Ballygoran Road via a new link.

No stream crossing is required for this location. Additionally, the works are not on a floodplain.

1.3.2 Junction 7 Maynooth Conclusion

Locations D, E and F are the preferred junction locations as no stream crossings are involved. See Scoring Matrix overleaf in Table 1.2.

Table 1.2: Junction 7 Scoring Matrix

Criteria	Location A	Location B	Location C	Location D	Location E	Location F
Water Quality	Works in proximity to SAC (Rye Water Valley/ Carton SAC (Site Code 001398)).	The northern end of this Junction Location crosses the Lyreen River, a tributary of the Rye Water Valley / Carton SAC (Site Code 001398).	The southern end crosses a small Stream (Taghadoe), a tributary of the Lyreen River and hence hydrologically connected to the Rye Water Valley / Carton SAC (Site Code 001398).	No stream crossing is involved and hence insignificant impact on surface water bodies.	No stream crossing is involved and hence insignificant impact on surface water bodies.	No stream crossing is involved and hence insignificant impact on surface water bodies.
Flood Risk	Section of the works in Flood Zone A (1% AEP) and Flood Zone B (0.1% AEP) from fluvial sources.	A significant proportion is within the floodplain (Flood Zone A and Flood Zone B) of the Lyreen River.	Involves works in the floodplain (Flood Zone A and Flood Zone B) of the Meadowbrook Stream (Taghadoe).	No visible flood risk. Works are in Flood Zone C.	No visible flood risk. Works are in Flood Zone C.	No visible flood risk. Works are in Flood Zone C.
Scoring						
Qualitative Assessment	Major or highly negative	Major or highly negative	Moderately negative	Not significant or Neutral	Not significant or Neutral	Not significant or Neutral
Score/ Impact Level	1	1	2	4	4	4
Preference	Least Preferred	Least Preferred	Intermediate	Preferred	Preferred	Preferred

1.3.3 Junction 5 Leixlip Locations

1.3.3.1 Location A – Junction reusing existing R404 Overbridge

Location A is a new grade separated junction whereby the existing overbridge is reused, utilising existing infrastructure. It will connect to the R404 to the north and south.

No stream crossing is required for this location. Additionally, the works are not located on a floodplain.

1.3.3.2 Location B – Junction between Liffey River Bridge and Existing Junction 5

Location B is a new grade separated junction located between the Liffey River Bridge and the existing Junction 5. To the south, it will connect directly to the R403. To the north, it will connect to the R148.

No stream crossing is required for this location. Additionally, the works are not located on a floodplain.

1.3.4 Junction 5 Leixlip Conclusion

Location A is the preferred Location for Junction 5 as it uses an existing road and overbridge. See Scoring Matrix below in Table 1.3.

Table 1.3: Junction 5 Scoring Matrix

Criteria	Location A	Location B
Water Quality	No stream crossing is involved and hence insignificant impact on surface water bodies. Uses existing junction.	No stream crossing is involved and hence insignificant impact on surface water bodies. Involves construction of a new junction.
Flood Risk	No visible flood risk. Works are in Flood Zone C	No visible flood risk. Works are in Flood Zone C
Scoring		
Qualitative Assessment	Not significant or Neutral	Not significant or Neutral
Score/ Impact Level	4	4
Preference	Preferred	Intermediate

1.4 Summary

For Junction 7, the preferred locations are Locations D, E and F as their interaction with the Rye Water Valley / Carton SAC (Site Code 001398) is minimum and entirely in Flood Zone C (low risk).

For Junction 5, both Locations A and B are preferred but Location A is marginally better as it uses an existing junction which involves lesser construction activity and has less potential for impacts on surface water bodies and lower flood risk.

Kildare County Council

Maynooth to Leixlip Project

Appendix 5 - Stage 1 Landscape and
Visual - Junction Options
Assessment

Draft 1 | 31 July 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Tables

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Landscape and Visual Assessment Matrix of Junction 7 Options

Table 1.3: Landscape and Visual Assessment Matrix of Junction 5 Options

1 Stage 1 Landscape and Visual Junction Options Assessment

1.1 Introduction

This section details the Stage 1 Landscape and Visual assessment of the Junction Options with respect to the Landscape and Visual constraints identified in the Constraints Report. It assesses the potential significance of effects on landscape receptors and visual receptors, positively or negatively, based on its sensitivity and the magnitude of change.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

The landscape and visual constraints assessment involved desktop studies where the Landscape and Visual specialist has developed an understanding of the character of the existing landscape through study of the Landscape Character Assessment incorporated into the Kildare County Development Plan 2017-2023, South Dublin County Council Development Plan 2016 -2022, Fingal Development Plan 2017-2023 and Meath County Development Plan 2013-2019 (carried through to the Development Plan 2020-2026) as well as other landscape and visual references in the County Development Plans and to review of the landscape and visual environment based on other principal sources of information.

The assessment has had regard to the following documents:

- Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Specified Infrastructure Projects – Overarching Technical Document (PE-ENV-01101), December 2020 TII;
- Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Proposed National Roads - Standard (PE-ENV-01102), December 2020 TII;
- Draft Advice Notes for Preparing Environmental Impact Statements, Draft September 2015 Environmental Protection Agency;
- Guidelines on the information to be contained in Environmental Impact Assessment Reports, May 2022 EPA;
- Guidelines for Landscape and Visual Impact Assessment, 3ed. April 2013 Landscape Institute & Institute of Environmental Management and Assessment;
- Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis, October 2016 TII
- Kildare County Development Plan 2017-2023, Kildare County Council, 2017;

- South Dublin Development Plan 2016-2022, South Dublin County Council, 2016;
- Celbridge Local Area Plan 2017-2023, Kildare County Council, 2017; and
- Maynooth Local Area Plan 2013-2019 (As Amended), Kildare County Council, 2017.
- Leixlip Local Area Plan 2020-2023, Kildare County Council, 2019.

Other principal sources of information were:

- Ordnance Survey Ireland Geohive (<http://map.geohive.ie/mapviewer.html>);
- Environmental Protection Agency GIS Mapping (<https://gis.epa.ie/EPAMaps/>);
- Heritage Council GIS Mapping (<https://heritagemaps.ie>);
- National Biodiversity Data Centre (<https://data.gov.ie/organization/national-biodiversity-data-centre>); and
- Google Aerial Photography and Mapping (<https://www.google.ie/maps>).

1.2.1 Scoring Procedure

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG scoring procedure. The PAG seven-point scale scoring procedure is shown in Table 1.1.

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Summary tables are provided in Sections 1.3.2 and 1.3.4 which provide an overall score for each junction option.

1.3 Junction Options Assessment

1.3.1 Junction 7 Maynooth Options

Mitigation through introduction of screening planting to the boundaries of the proposed infrastructure for all locations would be effective in integrating the proposals into the landscape with a likely reduction of effects to moderate over the long term for receptors not impacted by land acquisition.

1.3.1.1 Location A – Junction West of Millfarm

This has potential for impacts on landscape and visual receptors through the acquisition of private property, and the introduction of new road infrastructure and associated features such as lighting and signage. There would be a direct impact on residential property with loss of private amenity space, trees, vegetation and set back of boundaries. There would be direct impacts on agricultural property with loss of land area, hedgerows and trees. There would be changes to existing rural roads with a change in character and an impact on road users. There is potential for the proposals to introduce new built elements within views experienced from surrounding residential properties, from the Royal Canal and from protected views from Royal Canal bridges, with a resulting visual impact through a change in the rural character of the views. More minor visual effects would result from the removal of roadside vegetation to the boundaries of the M4 which would reduce screening of the road.

There is potential for significant direct landscape and visual effects on residential properties, agricultural properties, trees and vegetation. There is potential for significant visual effects on surrounding residential receptors not impacted by land acquisition with views of the proposals, especially during construction.

1.3.1.2 Location B – Junction between Millfarm and Newtown Road

There would be direct impacts on agricultural property with loss of land area, hedgerows and trees, but with less impact on trees than for Location A. There is potential for the proposals to introduce new built elements within views experienced from the Royal Canal and protected views from Royal Canal bridges, as well as a limited number of residential properties, with a resulting visual impact through a change in in the rural character of the views. As per Location A, more minor visual effects would result from the removal of roadside vegetation to the boundaries of the M4 which would reduce screening of the road.

There is potential for significant direct effects on agricultural properties, trees and vegetation. There is potential for significant visual effects on a limited number of surrounding residential receptors with views of the proposals, especially during construction. There is potential for significant visual effects on the Royal Canal and protected views on the canal.

1.3.1.3 Location C – Junction between Newtown Road and R406 Straffan Road

There would be direct impacts on residential and agricultural property with loss of land area, hedgerows and trees as well as indirect impacts on visual receptors. This would result in impacts on a greater number of residential and recreational receptors than Location A and B due to the introduction of road infrastructure in proximity to suburban residential areas and associated public open spaces on the southern extents of Maynooth.

There is potential for significant direct landscape and visual effects on a residential property, and on agricultural properties, trees and vegetation. There is potential for significant indirect effects on surrounding residential receptors with views of the proposals, especially during construction.

1.3.1.4 Location D – Junction West of Existing Ballygoran Overbridge

There is potential for a significant direct effect on a single residential property with loss of land area and garden vegetation as well as the set back of boundaries. There is potential for significant visual effects on surrounding residential receptors with views of the proposals, especially during construction, most notably for properties to the south due to loss of screening vegetation to the southern boundary of the road. Impacts on agricultural receptors, trees and vegetation are not likely to be significant.

1.3.1.5 Location E – Junction reusing Existing Ballygoran Overbridge

There is potential for significant direct effects on limited agricultural property and a single residential property with loss of land area and garden vegetation as well as the set back of boundaries. There is also potential for significant indirect effects on surrounding residential receptors with views of the proposals, especially during construction, most notably for properties to the northeast due to loss of screening vegetation to the northern boundary of the road. Impacts on agricultural receptors, trees and vegetation are not likely to be significant.

1.3.1.6 Location F – Junction East of Existing Ballygoran Overbridge

There is potential for significant direct effects on some non-residential properties and numerous residential properties through loss of land, and impacts on boundaries, trees and other vegetation. There is also potential for significant visual effects on surrounding residential receptors with views of the proposals, especially during construction, most notably for properties to the north due to loss of screening vegetation to the northern boundary of the road. Impacts on agricultural receptors, trees and vegetation are not likely to be significant.

1.3.2 Junction 7 Maynooth Conclusion

Location D is preferred due to its more limited extents and reduced landtake, which results in reduced landscape and visual impacts, although significant effects will occur on a limited number of residential properties through visual impacts, and for a single residential property through landtake. Locations A and C would be least preferred due to highly negative impacts on the landscape and visual resource. Location A would result in the removal of substantial lengths of hedgerow containing established trees and there would be landtake from a residential property with expected significant visual effects on several others. Location C is predicted to result in significant visual effects on numerous residential and amenity receptors to the southern extents of Maynooth, significant effects on a single residential property through landtake, and substantial loss of trees and vegetation.

Although the other locations have intermediate impacts, they are still predicted to result in some significant effects on a variety of landscape and visual receptors.

Overall, landscape mitigation measures, such as the provision of replacement and additional planting to the boundaries of the proposed infrastructure should be effective in integrating the proposals into the landscape thus reducing effects to moderate. However, effects on properties with permanent land acquisition are likely to remain significant.

Table 1.2: Landscape and Visual Assessment Matrix of Junction 7 Options

Assessment Criteria	Location A	Location B	Location C		Location D	Location E	Location F
Designated Landscapes/Amenities	2	1	3	1	1	1	
Archaeological Features	0 (No Impact Expected)	0 (No Impact Expected)	0 (No Impact Expected)	0 (No Impact Expected)	0 (No Impact Expected)	0 (No Impact Expected)	
Architectural Heritage Features	0 (No Impact Expected)	0 (No Impact Expected)	0 (No Impact Expected)	0 (No Impact Expected)	0 (No Impact Expected)	0 (No Impact Expected)	
Natural Landscape Features	3	2	3	1	2	1	
Residential Properties/ Visual Receptors	2	1	3	2	2	3	
Designated views/scenic routes/areas	3	3	1	1	1	1	
Summary	Significant impacts on agricultural land, and field boundaries with established trees and hedgerows. Significant direct impact on a single residential property and visual impacts on the Royal Canal, protected views, and a limited	Significant impacts on agricultural land, trees and hedgerows. Significant visual impacts on the Royal Canal, protected views, and a limited number of residential receptors.	Visual impacts on numerous residential receptors and open spaces to the southern edge of Maynooth and a direct impact on a residential property. Significant loss of hedgerows and trees.		Relatively limited extents with significant impact on a single property and visual impacts on a limited number of residential properties.	Significant visual impacts on residential receptors through removal of established roadside tree screening, and direct impact on a single residential property and a	Significant impacts on numerous residential properties, and some non-residential properties

	number of residential receptors.				limited extent of agricultural property.	
Qualitative Assessment	Major or highly negative	Moderately negative	Major or highly negative	Moderately negative	Moderately negative	Moderately negative
Score/ Impact Level	1	2	1	2	2	2
Preference -	Least Preferred	Intermediate	Least Preferred	Preferred	Intermediate	Intermediate

1.3.3 Junction 5 Leixlip Options

1.3.3.1 Location A – Junction reusing existing R404 Overbridge

This will result in loss of roadside tree planting along the M4 and the R404, which will increase in visibility of the proposed infrastructure and result in potential visual impacts on nearby residential and open space receptors. There is also likely to be a visual impact on the Wonderful Barn and environs, which are the focus of objective BH1.6 of Leixlip Local Area Plan. Effects are likely to be significant for the Wonderful Barn and for the closest residential receptors with views of the proposals.

1.3.3.2 Location B – Junction between Liffey River Bridge and Existing Junction 5

As with Location A, this will result in the loss of roadside tree planting, which will lead to visual impacts on surrounding residential receptors. There will also be direct impacts on residential property with acquisition of land, set back of boundaries and loss of garden areas, trees and other vegetation. Significant effects are expected for residential property with land acquisition and nearby residential receptors which experience views of the proposals. The proposals would include land acquisition from agricultural land, introduction of infrastructural development and an intensification of built form within the high amenity area of the Liffey Valley as designated in South Dublin County Development Plan, which has potential to lead to localised significant effects on this designation. Although, not directly affected, the context of Lucan Demesne will be impacted by the introduction of a new junction on its boundary, but the effect is not expected to be significant.

1.3.4 Junction 5 Leixlip Conclusion

Both locations are likely to lead to significant effects on surrounding residential receptors. Location A would lead to visual impact on The Wonderful Barn, an architectural heritage feature of importance with the local landscape. However, Location B would be least preferred as it would lead to direct impacts on residential property and on the Liffey high amenity designation. Effects are likely to be most significant during construction, but effective mitigation proposals would likely reduce the effects to moderate for receptors not directly impacted by land acquisition.

Table 1.3: Landscape and Visual Assessment Matrix of Junction 5 Options

Assessment Criteria	Location A	Location B
Designated Landscapes / Amenities	1	2
Archaeological Features	0 (No Impact Expected)	0 (No Impact Expected)
Architectural Heritage Features	2	0 (No Impact Expected)
Natural Landscape Features topographical features, rivers, trees/hedgerows	2	2
Residential Properties/ Visual Receptors	1	2
Designated views/scenic routes/areas	0 (No Impact Expected)	0 (No Impact Expected)
Summary	Significant impacts on the Wonderful Barn and Environs and on some nearby residential receptors.	Significant localised impacts on high amenity designation. Significant direct impact on residential property and visual impacts on a number of residential receptors.
Qualitative Assessment	Moderately negative	Major or highly negative
Score/ Impact Level	2	1
Preference	Preferred	Least Preferred

1.4 Summary

Both locations will give rise to some degree of townscape and visual effect, most notably during the construction phase. These impacts arise especially where there is temporary and / or permanent acquisition of lands associated with residential or other properties, and where tree removal is required.

In the operational phase significant residual effects will remain for properties experiencing permanent land acquisition. However, landscape mitigation measures proposing replacement or additional tree and other planting where possible along the edges of the road corridors will aid in effectively integrating the project into the landscape.

Kildare County Council

Maynooth to Leixlip Project

Options Report - Appendix 5 - Stage
1 Material Assets Junction Options
Assessment

Draft 1 | 31 July 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Table 1.3: Criteria for Assessing the Significance of Impact on Services and Utilities

Table 1.4: Properties and Land Use Assessment

Table 1.5: Utilities and Services Assessment

Table 1.6: Material Assets Summary

1 Stage 1 Material Assets Junction Options Assessment

1.1 Introduction

This section details the Stage 1 assessment of the junction options in the context of Material Assets constraints identified in the Constraints Report.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

The following guidelines and legislation were referred to when undertaking this assessment:

- European Union (2018) (Planning and Development) (Environmental Impact Assessment) Regulations. (SI 296 of 2018);
- Environmental Protection Agency (EPA) (May 2022) Guidelines on the Information to be contained in Environmental Impact Assessment Reports¹; and
- Transport Infrastructure Ireland (TII) (2016) Project Appraisal Guidelines Unit 7.0 - Multi Criteria Analysis, PE-PAG-02031².

This assessment is a desktop assessment of available data sources. The desktop study considered the following sources of information i.e., aerial mapping / photography³, Property Registration Authority of Ireland (PRAI)⁴ database and data regarding agriculture in County Kildare and County Dublin from the Central Statistics Office (CSO) as referred to in the Constraints Report.

1.2.1 Scoring Procedure

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG scoring procedure. The PAG seven-point scale scoring procedure is shown in Table 1.1.

¹ Environmental Protection Agency (EPA) (May 2022) Guidelines on the Information to be contained in Environmental Impact Assessment Reports. Available from:

<https://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf> [Accessed 20 May 2022]

² Transport Infrastructure Ireland (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf> [Accessed: 3rd March 2022]

³ Google Aerial Mapping (2022). Available from: <https://www.google.com/maps> [Accessed: November 2020 to March 2022]

⁴ Property Registration Authority (2021). Available from <https://www.landdirect.ie/index> [Accessed in 2021 and 2022]

Table 1.1: II Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Following the individual criterion assessments, an overall assessment score was assigned to each junction option based on the TII PAG seven-point scale scoring procedure, and the overall preference for each junction option of Preferred, Intermediate, or Least preferred was assigned using the assessment criteria results and professional judgement.

1.2.2 Assessment Criteria for Properties and Land Use

For the purposes of assessing direct impacts on properties, the extent of each junction option is considered to include all lands required for the construction and operation of new infrastructure.

The potential impact of junction options on properties is assessed according to the significance criteria detailed in Table 1.2.

Table 1.2: Criteria for Assessing the Significance of Impact on Properties and Land Use

Significance Level/ Degree of Impact	Definition
Major or Highly Negative Profound	A non-agricultural property of national or regional importance is fully within the option extent and will be removed by the proposed option
Moderately Negative	A non-agricultural property or other material asset is fully within the option extent and may result in the demolition or acquisition of a dwelling or, where acquisition of a property results in loss of employment and total or partial loss of the business
Minor or Slightly Negative	Part of a non-agricultural property or other material asset is within the option extent
Not Significant or Neutral	An impact on a property which is currently occupied by a public right-of-way, e.g., a road or the non-agricultural property or other material asset is in the vicinity of the option but outside the option extent

1.2.3 Assessment Criteria for Utilities and Services

The locations of existing utilities were requested from relevant utility service providers and topographical survey information. Key utilities and services have been identified and used to inform this assessment.

Low voltage ESB lines which service homes and businesses within the vicinity of the junction options were evident, however these are considered to be a minor constraint and may be readily diverted where necessary. In addition, it would not be a differentiating factor when comparing locations. The ESB services that have been assessed (see bulleted list below) are the major utilities for this service provider and pose more significant constraints for the project. This is because they are high voltage.

Small diameter foul combined and surface water sewers and watermains throughout the study area have not been fully considered as part of this Stage 1 assessment, as they are not considered significant constraints for the junction options. Moreover, they are a minor constraint and could be readily diverted where necessary. The assessment has been carried out based on the larger diameter, more critical services, as detailed in the bulleted list below, as these pose more significant constraints for the junction options.

In summary, at Stage 1 in the assessment and comparison of the Junction Locations, impacts on larger utilities and services were considered as high impact and differentiating factors. The following utilities and services were considered:

- ESB High Voltage (i.e., 38kV, 110kV and 220kV) Overhead Lines;
- ESB High Voltage Underground Lines;
- ESB Medium Voltage (i.e., 10kV, 20kV) Overhead Lines;
- ESB Substations;
- Gas Networks Ireland Infrastructure;
- Irish Water watermains;
- Irish Water foul and combined sewers;
- Water/wastewater treatment plants;
- Telecoms Antennas;
- Eir underground services; and
- E-Net services.

The potential impact of the junction options on services and utilities is assessed according to the significance criteria detailed in Table 1.3.

Table 1.3: Criteria for Assessing the Significance of Impact on Services and Utilities

Significance Level/ Degree of Impact	Definition
Major or Highly Negative Profound	Removal of a service or utility that is of national or regional importance
Moderately Negative	Major diversion of High Voltage ESB lines (38kV, 110kV or 220kV) or fibre optic telecoms
Minor or Slightly Negative	Minor diversion of High Voltage ESB lines (38kV, 110kV or 220kV) or fibre optic telecoms
Not Significant or Neutral	The diversion of low and medium voltage ESB network, telecommunications or water supply or foul sewer services

1.3 Junction Options Assessment

1.3.1 Properties and Land Use

The impacts on residential lands within the extent of the junction options are shown in Table 1.4.

There are no amenities located within the extent of the junction locations.

Adjacent to the junction locations there are a number of business parks including the M4 Business Park, the Maynooth Business Campus, and the Liffey Business Campus (former HP site). The Properties and Land Use assessment is summarised in Table 1.4.

Table 1.4: Properties and Land Use Assessment

Assessment Criteria	Junction 7						Junction 5	
	Location A	Location B	Location C	Location D	Location E	Location F	Location A	Location A
Residential	Location A has a minor or slightly negative impact on 3 residential properties with 1 requiring landtake due to earthworks on the Southern Link Road (L5042). Location B has no potential impacts.		No potential impact	Location D has a moderately negative impact on 1 residential property. Location E has a not significant or neutral impact on 1 residential property. Location F has a major or highly negative impact on a number of residential properties.			No potential impact	Potential minor or slightly negative impact on 1 residential property at WB Merge
Commercial/Industrial	No potential impact		No potential impact	Locations D and E do not have potential impacts. Location F requires landtake from Ray Crofton Motors Limited on the southern side of the M4. It also has a moderately negative impact on a Kildare County Council compound located to the north of the M4.			No potential impact	Potential landtake required at Tara Park on the R148
Amenity	No potential impact		No potential impact	No potential impact			No potential impact	No potential impact
Other	No potential impact		No potential impact	No potential impact			No potential impact	No potential impact
Qualitative Assessment	Minor or Slightly Negative	Not Significant or Neutral	Not Significant or Neutral	Minor or Slightly Negative	Not Significant or Neutral	Moderately Negative	Not Significant or Neutral	Moderately Negative
Score/ Impact	3	4	4	3	4	2	4	2
Preference	Intermediate	Preferred	Preferred	Intermediate	Preferred	Least Preferred	Preferred	Least Preferred

1.3.2 Utilities and Services

Irish Water Watermains

Storm watermains are located in much of the existing M4/N4 mainline, from Junction 7 Maynooth to Junction 5 Leixlip and as such, evident in the majority of the junction locations.

Numerous watermains are evident throughout the extent of the junction locations, adjacent to the M4/N4 mainline. Watermains cross the M4/N4 at various locations, typically utilising existing overbridges although also traversing under the M4/N4 mainline at some locations. Ballygoran Reservoir located east of Junction 7 Maynooth with various watermain inlets and outlets. As such, the majority of junction locations are impacted by watermains.

Water/ Wastewater Treatment Plants

Leixlip Hydro Station and Leixlip Drinking Water Treatment Plant are located west of Junction 5 Leixlip, although no major impact is envisaged.

Irish Water Foul or Combined Sewers

Gravity fed foul wastewater network mainline crossings are evident at Junction 7 Maynooth, the R404 and west of the River Liffey Bridge. There is a combined sewer crossing at Junction 5 Leixlip, although no major impact is envisaged.

ESB Services

There is one overhead HV ESB line within the extent of the junction locations. This is located east of Junction 7 Maynooth. Underground HV lines are located adjacent to the Ballygoran Road and terminate at a sub-station also located on the Ballygoran Road.

There is a LV/MV overhead crossing located between Junction 6 Celbridge and Junction 5 Leixlip.

Gas Networks Ireland

Decommissioned gas infrastructure is evident west of Junction 6 Celbridge. Low pressure gas infrastructure is evident east of Junction 6 Celbridge. Medium pressure gas infrastructure is evident throughout the extent of the junction locations with an underground mainline crossing east of the R405 Ballygoran Road Overbridge and a mainline crossing on the R404 Celbridge Road Overbridge.

EIR Underground Services

Numerous EIR infrastructure is evident within the extent of the junction locations with at-grade crossings at Junction 7 Maynooth and Junction 5 Leixlip.

EIR mainline crossings are also evident at the M4 Business Park, the R404 Celbridge Road Overbridge and east of Junction 5 Leixlip.

Other Utilities Services

There is a small quantity of BT infrastructure located at Junction 6 Celbridge and adjacent to Barnhall Road. Further BT infrastructure crosses the M4 on the R404 Celbridge Road Overbridge.

UPC infrastructure is evident throughout the extent of the junction locations with M4 crossings located at Junction 6 Celbridge, the R405 Ballygoran Road Overbridge, the R404 Celbridge Road Overbridge, Junction 5 Leixlip and east of Junction 5 Leixlip.

The junction assessment is summarised in Table 1.5.

Table 1.5: Utilities and Services Assessment

Assessment Criteria	Junction 7						Junction 5	
	Location A	Location B	Location C	Location D	Location E	Location F	Location A	Location B
ESB High Voltage (i.e., 38kV, 110kV and 220kV) Overhead Lines (HV OH)	No potential impact		No potential impact	No potential impact			No potential impact	No potential impact
ESB High Voltage Underground Lines (HV UG)	No potential impact		No potential impact	Location D - Infrastructure evident on WB Diverge. Location E - Infrastructure evident near WB Merge. Not significant or neutral impact. Location F has no potential impact.			No potential impact	No potential impact
ESB Medium Voltage (i.e., 10kV, 20kV) Overhead Lines (MV OH)	No potential impact		No potential impact	No potential impact			No potential impact	No potential impact
ESB Medium Voltage (i.e., 10kV, 20kV) Overhead Lines (MV UG)	Location A has no potential impact. Location B has a not significant or neutral impact on infrastructure at the proposed WB Merge/ EB Diverge		Not significant or neutral impact on infrastructure at the proposed WB Merge/ EB Diverge	Location D – 4 corridor crossings impacting EB Diverge/WB Merge. Location E has no potential impact. Location F - Infrastructure evident throughout junction footprint. This is primarily located on the EB Merge/ WB Diverge. Mainline Crossing evident adjacent to Celbridge Entertainment Centre.			Infrastructure evident crossing M4 and the R404 north and south of the M4.	Infrastructure Evident Crossing Mainline East of Cooldrinagh Footbridge

Assessment Criteria	Junction 7						Junction 5	
	Location A	Location B	Location C	Location D	Location E	Location F	Location A	Location B
ESB Substations	None						None	
Gas Networks Ireland - MP gas mains	Location A - No potential impact. Location B - infrastructure adjacent to northern junction, however, no potential impact.	No potential impact	No potential impact	Location D - Gas infrastructure evident on Northern Link Road. Location E - Gas infrastructure evident on northern and Southern Link Roads. Location F - Gas infrastructure crossing mainline. All are minor or slightly negative impacts.			Gas Infrastructure Crossing Mainline Infrastructure also Evident Running Adjacent to Southern Link Road. Not significant or neutral impact.	No potential impact
Irish Water watermains	Location A - 300mm diameter uPVC infrastructure evident running adjacent to L5042. Location B - No potential impact.	No potential impact	No potential impact	Location D - 3 No. 400mm diameter watermain crossings and 2 No. 800mm diameter crossings on corridor. Numerous additional crossings on Link Roads. Location E - 3 No. 400mm diameter watermain crossings and 2 No. 800mm diameter crossings. Additional crossings on link Roads. Location F - 300mm diameter watermain crossing mainline. All are minor or slightly negative impacts.			Infrastructure Evident on Overbridge Infrastructure also Evident Running Adjacent to Southern Link Road. Not significant or neutral impact.	Infrastructure (100mm Diameter) Evident at Cooldrinagh Footbridge. Not significant or neutral impact.
Irish Water foul or combined sewers	No potential impact	No potential impact	No potential impact	No potential impact			No potential impact	225mm diameter evident on EB Merge and WB Diverge.

Assessment Criteria	Junction 7						Junction 5	
	Location A	Location B	Location C	Location D	Location E	Location F	Location A	Location B
								Not significant or neutral impact.
Water/waste-Water Treatment Plants	No potential impact		No potential impact	No potential impact			No potential impact	No potential impact
Eir Underground Services	Location A - Eir infrastructure evident adjacent to L5042. Location B - no potential impact.		No potential impact	Location A - Eir infrastructure evident on Northern Link Road. Location B - Eir infrastructure evident on Northern and Southern Link Roads. Location C - Eir infrastructure evident crossing mainline. All are minor or slightly negative impacts.			Eir Infrastructure evident crossing M4 and overbridge. Infrastructure also evident adjacent to Southern Link Road	Infrastructure evident at Cooldrinagh Footbridge & Existing Junction 5 Overbridge. Not significant or neutral impact.
Other	No potential impact		No potential impact	Location D - UPC infrastructure evident on Northern Link Road. Location E - UPC infrastructure evident on Northern and Southern Link Roads. Location F - UPC infrastructure evident on Southern Link Road, WB Merge and EB Diverge. All are minor or slightly negative impacts.			BT infrastructure evident on Overbridge. Infrastructure also evident adjacent to Southern Link Road.	UPC infrastructure evident at existing Junction 5 Overbridge. Not significant or neutral impact.

Assessment Criteria	Junction 7						Junction 5	
	Location A	Location B	Location C	Location D	Location E	Location F	Location A	Location B
Qualitative Assessment	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral	Moderately Negative	Moderately Negative	Moderately Negative	Not Significant or Neutral	Not Significant or Neutral
Score/ Impact	4	4	4	2	2	2	4	4
Preference	Intermediate	Intermediate	Preferred	Least Preferred	Least Preferred	Least Preferred	Intermediate	Intermediate

1.4 Summary

The overall ranking preferences for the junction locations in terms of material assets are shown in Table 1.6.

Table 1.6: Material Assets Summary

Assessment Criteria	Junction 7						Junction 5	
	Location A	Location B	Location C	Location D	Location E	Location F	Location A	Location B
Properties	Low impact on residential landtake. Dwelling Should remain.	No Impact	No Impact	Minor impact on residential landtake. Dwelling Should remain.	No Impact	Impact on Commercial/ Business Premises		Low Impact on Residential Landtake. Dwelling Should Remain
Utilities	Low Impact	Low Impact	Low Impact	Medium Impact with HV Diversions Required	Medium Impact with HV Diversions Required	Medium Impact due to Quantity	Medium Impact due to Quantity	Medium Impact due to Quantity
Other	-	-	-	-	-	-	-	-
Qualitative Assessment	Minor or Slightly Negative	Not Significant or Neutral	Not Significant or Neutral	Minor or Slightly Negative	Not Significant or Neutral	Moderately Negative	Not Significant or Neutral	Moderately Negative
Score/ Impact Level	3	4	4	3	4	2	4	2
Preference	Least Preferred	Intermediate	Preferred	Least Preferred	Preferred	Least Preferred	Preferred	Least Preferred

Kildare County Council

Maynooth to Leixlip Project

Options Report - Appendix 5 - Stage
1 Noise and Vibration Junction
Options Assessment

Draft 1 | 31 July 2022

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Tables

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Potential Impact Rating values for Location A

Table 1.3: Potential Impact Rating values for Location B

Table 1.4: Potential Impact Rating values for Location C

Table 1.5: Potential Impact Rating values for Location D

Table 1.6: Potential Impact Rating values for Location E

Table 1.7: Potential Impact Rating values for Location F

Table 1.8: Summary Noise Ranking for Junction 7

Table 1.9: Potential Impact Rating values for Location A

Table 1.10: Potential Impact Rating values for Location B

Table 1.11: Summary Noise Ranking for Junction 5

1 Stage 1 Noise and Vibration – Junction Options Assessment

1.1 Introduction

This section details the Stage 1 assessment of the Junction Options in the context of the Noise and Vibration constraints identified in the Constraints Report.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

The assessment has assessed each junction option considering their potential impacts to Noise and Vibration on the surrounding environment.

1.2.1 Data Sources

For guidance on the Noise and Vibration impact assessment, reference has been made to the following guidance documents:

- Section 5.0 of the Guidelines for the Treatment of Noise and Vibration in National Road Schemes (TII Noise Guidelines 2004)¹;
- Section 2 of the 2014 Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (TII Noise Guidelines 2014)²; and
- The Design Manual for Roads and Bridges (DMRB) (UKHA, 2020)³.

¹ Transport Infrastructure Ireland, Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2004. Available from: https://www.tii.ie/technical-services/environment/planning/Guidelines_for_the_Treatment_of_Noise_and_Vibration_in_National_Road_Schemes.pdf

² Transport Infrastructure Ireland, Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes, 2014. Available from: https://www.tii.ie/technical-services/environment/planning/Good_Practice_Guidance_for_the_Treatment_of_Noise_during_the_Planning_of_National_Road_Schemes.pdf

³ Design Manual for Roads and Bridges (DMRB) (UKHA, 2020). Available from <https://www.standardsforhighways.co.uk/prod/attachments/cc8cfcf7-c235-4052-8d32-d5398796b364?inline=true>

This assessment has also been carried out in accordance with the requirements of the TII Project Management Guidelines 2019⁴, and the TII Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis PE-PAG-02031, October 2016⁵.

1.2.2 Noise

The TII PE-PAG-02031 (October 2016) notes that the following for Stage 1 of the Multi Criteria Analysis (MCA) used for establishing preferences between options for noise:

“For Stage 1 any receptors deemed to be particularly sensitive to noise and/or vibration should be identified along with characteristics of the prevailing noise climate and opportunities for noise mitigation e.g. as a result of favourable topography. This will be a qualitative statement”

The Noise and Vibration constraints study identified in the Constraints Report has identified properties deemed to be particularly sensitive to noise and / or vibration. These are identified as residential properties which are located typically within 50m of the existing M4/N4 which experience elevated levels of road traffic noise. The characteristics of the prevailing noise climate at these properties and additional residential properties and schools identified in proximity to the existing M4/N4 has been established to be from road traffic.

It has been assumed for the purpose of this assessment that existing noise barriers or earth embankments along the existing M4/N4 shall be replaced with an equal or enhanced construction depending on identified impacts during the detailed design assessment of the preferred junction design.

This Stage 1 assessment used for ranking the junction options has focused on identifying the number of properties located in proximity to each junction design at varying distance bands to establish a Potential Impact Rating (PIR) for each.

Potential Impact Rating (PIR)

A Potential Impact Rating based upon property counts for each junction option has been used to determine which junction option has the lowest nominal potential impact on existing properties.

The number of properties potentially sensitive to noise and/or vibration within 300m of each of the proposed junction option has been identified. For this study, property counts include any existing residential properties, hospitals and medical buildings, educational buildings and religious buildings which were identified using OSI mapping data and GIS data provided by the design team.

⁴ Transport Infrastructure Ireland, Project Management Guidelines PE-PMG-02041, 2020. Available from: <https://www.tiipublications.ie/library/PE-PMG-02041-03.pdf>

⁵ Transport Infrastructure Ireland, Project Appraisal Guidelines for National Road Schemes Unit 7.0 – Multi Criteria Analysis, October 2016. Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

Property counts have been undertaken for four bands from the edge of each junction option, i.e., 0 to 50m, 50 to 100m, 100 to 200m and 200 to 300m. A weighting value for each distance band has been applied with a weighting factor of 4 for the closest distance band (0 to 50m) down to 1 for the furthest distance band (200 to 300m). For the Potential Impact Rating assessment, the calculated weighted value for each distance band is summed to obtain a total Potential Impact Rating value. The junction option with the lowest Potential Impact Rating has the lowest nominal potential noise impact on existing noise sensitive receptors.

Construction Noise and Vibration Impacts

The potential noise or vibration impacts of the Stage 1 junction options during the construction phase relate to new structures. This will require earthworks, structure foundations, bridge / deck construction and general road works including levelling, road surfacing, road markings etc. These works will be required for all junction options to varying extents.

The potential noise and vibration impacts associated with the construction phase of all junction options will be of short-term duration (less than 7 years). The construction phase for each junction option will be undertaken using standard road and overbridge construction techniques and will be controlled through the use of construction noise limits.

During the construction phase, there is potential for minor vibration levels to be generated depending on the works involved, however the magnitude of which will be orders of magnitude below those associated with any form of building or structure cosmetic damage. Any construction activity will be controlled through vibration limits.

No further consideration has therefore been given to the construction phase to differentiate junction options.

1.2.3 Vibration

In terms of vibration, the TII Noise Guidelines 2004 and TII Noise Guidelines 2014 note that road traffic along normal well-maintained surfaces, in line with junction options, generates very low levels that are normally not perceptible to building occupants. Vibration magnitudes from road traffic are also orders of magnitude below those associated with any form of cosmetic damage to buildings and vulnerable structures. For the purposes of this assessment, therefore, it is assumed that all junction options will have a comparable low vibration impact during their operational phase and vibration is not assessed further from a ranking point of view.

1.2.4 Impact Score

The comparative evaluation of junction options has been assisted by scoring of impacts for each of the options using a summary assessment matrix broadly based on Table 7.1.2 of the Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis (TII PAG).

Each impact is scored based on the PAG seven-point Likert scale (listed below) and a number assigned according to the level of significance of the impacts.

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Following the assessment methodology process outlined in this section, a determination is made as to whether each option corridor is either Preferred, Intermediate or Least Preferred based on a combination of the assigned impact scores and professional judgement and compares each of the junction options against each other.

1.3 Junction Options Assessment

An assessment of the potential noise impact based on the number of noise sensitive receptors within specified distance bands of each of the junction locations under consideration as per the methodology in Section 1.2 is set out below.

1.3.1 Junction 7 Maynooth Options

Location A – Junction West of Millfarm

There are a small number of residential properties located north and south of the M4 along local roads in proximity to this junction location. An assessment of the potential noise impact based on the number of noise sensitive receptors within specified distance bands of this junction location, is set out in Table 1.2.

Table 1.2: Potential Impact Rating values for Location A

PIR 0-50m Band	PIR 50-100m Band	PIR 100-200m Band	PIR 200-300m Band	Total PIR
8 (2 x 4)	15 (5 x 3)	4 (2 x 2)	11 (11 x 1)	38

The total Potential Impact Rating for Location A is 38. The highest Potential Impact Rating band is determined in the 50 to 100m band (15 properties). The highest overall number of properties are counted within the 200 – 300m distance (11).

This location has the lowest overall Potential Impact Rating compared to the other junction locations and has the lowest number of properties within 0 – 50m of the proposed design.

Location B – Junction between Millfarm and Newtown Road

There are a number of residential properties located north and south of the M4 along local roads. The highest density of residential properties are located northeast within Parsons Hall residential area. An assessment of the potential noise impact based on the number of noise sensitive receptors within specified distance bands of this junction location, is set in Table 1.3.

Table 1.3: Potential Impact Rating values for Location B

PIR 0-50m Band	PIR 50-100m Band	PIR 100-200m Band	PIR 200-300m Band	Total PIR
12 (3 x 4)	9 (3 x 3)	10 (5 x 2)	25 (25 x 1)	56

The total Potential Impact Rating for Location B is 56. The highest Potential Impact Rating band is determined in the 200 to 300m band (25) which also has the highest overall number of properties (25 properties). The majority of the properties within the 200 – 300m band are located at Parsons Hall to the northeast and residential properties southeast of the proposed junction link road along the R408 Newtown Road.

This junction location has the second lowest overall Potential Impact Rating compared to the other junction locations. It has the same number of properties within 0 – 50m as Junction Location C, D and E. This junction location has the lowest number of properties within the 100 – 200m distance band.

Location C – Junction between Newtown Road and R406 Straffan Road

There are a small number of residential properties located in the immediate vicinity of the junction location north and south of the M4. The highest density of residential properties are located north of the junction link road at residential estates to the east and west of Meadowbrook Road (e.g. Newtown Court, Brookfield Park, Brookfield Avenue). An assessment of the potential noise impact based on the number of noise sensitive receptors within specified distance bands of this junction location, is set out in Table 1.4.

Table 1.4: Potential Impact Rating values for Location C

PIR 0-50m Band	PIR 50-100m Band	PIR 100-200m Band	PIR 200-300m Band	Total PIR
12 (3 x 4)	48 (16 x 3)	414 (207 x 2)	276 (276 x 1)	750

The total Potential Impact Rating for Location C is 750. The highest Potential Impact Rating band is determined in the 100 to 200m band (414). The highest overall number of properties are located within the 200 – 300m band (276 properties) which are clustered at the residential estates to the east and west of Meadowbrook Road.

This junction location has the highest overall Potential Impact Rating compared to the other junction locations. The high Potential Impact Rating is due to the cluster of properties northeast and northwest of the junction within the 200 to 300m of the design. It is noted that whilst this junction location has a high overall Potential Impact Rating value, the potential noise impact at the properties within the further distance bands where the majority of properties are located, will be significantly less intrusive compared to properties in closer distance bands. In addition, properties located further north of the junction beyond the initial rows of properties within these residential estates will be substantially screened by road traffic noise from the junction.

Option D – Junction West of Existing Ballygoran Overbridge

There are a number of residential properties located in the immediate vicinity of the junction location north and south of the M4. The closest properties are those located along Ballygoran View to the west of the junction location. The highest density of residential properties are located northwest of the junction location at the Griffith Rath Manor residential area and properties to the northeast at Ballygoran. An assessment of the potential noise impact based on the number of noise sensitive receptors within specified distance bands of this junction location, is set out in Table 1.5.

Table 1.5: Potential Impact Rating values for Location D

PIR 0-50m Band	PIR 50-100m Band	PIR 100-200m Band	PIR 200-300m Band	Total PIR
12 (3 x 4)	48 (16 x 3)	222 (111 x 2)	133 (133 x 1)	415

The total Potential Impact Rating for Location D is 415. The highest Potential Impact Rating band is determined in the 100 to 200m band (222). The highest overall number of properties are located within the 200 – 300m band (133 properties) which are clustered at the residential estates to northeast at Griffin Rath Manor.

This location has the second highest overall Potential Impact Rating compared to the other junction locations. It has the same number of properties within 0 – 50m as Junction Locations B, C and E.

The closest properties along Ballygoran View to the southwest of the junction location currently experience high levels of road traffic noise from the M4. This location is likely to result in further increased noise levels at these properties due to increased road traffic passing east of the properties and the closer proximity of the ramps to the M4. It is likely increased noise levels would be difficult to mitigate at this location.

Location E – Junction reusing Existing Ballygoran Overbridge

There are a small number of residential properties located in the immediate vicinity of the junction location north and south of the M4. The closest properties are those located at Ballygoran to the northeast of the junction location and Ballygoran View to the south of the junction merges and diverges along the M4. An assessment of the potential noise impact based on the number of noise sensitive receptors within specified distance bands of this junction location, is set out in Table 1.6.

Table 1.6: Potential Impact Rating values for Location E

PIR 0-50m Band	PIR 50-100m Band	PIR 100-200m Band	PIR 200-300m Band	Total PIR
12 (3 x 4)	33 (11 x 3)	48 (24 x 2)	21 (21x 1)	114

The total Potential Impact Rating for Location E is 114. The highest Potential Impact Rating band is determined in the 100 to 200m band (48). The highest overall number of properties are located within the 100 – 200m band (24 properties) which are clustered at Ballygoran Road and Ballygoran View.

This junction location has the third highest overall Potential Impact Rating compared to the other junction locations. It has the same number of properties within 0 – 50m of the junction location.

The closest properties are those located at Ballygoran to the northeast of the junction location and Ballygoran View to the south of the junction along the M4. The proposed design has the potential to result in further increased noise levels at these properties due to the closer proximity of the ramps to the M4, however the overall impact is likely to be lower compared to Location D.

Location F – Junction East of Existing Ballygoran Overbridge

There are a number of residential properties located in the immediate vicinity of the junction location north and south of the M4. The closest properties are those located at Ballygoran to the northeast and northwest of the junction location and Ballygoran Road to the southeast of the Junction. The junction locations would possibly require demolition of two properties and acquisition of an additional two properties, depending on the final alignment of the junction design. All properties within the 0 to 300m bands are however counted as part of this analysis. An assessment of the potential noise impact based on the number of noise sensitive receptors within specified distance bands of this junction location, is set out in Table 1.7.

Table 1.7: Potential Impact Rating values for Location F

PIR 0-50m Band	PIR 50-100m Band	PIR 100-200m Band	PIR 200-300m Band	Total PIR
32 (8 x 4)	15 (5 x 3)	22 (11 x 2)	14 (14x 1)	83

The total Potential Impact Rating for Location F is 83. The highest Potential Impact Rating band is determined in the 0 – 50m band (32). The highest overall number of properties are located within the 200 – 300m band (14 properties).

This junction location has the third lowest overall Potential Impact Rating compared to the other junction locations. It has the highest number of properties within 0 – 50m of the junction location.

The closest properties are those located at Ballygoran to the northeast, northwest and southeast of the junction location. This junction location will bring a new junction with associated overbridge and slip roads in very close proximity to existing residential properties with existing high levels of noise. The cumulative noise impact from the M4 and the new junction is likely therefore to result in further elevated levels of road traffic noise that may prove difficult to sufficiently mitigate.

Junction 7 Maynooth Conclusion

A summary of the assessment is shown in Table 1.8.

Table 1.8: Summary Noise Ranking for Junction 7

Assessment Criteria	Location A	Location B	Location C	Location D	Location E	Location F
Potential Impact Rating (PIR)	38	56	750	415	114	83
Potential Noise Impact	Moderate impacts at closest properties, minor impact at properties in further distance bands, possible to mitigate	Moderate impacts at closest properties, minor impact at properties in further distance bands possible to mitigate	Moderate impacts at closest properties reducing to minor to negligible impacts at majority of properties within furthest distance bands. Possible to mitigate impacts.	Closest properties to junction design exposed to existing high road traffic noise levels – likely to be increased as part of junction design and difficult to mitigate	Closest properties to junction design exposed to existing high road traffic noise levels – possible increase in road traffic as part of junction design. Less significant compared to Locations D and F.	Closest properties to junction design exposed to existing high road traffic noise levels – likely to be increased as part of junction design and difficult to mitigate.
Qualitative Assessment	Moderately negative	Moderately negative	Moderately negative	Major or highly negative	Moderately negative	Major or highly negative
Score/Impact Level	2	2	2	1	2	1
Preference	Preferred	Preferred	Intermediate	Least Preferred	Intermediate	Least Preferred

1.3.2 Junction 5 Leixlip Options

Location A – Junction reusing existing R404 Overbridge

The closest properties are those located at Barnhall Meadows and Leixlip Park to the northeast and northwest of the junction location. There are no identified noise sensitive buildings within 300m south of the M4 at this junction location. An assessment of the potential noise impact based on the number of noise sensitive receptors within specified distance bands of this junction location, is set out in Table 1.9.

Table 1.9: Potential Impact Rating values for Location A

PIR 0-50m Band	PIR 50-100m Band	PIR 100-200m Band	PIR 200-300m Band	Total PIR
0 (0 x 4)	0 (0 x 3)	110 (55 x 2)	75 (75x 1)	185

The total Potential Impact Rating for Location A is 185. The highest Potential Impact Rating band is determined in the 100 – 200m band (110). The highest overall number of properties are located within the 200 – 300m band (75 properties).

This junction location has a lower overall Potential Impact Rating compared to Location B. There are no properties counted within 0 to 100m of this junction location.

The distance between the junction location and the closest noise sensitive properties will not result in any significant change in existing road traffic noise levels.

Location B – Junction between Liffey River Bridge and Existing Junction 5

There are a number of residential properties located in the immediate vicinity of this junction location, predominately located to the southwest along Cooldrinagh Lane South, northwest along Cooldrinagh Lane North and to the southeast at Weston Close, Weston Crescent, Weston Drive, Weston Avenue, Weston Way etc. An assessment of the potential noise impact based on the number of noise sensitive receptors within specified distance bands of this junction location, is set out in Table 1.10.

Table 1.10: Potential Impact Rating values for Location B

PIR 0-50m Band	PIR 50-100m Band	PIR 100-200m Band	PIR 200-300m Band	Total PIR
100 (25 x 4)	171 (57 x 3)	332 (166 x 2)	124 (124 x 1)	727

The total Potential Impact Rating for Location B is 727. The highest Potential Impact Rating band is determined in the 100 – 200m band (332). The highest overall number of properties are located within this distance band also (166 properties).

This junction location has a higher overall Potential Impact Rating compared to Location A. There are 82 properties counted within 0 to 100m of this junction location compared to 0 within the same distance bands for Location A.

The proposed design will bring a new junction with associated overbridge and slip roads in proximity to existing residential properties with existing high levels of noise. Therefore, there is potential for increased traffic noise levels at properties to the southeast and northeast with potential for increased or neutral changes in traffic noise levels at properties within Weston. The cumulative noise impact has the potential therefore to result in further elevated levels of road traffic noise that may prove difficult to sufficiently mitigate.

1.3.3 Junction 5 Leixlip Conclusion

A summary of the assessment is shown in Table 1.11.

Table 1.11: Summary Noise Ranking for Junction 5

Assessment Criteria	Location A	Location B
Potential Impact Rating (PIR)	185	727
Potential Noise Impact	Minor impacts at properties close to junction location with potential to mitigate	Moderate impacts at closest properties, minor impact at properties in further distance bands. It may be difficult to mitigate.
Qualitative Assessment	Minor or slightly negative	Major or highly negative
Score/ Impact Level	3	1
Preference	Preferred	Least Preferred

1.4 Summary

Junction 7

Locations A and B are determined to be Preferred, Locations C and E Intermediate and Locations D and F as Least Preferred.

Junction 5

Locations A is Preferred, and Location B is Least Preferred.

Kildare County Council

Maynooth to Leixlip Project

Options Report - Appendix 5 - Stage
1 Population Junction Options
Assessment

Draft 1 | 31 July 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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Tables

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Junction Locations west of existing Maynooth Junction

Table 1.3: Junction Locations east of existing Maynooth Junction

Table 1.4: Junction 5 Summary

1 Stage 1 Population Junction Options Assessment

1.1 Introduction

This section details the Population assessment of the Stage 1 Junction Options with respect to the Population constraints identified in the Constraints Report.

This is a broad ranging topic which “*covers the existence, activities and health of people, usually considering people as groups or ‘populations’*” (EPA 2015)¹. Aspects examined in this section primarily relate to potential impacts on socio-economic activities (settlement patterns, population characteristics, activities, and economic) and social well-being and health of people at a community level.

Criteria relevant to the assessment of Population are of a socio-economic nature and include Journey Characteristics, Journey Amenity, General Amenity, Community Severance, and Economic effects relating to business, tourism and employment. A more detailed assessment of these criteria will be conducted in the Stage 2 Assessment.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

The Stage 1 Preliminary Junction Options Assessment considers the potential effects that the junction options could present at a community level. The population assessment is primarily a qualitative socio-economic assessment, although quantitative data will be taken into account once this becomes available or relevant to the stage of the assessment, including traffic volumes and pedestrian and cyclist counts. There are five principal assessment criteria for the assessment of Population as below.

- Journey Characteristics and connectivity;
- Journey Amenity;
- General Amenity;
- Community Severance; and
- Economic.

These arise from changes in economic activity affecting local businesses or employment, either directly or indirectly. These effects can occur due to direct impacts on business premises, from changes in accessibility, or from changes in development opportunities for the local economy.

¹ Extracted from the Advice Notes for Preparing Environmental Impact Statements (EPA draft September 2015)

The methodology aligns with the Project Appraisal Guidelines for National Roads Unit 7.0 – Multi-Criteria Analysis (PAG, 2016). The assessment is based on sub-criteria, scored on a seven-point scale. The number and significance of individual effects are assessed against the five criteria listed in Section 1.3 for the assessment of potential impacts relevant to Population and converted to the assessment scores provided in Table 1.1. Equal importance weighting is applied to the five criteria. The Junction Options are rated relative to the baseline environment using qualitative as well as quantitative analysis and professional judgement of their significance.

1.2.1 Scoring Procedure

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG scoring procedure. The PAG seven-point scale scoring procedure is shown in Table 1.1.

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Following the individual criterion assessments, an overall assessment score was assigned to each junction location based on the TII PAG seven-point scale scoring procedure, and the overall preference for each junction location of Preferred, Intermediate, or Least Preferred was assigned using the assessment criteria results and professional judgement.

1.3 Junction Options Assessment

1.3.1 Junction 7 Maynooth Options

1.3.1.1 Location A – Junction West of Millfarm

Journey Characteristics

This may be attractive for westbound journeys from the west and north of Maynooth, including the university, and for eastbound traffic from Kilcock. From the north, Location A provides a connection with the R148 via the L5041 but leaves the latter road to follow the line of an existing lane to two residential properties, stables and a shed to which revised access would need to be provided from the junction connecting road. This is the only direct impact associated with the footprint of the northern connecting road.

Journey Amenity

Amendments to Jackson's Bridge over the Royal Canal may be required. There may be an impact on people accessing Laraghbryan Cemetery.

General Amenity

There may be a negative impact for boat, walking and cyclists on the Royal Canal, but for most activities the effect would be of short duration for most of these mobile activities except perhaps for boats stopped temporarily at the Canal Lock 14. There may be a loss of rurality for the cluster of properties located on the L5041. To the south of the M4, the link road would pass beside three residential properties with all properties, but especially the adjacent property, likely to be impacted.

Community Severance

Cycle journeys including by young people, to North Kildare Multi-sports playing fields may be impacted. There may be some impact on pedestrian or cycle crossings of the road to reach residential estates and on access to Maynooth Town Football Club, the Maynooth Astro pitch and possibly Maynooth Lodge Nursing Home.

Economic

There may be potential slight positive impacts for a small number of guest houses and B&Bs on the R148 and the L5042 as they would be close to the new connection to the M4 and therefore more attractive to people wishing to overnight.

1.3.1.2 Location B – Junction between Millfarm and Newtown Road

Journey Characteristics

This location would be attractive especially for journeys from the west, south and north of Maynooth, including the university. From the north the connecting road would leave the L5041 crossing agricultural land to the proposed location. To the south the junction feeder road would connect with the R408 Newtown Road in the vicinity of a single residential property and Maynooth Lodge Nursing Home. The location may be more accessible for people living in the residential estates off Newtown Road.

Journey Amenity

Amendments to Jackson's Bridge over the Royal Canal may be required. There may be an impact on people accessing Laraghbryan Cemetery.

General Amenity

There may be a slight negative impact for boat, walking and cyclists on the Royal Canal, but this may be of short duration for most of these mobile activities except perhaps for boats stopped temporarily at the canal lock. There may be a loss of rurality for the cluster of properties located on the L5041.

Community Severance

Journeys to North Kildare Multi-sports playing fields may be impacted. There may be some impact on pedestrian or cycle crossings of the R408 Newtown Road to reach residential estates and access to Maynooth Town Football Club, the Maynooth Astro pitch and possibly Maynooth Lodge Nursing Home.

Economic

There are potential slight positive impacts for a small number of guest houses and B&Bs on the R148 and the L5042 as they would be close to the new connection to the M4 and therefore more attractive to people wishing to overnight..

1.3.1.3 Location C – Junction between Newtown Road and R406 Straffan Road

Journey Characteristics

The junction would be more accessible for people living in the residential estates off Newtown Road.

Journey Amenity

There may be some impacts on Maynooth Station, access to Maynooth Business Campus and access to retail facilities on the R406 Straffan Road.

General Amenity

The link road to the R406 may be located to the rear of properties on the Straffan Wood estate, which may present an environmental impact. (see Landscape & Visual and Noise & Vibration).

Community Severance

There may be some impact on pedestrian or cycle crossings of the R408 Newtown Road to reach residential estates and to access Maynooth Town Football Club and possibly Maynooth Lodge Nursing Home.

Economic

There are no distinct economic impacts on businesses from this junction location.

1.3.1.4 Location D – Junction West of Existing Ballygoran Overbridge

Journey Characteristics

This location would provide access to Maynooth via the R405 from the southeast and also serve the M4 Business Park. Access is also provided into Celbridge via the R405.

Journey Amenity

Significant impacts may arise for access to Maynooth Educate Together School and Gaelscoil Ui Fhiaich with any increase in vehicle traffic volumes on the R405.

General Amenity

The westbound slip road to the M4 would impact significantly on at least one property at the end of Ballygoran View.

Community Severance

There may be a severance impact on both the Maynooth Educate Together and Gaelscoil Ui Fhiaich schools.

Economic

B&B's on Ballygoran Road and in Barrogstown are located close to the proposed junction location and therefore more accessible.

1.3.1.5 Location E – Junction reusing Existing Ballygoran Overbridge

Journey Characteristics

Impacts for Location E are as per Location D.

Journey Amenity

Impacts for Location E are similar to Location D. Construction works on the existing Ballygoran Overbridge are likely to impact temporarily on traffic movement on the R405 between Maynooth and Celbridge.

General Amenity

There are no distinct impacts associated with community facilities or general amenity.

Community Severance

Impacts for Location E are as per Location D.

Economic

The location would provide for more direct access to businesses along the R405 and to a B&B in Barrogstown. There could, however, be a direct impact on the boundary of Ray Crofton Motors, but not sufficient to impact significantly on the turnover of the business.

1.3.1.6 Location F – Junction East of Existing Ballygoran Overbridge

Journey Characteristics

Impacts for Location F are similar to Locations D and E for the R405.

Journey Amenity

Impacts for Location F are similar to Locations D and E for the R405.

General Amenity

Significant impacts on numerous properties would likely occur in Barrogstown.

Community Severance

Impacts for Location F are much the same as those for the previous options. In addition, significant local residential severance would occur at Barrogstown.

Economic

Impacts for Location F are similar to Locations D and E. There would, however, be a direct impact on Ray Crofton Motors and possibly adjacent businesses to the south of the M4.

Table 1.2: Junction Locations west of existing Maynooth Junction

Criteria	Location A	Location B	Location C
Journey Characteristics	Direct access only to R148 for most Maynooth and for Kilcock traffic, but only to L5041 to south	More options for access into Maynooth includes university and residential areas	Further options for access into Maynooth includes university and residential areas. No enhanced access to Kilcock.
Journey Amenity	Impact on canal bridge. Some reduced traffic on R406 even if existing junction retained.	Impact on canal bridge. Some reduced traffic on R406 even if existing junction retained.	Impact on canal bridge. Some reduced traffic on R406 even if existing junction retained.
General Amenity	Slight to moderate impact on use of Royal Canal	Slight to moderate impact on use of Royal Canal	Possible impact on football club. Significant environmental impacts on local residential estates
Community Severance	Greater severance on NUIM. Impact on cycle access to nearby sports amenities	Moderate severance on NUIM. Impact on cycle access to sports amenities. Additional severance on Parson Street and on Newtown Road.	Additional severance on Parson Street and on Newtown Road, but no new severance on R148 at NUIM.
Economic	Slight positive impacts for local B&Bs or guest houses. Negative impact on businesses on R406 in event that existing junction is closed.	Slight positive impacts for local B&Bs or guest houses. Negative impact on businesses on R406 in event that existing junction is closed.	No direct impacts
Scoring			
Qualitative Assessment	Minor or Slightly negative	Minor or Slightly positive	Minor or Slightly negative
Score/ Impact Level	3	5	3
Preference	Intermediate	Preferred	Intermediate

Table 1.3: Junction Locations east of existing Maynooth Junction

Criteria	Location D	Location E	Location F
Journey Characteristics	Access to R405 between Maynooth and Celbridge and to Business Campus potentially via the L5045 Ballygoran Road.	Access to R405 between Maynooth and Celbridge and to Business Campus potentially via the L5045 Ballygoran Road.	Access to R405 between Maynooth and Celbridge. Potential access to R148 too, but unclear where connecting roads would go.
Journey Amenity	No change in congestion where R406 meets Main Street. Impact on active travel access to schools and residential estates on R405. Ballygoran road is narrow.	No change in congestion where R406 meets Main Street. Impact on active travel access to schools and residential estates on R405. Ballygoran road is narrow.	No change in congestion where R406 meets Main Street. Impact on active travel access to schools and residential estates on R405.
General Amenity	Significant direct impact on one property	Significant direct impact on one property	Very significant impacts in Barrogstown.
Community Severance	Significant community severance at schools due to additional traffic and also for neighbourhood severance.	Significant community severance at schools due to additional traffic and also for neighbourhood severance.	Significant community severance at schools due to additional traffic and also for neighbourhood severance on the R405 and in Barrogstown
Economic	No direct new impacts	Impact on premises of vehicle sales business	Significant impact vehicle sales business
Scoring			
Qualitative Assessment	Moderately negative	Moderately negative	Major or highly negative
Score/ Impact Level	2	2	1
Preference	Intermediate	Intermediate	Least Preferred

1.3.2 Junction 5 Leixlip Options

1.3.2.1 Location A – Junction reusing existing R404 Overbridge

Journey Characteristics

Location A would connect to the R404 (to the north and south) providing access into the centre-west of Leixlip as an alternative to the access that is currently available from the R148 to the east. The junction would also provide additional accessibility from the east to the Liffey Business Campus, shortening journey times for employees and suppliers from Dublin and the east.

Journey Amenity

Location A would provide access into the centre and west of Leixlip.

General Amenity

This location would impact on the R404 Celbridge Road which is largely residential.

Community Severance

There may be severance impacts between residential estates on the R404 in Leixlip. There are bus stops, retail facilities and a medical centre on either side of the road. Scoil Chearbhaill is located where Celbridge Road meets Old Hill and Colaiste Chiarain is situated just off Celbridge Road. There are other schools, sports pitches and green space in the area.

Economic

Location A would provide additional access to the Liffey Business Campus which may have economic benefits.

1.3.2.2 Location B – Junction between Liffey River Bridge and Existing Junction 5

Journey Characteristics

Location B would connect to the R148 to the north and R403 to the south providing access into the centre-east of Leixlip.

Journey Amenity

Location B would provide access from the east of Leixlip. It would involve a junction that is between the existing junction and Cooldrinagh Lane Footbridge.

General Amenity

There may be impacts on the R148 including Springfield Hotel and to the rear of residential properties on Cooldrinagh Lane. A direct impact is likely on at least the boundary of one residential property.

Community Severance

There are existing severance issues for pedestrians and cyclists accessing Leixlip from Lucan and the Weston residential estate.

Economic

There are no distinct new economic impacts.

1.3.2.3 Junction 5 Leixlip Conclusion

Location A would have the benefit of providing a western access to Leixlip. Location B provides a new junction without providing distinct benefits from a socio-economic perspective while introducing new impacts on Cooldrinagh Lane.

Table 1.4: Junction 5 Summary

Criteria	Location A	Location B
Journey Characteristics	Additional access to centre of Leixlip. Additional accessibility to Liffey Business Campus	Replacement connection for existing Leixlip Junction East
Journey Amenity	More direct access into Leixlip centre	Removes traffic from existing eastbound slip where meets N4 as busy section.
General Amenity	Additional traffic on R404 Celbridge Road.	Improves amenity of three properties on extension to Leixlip Road, but introduces new impacts for Cooldrinagh Lane
Community Severance	Additional neighbourhood severance on R404, including for community facilities including two schools and medical centre	Likely transfer of severance issues to new location.
Economic	Possible economic benefits	No specific impacts.
Scoring		
Qualitative Assessment	Not significant or Neutral	Not significant or Neutral
Score/ Impact Level	4	4
Preference	Intermediate	Intermediate

1.4 Summary

Junction 7

Location B is Preferred, Locations A, C, D and E are Intermediate, and Location F is Least Preferred.

Junction 5

Both Location A and B are intermediate.

Kildare County Council

Maynooth to Leixlip Project

Options Report - Appendix 5 - Stage
1 Soils and Geology Junction
Options Assessment

Draft 1 | 31 July 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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ARUP

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Tables

Table 1.1: Rating of Significant Environmental Impacts ¹

Table 1.2: PAG Scoring System used in Ranking

Table 1.3: Junction 7 Options Summary

Table 1.4: Junction 5 Options Summary

1 Stage 1 Soils and Geology Junction Options Assessment

1.1 Introduction

This section details the Soils and Geology assessment of the Stage 1 Junction Options with respect to the Soils and Geology constraints identified in the Constraints Report.

Section 1.2 outlines the methodology utilised to carry out the assessment, Section 1.3 details the options assessment, and a summary is presented in Section 1.4.

1.2 Methodology

The Stage 1 assessment has been prepared in accordance with the following guidance:

- Transport Infrastructure Ireland (TII) guidance, formally National Roads Authority (NRA) guidance, Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology on National Road Schemes (herein referred to as NRA Guidelines)¹;
- The Environmental Protection Agency (EPA) (May 2022) Guidelines on the Information to be contained in Environmental Impact Assessment Reports²; and
- Transport Infrastructure Ireland (TII) guidance, formally National Roads Authority (NRA). Environmental Impact Assessment of National Road Schemes – a Practical Guide³.

The NRA Guidelines provide useful criteria for rating of the identified Soils and Geology constraints (herein referred to as Criteria) that are presented in the Soils and Geology section of the Constraints Report. Each criterion comprises individual attributes which have been assigned an Importance using Box 4.1 of the NRA Guidelines. The Importance ratings are listed in Table 1.1.

¹ National Roads Authority, 2009. Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, Ireland: s.n. Available at: <https://www.tii.ie/technical-services/environment/planning/Guidelines-on-Procedures-for-Assessment-and-Treatment-of-Geology-Hydrology-and-Hydrogeology-for-National-Road-Schemes.pdf>

² Environmental Protection Agency, 2022. Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. Available at: <https://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf> [Accessed: 20 May 2022]

³ National Roads Authority, 2008. Environmental Impact Assessment of National Road Schemes – a Practical Guide. Available at: <https://www.tii.ie/technical-services/environment/planning/Environmental-Impact-Assessment-of-National-Road-Schemes-Practical-Guide.pdf>

Table 1.1: Rating of Significant Environmental Impacts ¹

Importance of Attribute	Magnitude of Impact			
	Negligible	Small Adverse	Moderate Adverse	Large Adverse
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant / Moderate	Profound / Significant	Profound
High	Imperceptible	Moderate / Slight	Significant / Moderate	Severe / Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

The ‘Magnitude of Impact’ assesses the impact that each junction option has on each criterion attribute, a ‘Magnitude of Impact’ is assigned using Box 5.1 of the NRA Guidelines as presented in the table above. The magnitude of the potential impacts that arise for each criterion attribute have been assessed based on the information that is currently available.

A ‘Significance of Impact’ has then been determined from the table above based on the ‘Importance of Attribute’ and the ‘Magnitude of Impact’.

In addition to a significance of impact being determined for each associated criterion attribute for each junction option, an overall impact rating was assigned to that criterion using the TII Project Appraisal Guidelines (PAG) for National Roads Unit 7.0 – Multi-Criteria Analysis (MCA)⁴. The following scoring system as outlined in Section 2.4 of the TII PAG was then used to score the junction options:

Table 1.2: PAG Scoring System used in Ranking

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

⁴ Transport Infrastructure Ireland, 2016. Project Appraisal Guidelines for National Roads Unit 7.0 - Multi-Criteria Analysis. Available at: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

1.2.1 Assessment Criteria

The soils and geology criteria which have been considered as part of this assessment are as follows:

- **Soil Deposits** comprising well drained soil types which are important for agriculture;
- **Contaminated Sites** which comprise the horizontal extent of made ground and historic quarries;
- **Bedrock Geology** comprising areas where bedrock outcrops and sub crops are recorded;
- **Soft Soils** comprising alluvium deposits (soft ground);and
- **Earthworks** comprising bulk cut and fill volumes and the cut/fill balance.

These criteria are impacted by the junction options and their locations and are considered to be differentiators in the assessment of junctions. The junction options are sub divided into locations so it should be noted that not every criteria listed above is impacted at each junction location.

The following constraints/criteria identified in the Soils and Geology section of the Constraints Report have been excluded from this Stage 1 assessment for the following reasons:

- **Glacial Till:** Glacial Till is widespread throughout the study area and common to all junction options and it is not considered a differentiator and was eliminated from the analysis under the Subsoil criterion;
- **Bedrock Karst:** There are no karst features identified within the study area and therefore this criterion is not considered a differentiator;
- **Landslide Susceptibility:** There are areas of moderately high to high landslide susceptibility within the study area but none of these are impacted by the Stage 1 Junction Options. Therefore, this criterion is not a differentiator;
- **Historic Industrial Sites and Mines:** There is a historical industrial site within the study area but this has not been impacted by the Stage 1 Junctions. There are no mines within the study area. Therefore, this criterion is not a differentiator;
- **Existing Industrial facilities:** There are existing industrial facilities within the study area, but they are not impacted by the Stage 1 Junction Options. Therefore, this criterion is not a differentiator;
- **Prospecting Licences:** There are two prospecting licences between Junction 7 and Junction 5 that are common to all options and hence are not considered a differentiator; and
- **Economic Geology:** It is unlikely that the high to very high crushed rock aggregate potential that has been identified immediately adjacent to the existing M4 east and west of the R405 Ballygoran Overbridge and from the River Liffey Bridge to Junction 5 will be a viable economic resource due to its location. For this reason, this criterion is not a differentiator.

The criterion of Soft Soils will be assessed as an attribute under the criterion of Earthworks for this assessment as it is considered in terms of material management requirements and not in terms of subsoil importance.

1.2.2 Assumptions

- All excavated material from the junction options will be taken off site to an appropriate licenced facility;
- Earthwork volumes (i.e. bulk cut/fill and surplus/deficit volumes) have been estimated based on the indicative designs with the following assumptions;
 - Cut volumes are based on 1V:2H slopes;
 - Fill volumes are based on 1V:2H slopes;
 - Volumes are based on 100mm depth of topsoil on slopes and verges;
 - Volumes reported are for the mainline of the option corridors (i.e. volumes exclude side roads, junctions, excavated material for utilities, gantries, and structures);
 - Volumes do not consider topsoil removal, over-excavation in soil and rock, temporary works, or construction compounds;
 - Bulk earthwork volumes do not include for excavate and replace volumes associated with soft soils and made ground areas;
 - Disposal of unsuitable material (Class U2) to a licenced facility has not been accounted for under the Earthworks criterion;
 - Material from identified potentially contaminated sites (historic quarries) are considered to require excavation and disposal to an appropriate licenced facility if intersected;
 - Volumes relate to in-situ volumes only, material bulking factors have not been applied; and
 - Volumes have been rounded up to the nearest 100m³.

1.3 Junction Options Assessment

1.3.1 Junction 7 Maynooth Options

The Soils and Geology criteria of Soil Deposits, Contaminated Sites, Bedrock Geology, Earthworks (including Soft Soils) are considered of high importance as they have a high quality/significance/value on a local scale.

The magnitude of the impact of the Junction 7 Maynooth Options is discussed in the following sections.

1.3.1.1 Location A – Junction West of Millfarm

Location A impacts the earthworks attribute of soft soils as it intersects the alluvial deposits along the alignment of the River Lyreen to the north where the junction connects to the R148 via the L5041 local road. The bulk cut is 18,000m³ and the bulk fill is 241,000m³ which results in a deficit of 223,000m³. Considering the attributes of soft soils, bulk cut and fill the significance of impact of the Earthworks criterion on Soils and Geology is large adverse. The magnitude is severe/significant.

The criteria of Soil Deposits, Contaminated Sites and Bedrock Geology have not been impacted by Location A and therefore are therefore not considered a differentiator for this location.

The qualitative assessment is Major or Highly Negative.

1.3.1.2 Location B – Junction between Millfarm and Newtown Road

Location B impacts the earthworks attribute of soft soils as it intersects the alluvial deposits along the alignment of the River Lyreen to the north where the junction connects to the R148 via the L5041 local road. The bulk cut is 27,000m³ and the bulk fill is 100,000m³ which results in a deficit of 73,000m³. Considering the attributes of soft soils, bulk cut and fill the significance of impact of the Earthworks criterion on Soils and Geology is large adverse. The magnitude is severe/significant.

The criteria of Soil Deposits, Contaminated Sites and Bedrock Geology have not been impacted by Location B and are therefore not considered a differentiator for this Location.

The qualitative assessment is Major or Highly Negative.

1.3.1.3 Location C – Junction between Newtown Road and R406 Straffan Road

Location C has no impact on the Soils and Geology criteria of Soil Deposits, Contaminated Sites, Bedrock Geology and Earthworks and are therefore not considered a differentiator for this Location.

The qualitative assessment is Not Significant or Neutral.

1.3.1.4 Location D – Junction West of Existing Ballygoran Overbridge

The bulk cut at Location D is 36,000m³ and the bulk fill is 19,000m³ which results in an earthworks surplus of 17,000m³. The attribute of soft soils was not impacted by this Location. The overall magnitude of impact on the Earthworks criterion is small adverse.

Location D impacts well drained soils that are important for agriculture. The magnitude of the impact is small adverse.

The link road to the Ballygoran Road to the south of the junction impacts an attribute from the Contaminated Sites criterion which is a historic early to mid 20th century quarry. The backfill to this quarry is likely to have been unregulated and therefore there is a risk that the backfill material is contaminated. As the link road runs over the historic quarry, it is assumed that the material used to backfill the quarry will need to be excavated and replaced and removed to an appropriate licenced facility. The magnitude of this impact is large adverse.

Bedrock outcrops are recorded on the Geological Survey of Ireland's Soils Map (Figure 4.5.1) to the east of the link road to Ballygoran Road. Considering that there is a historic quarry also in the area it is likely that there is shallow bedrock underlying the link road. The impact on the Bedrock Geology criterion is small adverse.

The qualitative assessment is Moderately Negative.

1.3.1.5 Location E – Junction reusing Existing Ballygoran Overbridge

The bulk cut at Location E is 22,000m³ and the bulk fill is 6,000m³ which results in an earthworks surplus of 16,000m³. The attribute of soft soils was not impacted by this location. The overall magnitude of impact on the Earthworks criterion is small adverse.

Location E will result in an impact on the Bedrock Geology criterion as shallow bedrock is recorded at this existing junction. The impact is small adverse.

Location E has no impact on the Soils and Geology criteria of Soil Deposits, Contaminated Sites and these are therefore not considered a differentiator for this Location.

The qualitative assessment is Minor or Slightly Negative.

1.3.1.6 Location F – Junction East of Existing Ballygoran Overbridge

The bulk cut at Location E is 20,000m³ and the bulk fill is 169,000m³ which results in an earthworks deficit of 149,000m³. The attribute of soft soils was not impacted by this location. The overall magnitude of impact on the Earthworks criterion is large adverse.

Location F impacts well drained soils that are important for agriculture. The magnitude of the impact is small adverse.

Location F has no impact on the Soils and Geology criteria of Contaminated Sites, Bedrock Geology and Soft Soils and these are therefore not considered a differentiator for this Location.

The qualitative assessment is Major or Highly Negative.

1.3.2 Junction 7 Maynooth Conclusion

From assessment of the Soils and Geology criteria, Location A, B and F are the least preferred as each have a large volume of bulk cut and fill and high overall earthworks deficits of 223,000m³, 73,000m³ and 149,000m³ respectively. Location D is also least preferred as it intersects a historic quarry that could be backfilled with unregulated contaminated waste that would need to be taken off site to a licenced waste facility.

The impact of Locations C and E on Soils and Geology is Not Significant or Neutral and Minor or Slightly Negative and therefore each of these location options are preferred.

1.3.3 Junction 5 Leixlip Options

All the Soils and Geology criteria of Soil Deposits, Contaminated Sites, Bedrock Geology, Earthworks (including Soft Soils) are considered of high importance as they have a high quality/significance/value on a local scale.

The magnitude of the impact of the Junction 5 Maynooth Options is discussed in the following sections.

1.3.3.1 Location A – Junction reusing existing R404 Overbridge

The bulk cut at Location A is 41,000m³ and the bulk fill is 10,000m³ which results in an earthworks deficit of 31,000m³. The attribute of soft soils was not impacted by this Location. The overall magnitude of impact on the Earthworks criterion is moderate adverse.

Location A has no impact on the Soils and Geology criteria of Soil Deposits, Contaminated Sites, Bedrock Geology and these are therefore not considered a differentiator for this location.

The qualitative assessment is Moderately Negative.

1.3.3.2 Location B – Junction between Liffey River Bridge and Existing Junction 5

The bulk cut at Location B is 61,000m³ and the bulk fill is 10,000m³ which results in an earthworks deficit of 51,000m³. The attribute of soft soils was not impacted by this Location. The overall magnitude of impact on the Earthworks criterion is moderate adverse.

Location B impacts the criterion of Soil deposits as it intersects well drained soils that are important for agriculture. The magnitude of the impact is considered small adverse.

Location B also impacts the Contaminated Sites Criterion as it intersects made ground where it connects to the R148 to the north and where it connects to the R403 to the south. The made ground is possibly highly variable and contaminated so it will likely need to be excavated and replaced and would need to be taken off site to a licenced waste facility. The magnitude of the impact is small adverse.

The qualitative assessment is Moderately Negative.

1.3.4 Junction 5 Leixlip Conclusion

Both Location A and B have a moderately negative impact on Soils and Geology. However, Location B does have a minor impact on the criteria of Soil Deposits and Contaminated Sites and also has an overall earthworks deficit of 51,000m³ which is larger than the deficit of Location A therefore it is considered the least preferred.

1.4 Summary

Table 1.3: Junction 7 Options Summary

Assessment Criteria	Location A	Location B	Location C	Location D	Location E	Location F
Soil Deposits (well drained soils)	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral	Minor or Slightly Negative	Not Significant or Neutral	Minor or Slightly Negative
Contaminated Sites (Historic quarry)	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral	Major or Highly Negative	Not Significant or Neutral	Not Significant or Neutral
Bedrock Geology	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral	Minor or Slightly Negative	Minor or Slightly Negative	Not Significant or Neutral
Earthworks	Major or Highly Negative	Major or Highly Negative	Not Significant or Neutral	Minor or Slightly Negative	Minor or Slightly Negative	Major or Highly Negative
Overall Qualitative Assessment	Major or Highly Negative	Major or Highly Negative	Not Significant or Neutral	Major or Highly Negative	Minor or Slightly Negative	Major or Highly Negative
Score/ Impact Level	1	1	4	1	3	1
Preference	Least Preferred	Least Preferred	Preferred	Least Preferred	Preferred	Least Preferred

Table 1.4: Junction 5 Options Summary

Assessment Criteria	Location A	Location B
Soil Deposits (well drained soils)	Not Significant or Neutral	Minor or Slightly Negative
Contaminated Sites (Made Ground)	Not Significant or Neutral	Minor or Slightly Negative
Bedrock Geology	Not Significant or Neutral	Not Significant or Neutral
Earthworks	Moderately Negative	Moderately Negative
Overall Qualitative Assessment	Moderately Negative	Moderately Negative
Score/ Impact Level	2	2
Preference	Preferred	Least Preferred



MAYNOOTH TO LEIXLIP PROJECT

Appendix 6.1
Stage 2 PAM
Options Graphics



Tionscadal Éireann
Project Ireland
2040



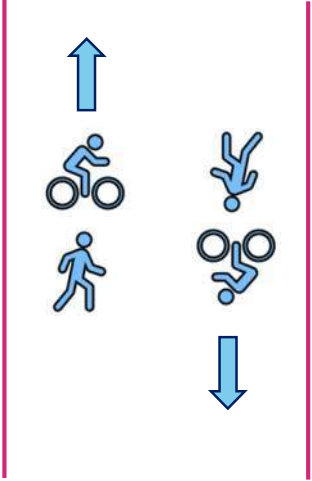
Kildare County Council

Maynooth to Leixlip Project

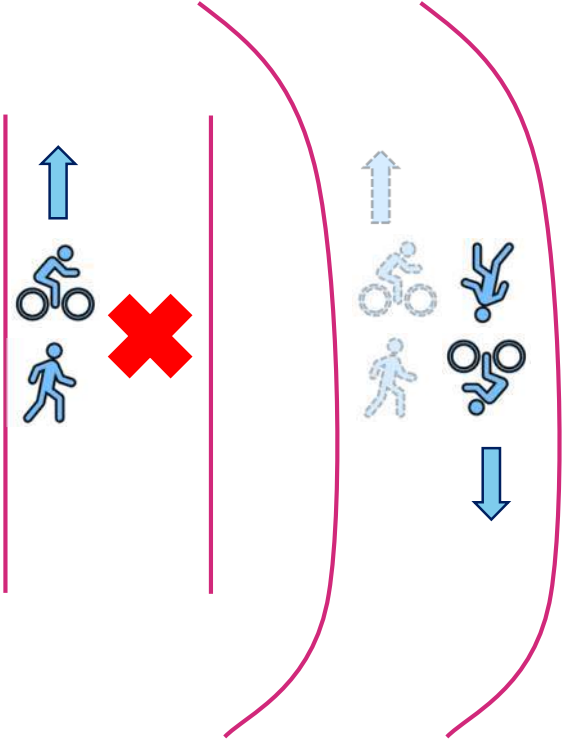
Phase 2 Stage 2 Options

Appendix 6.1

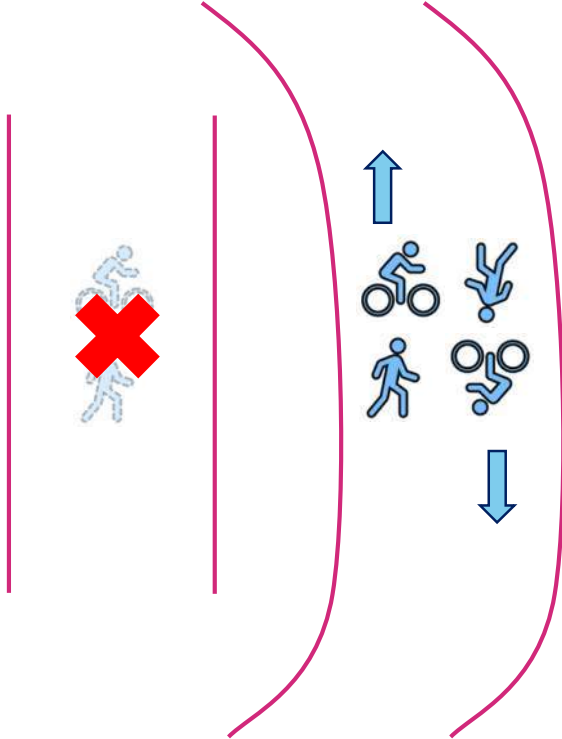
Active Travel Facility Scenario Methodology



Scenario (a)



Scenario (b)



Scenario (c)

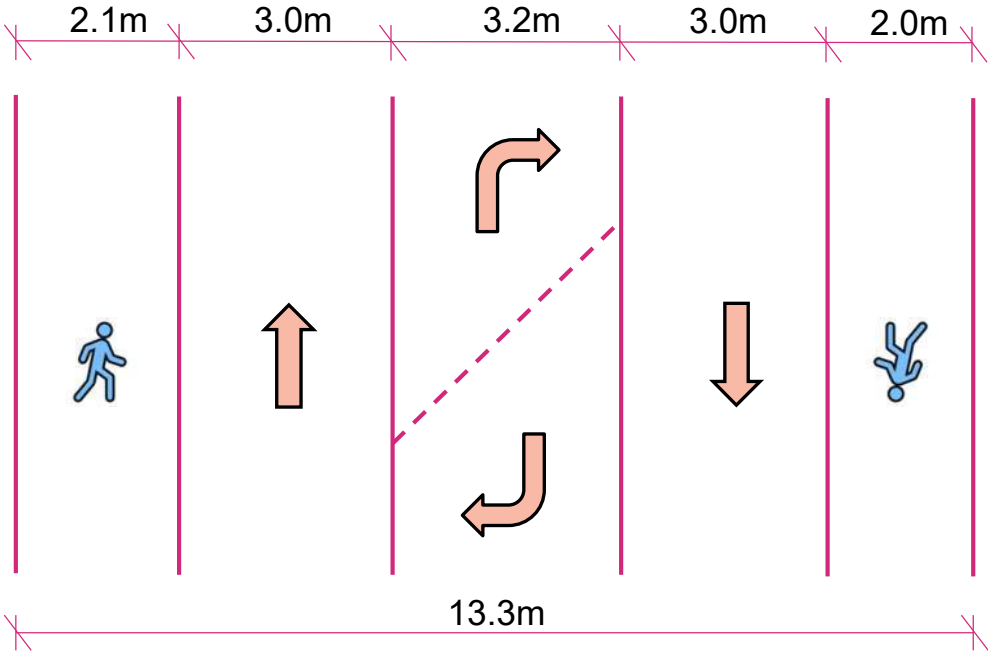
Junction 7 - Maynooth

Existing Conditions – Diamond Junction (no Traffic Signals)



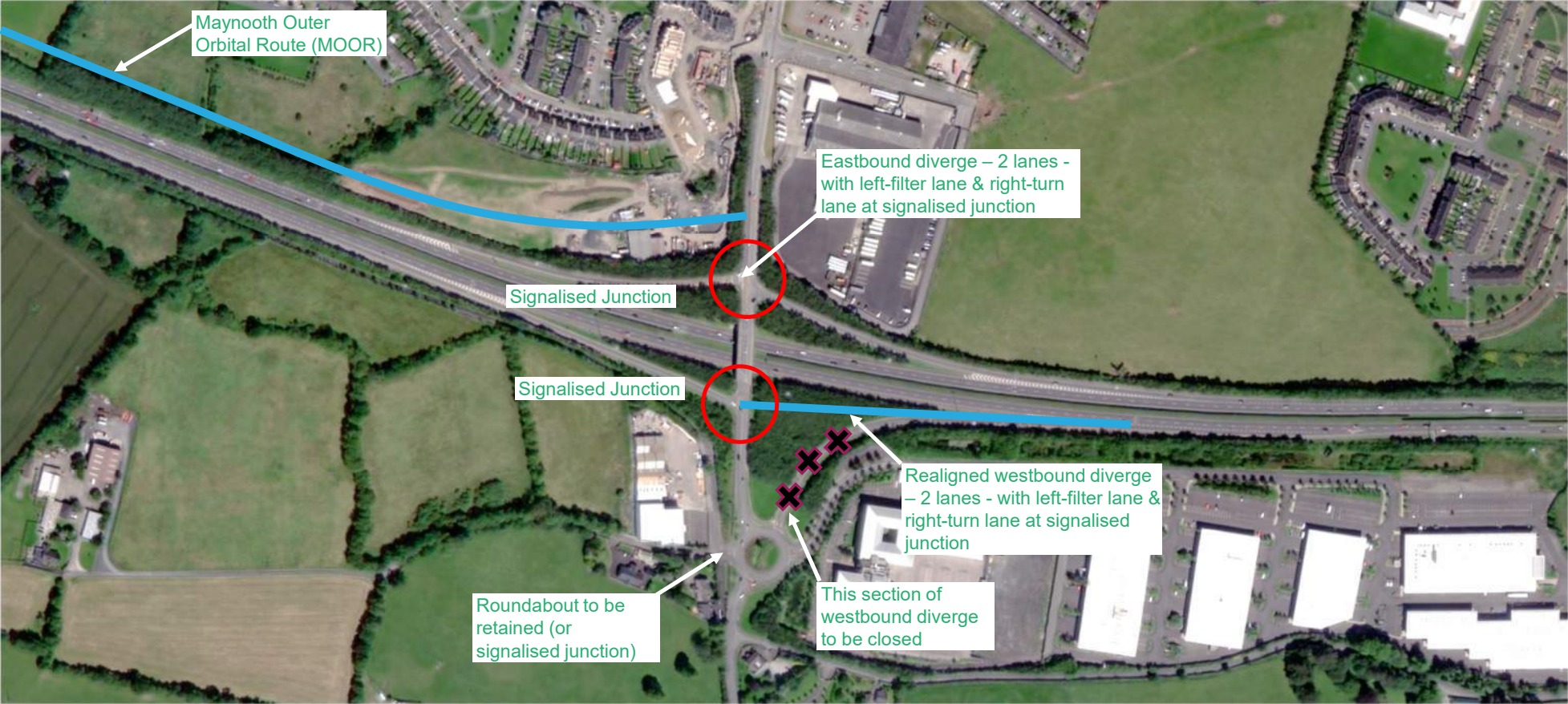
Junction 7 - Maynooth

Indicative Existing Cross Section on Overbridge



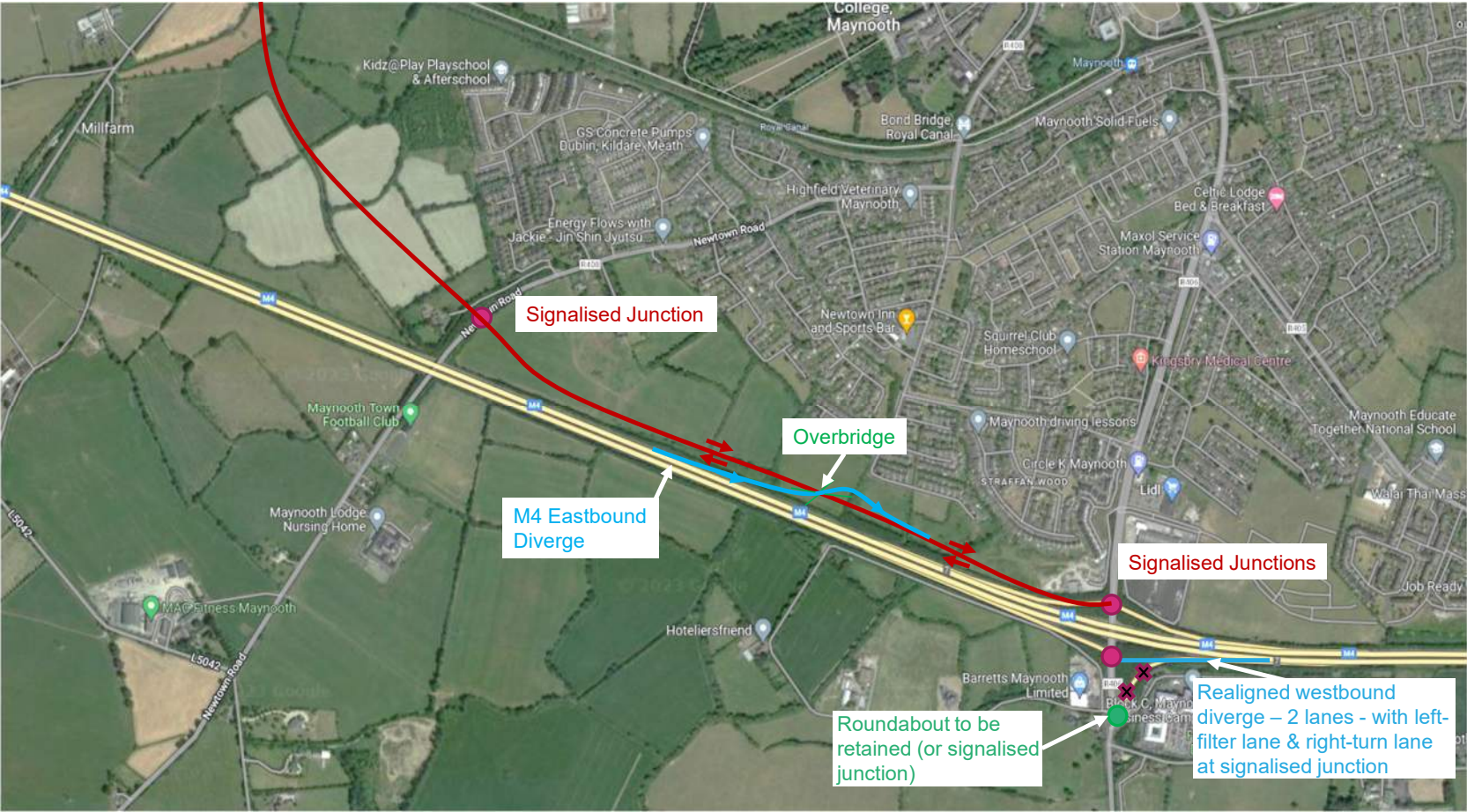
Junction 7 - Maynooth

Option 1 – Improve Existing Junction



Junction 7 - Maynooth

Option 1 – Improve Existing Junction (Overbridge R03 - ORD)



Junction 7 - Maynooth

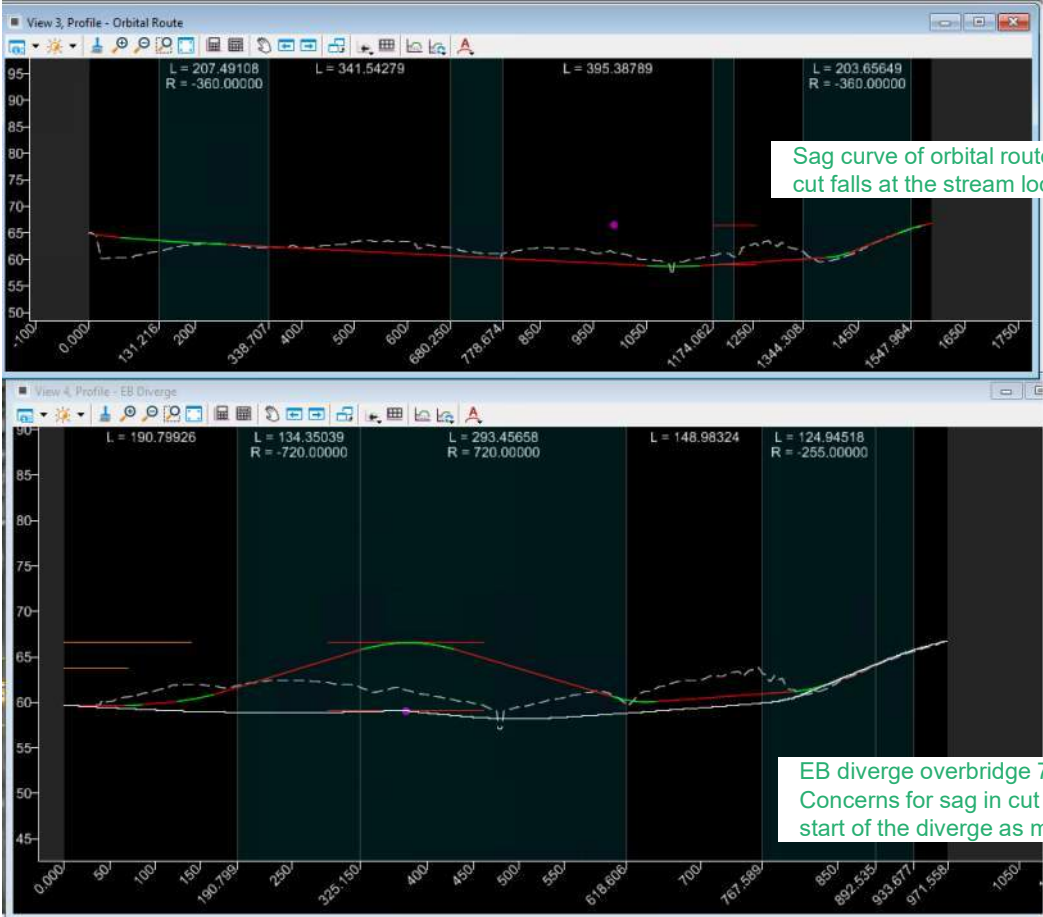
Option 1 – Improve Existing Junction (Overbridge R03 – ORD)



- 3 lanes EB on approach to the signalized junction (to compare with Option 2)
- 40m left turn pocket (SYSTRA model)
- But because the tie in location falls within the curve, the left turn lane starts on the straight section in advance of the merging nose (between EB diverge and Orbital route) developing over 120m length.

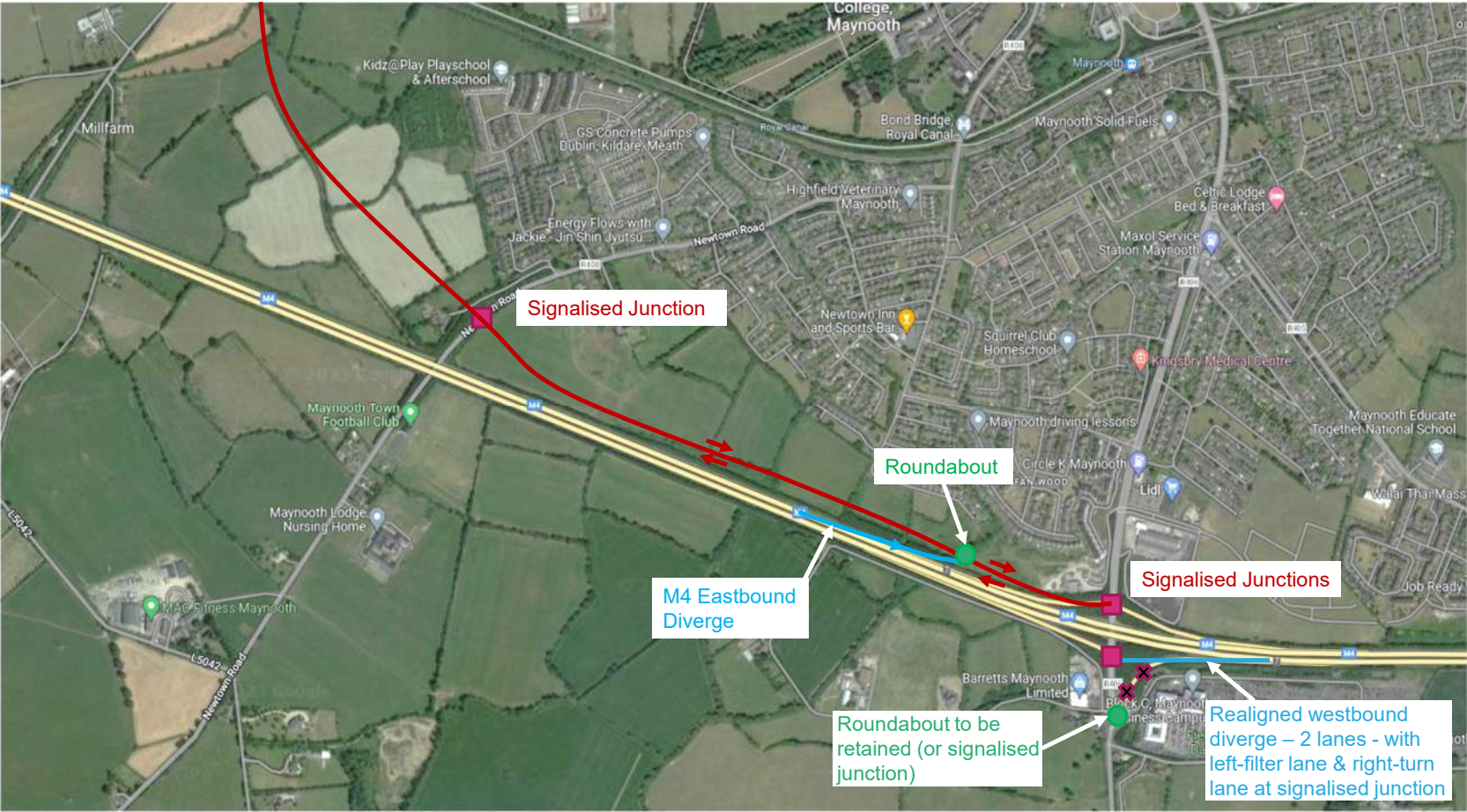
Junction 7 - Maynooth

Option 1 – Improve Existing Junction (Overbridge R03 – ORD)



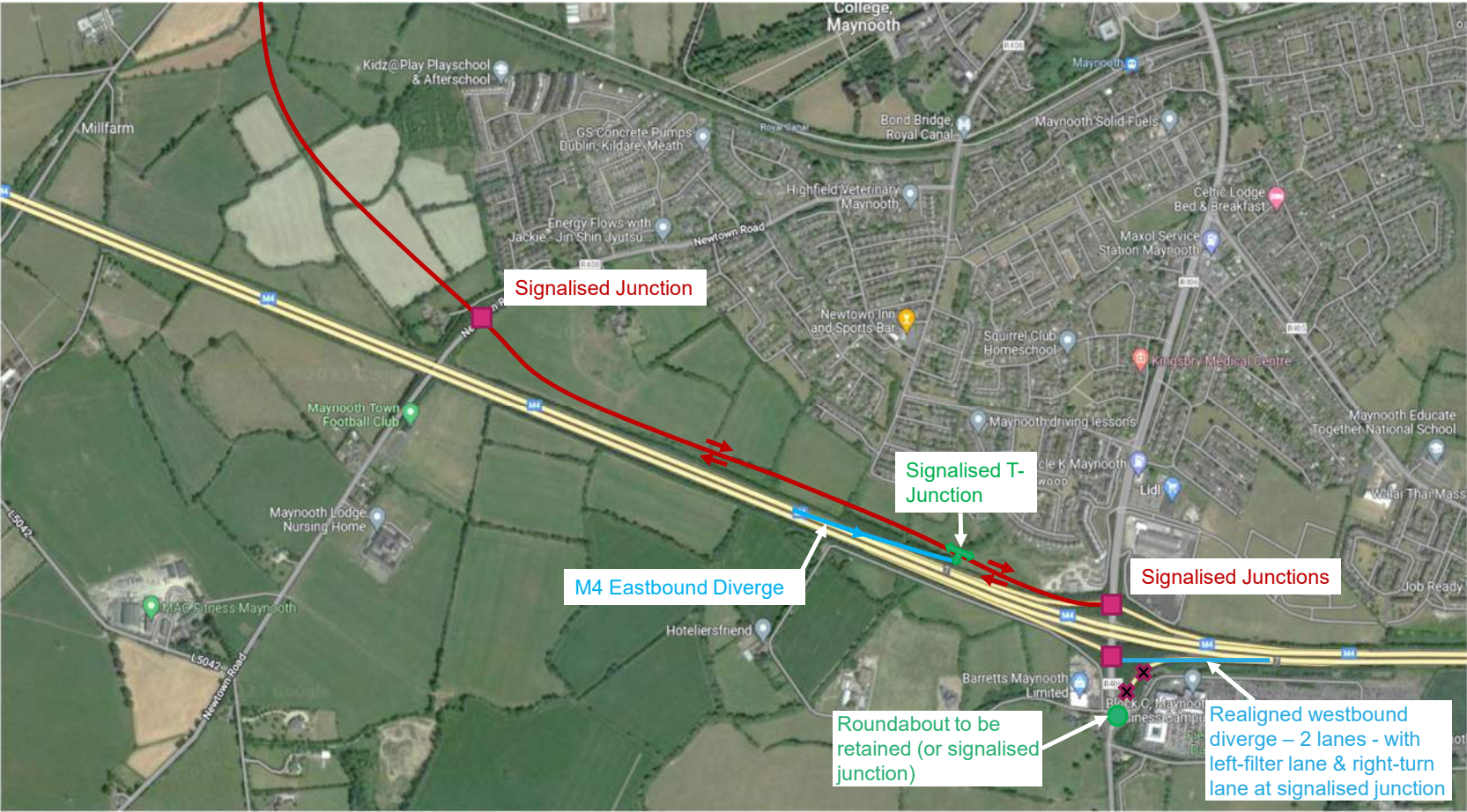
Junction 7 - Maynooth

Option 1 – Improve Existing Junction (Roundabout)



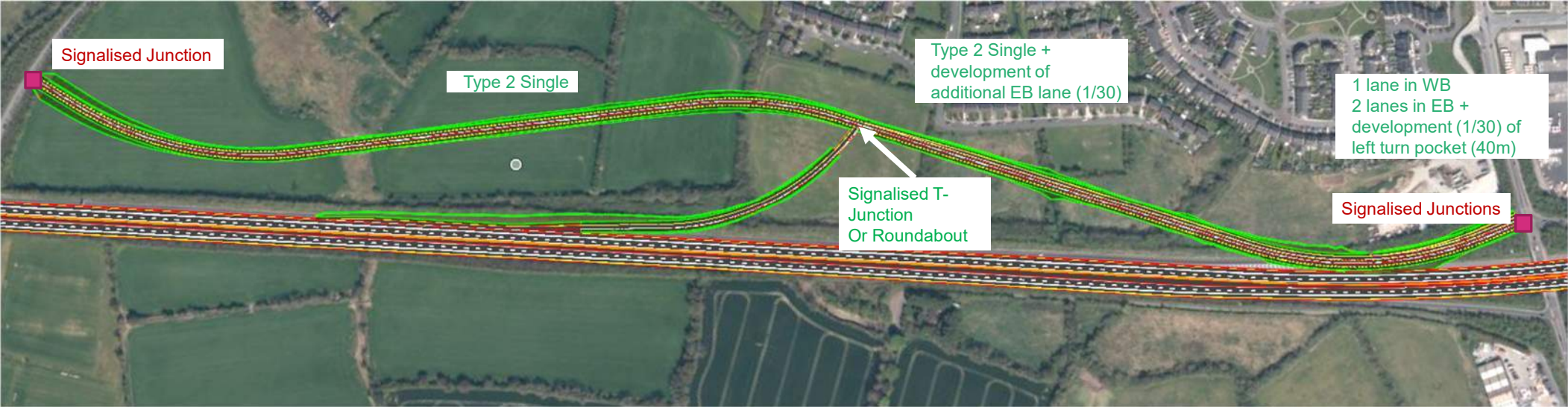
Junction 7 - Maynooth

Option 1 – Improve Existing Junction (Signalised T-Junction)



Junction 7 - Maynooth

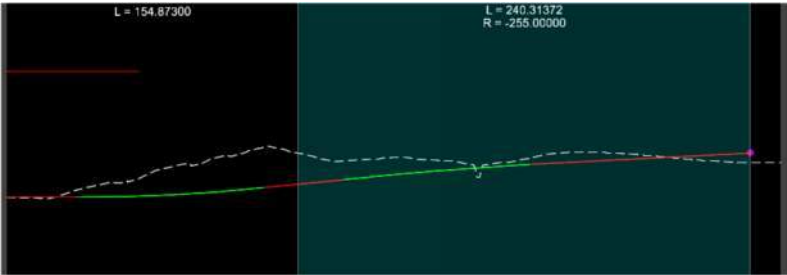
Option 1 – Improve Existing Junction (either T signalised or RBT) (ORD R04)



To achieve a reasonable angle between the EB diverge and the link road, without compromising the slip road geometry, the link road needs to be shifted as far north as possible.

R255 (DM for 60km.h) + near straight is provided for the slip road. Concerns with regards to the vertical alignment of the slip road, as it is preferable to keep the ML gradient for a certain length, but the ML gradient is approx. to 0 and slopes down through the east. A sag curve needed to be provided at the back of nose, not ideal especially given historical flooding issues in the area. (profile bottom R corner)

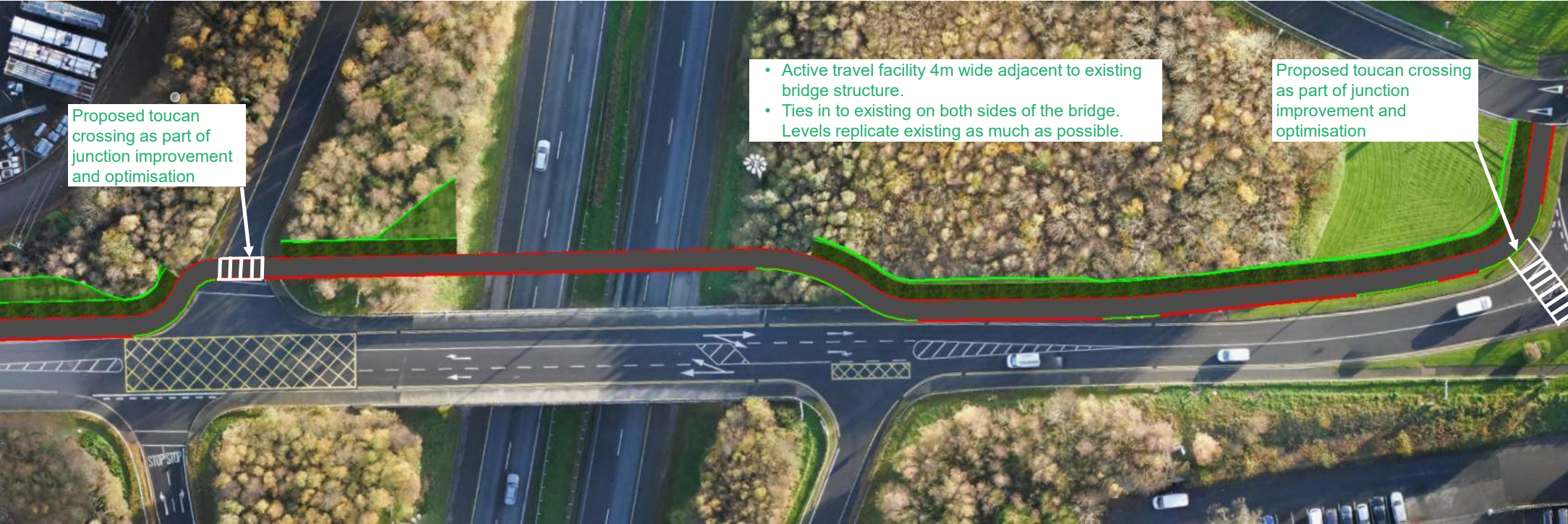
Slip road is 410 m long.



Junction 7 - Maynooth

Option 1 – Improve Existing Junction – Active Travel

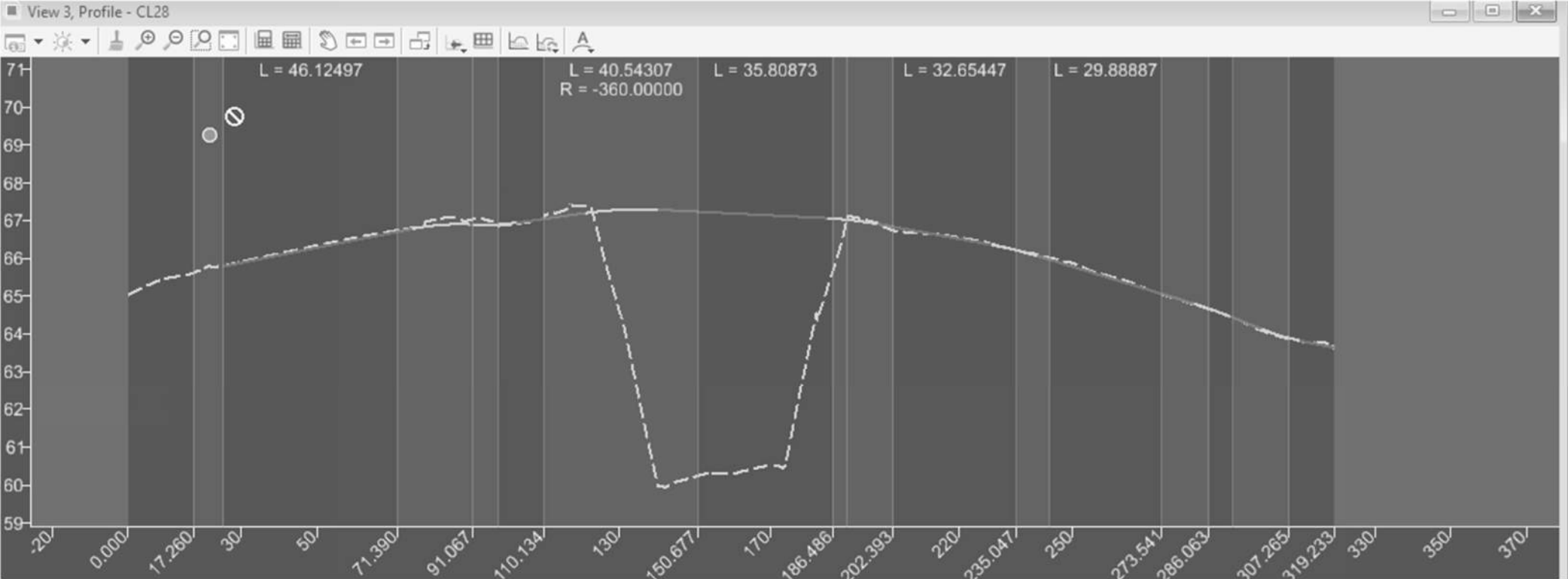
New Bridge and Linkage to the East



Junction 7 - Maynooth

Option 1 – Improve Existing Junction – Active Travel

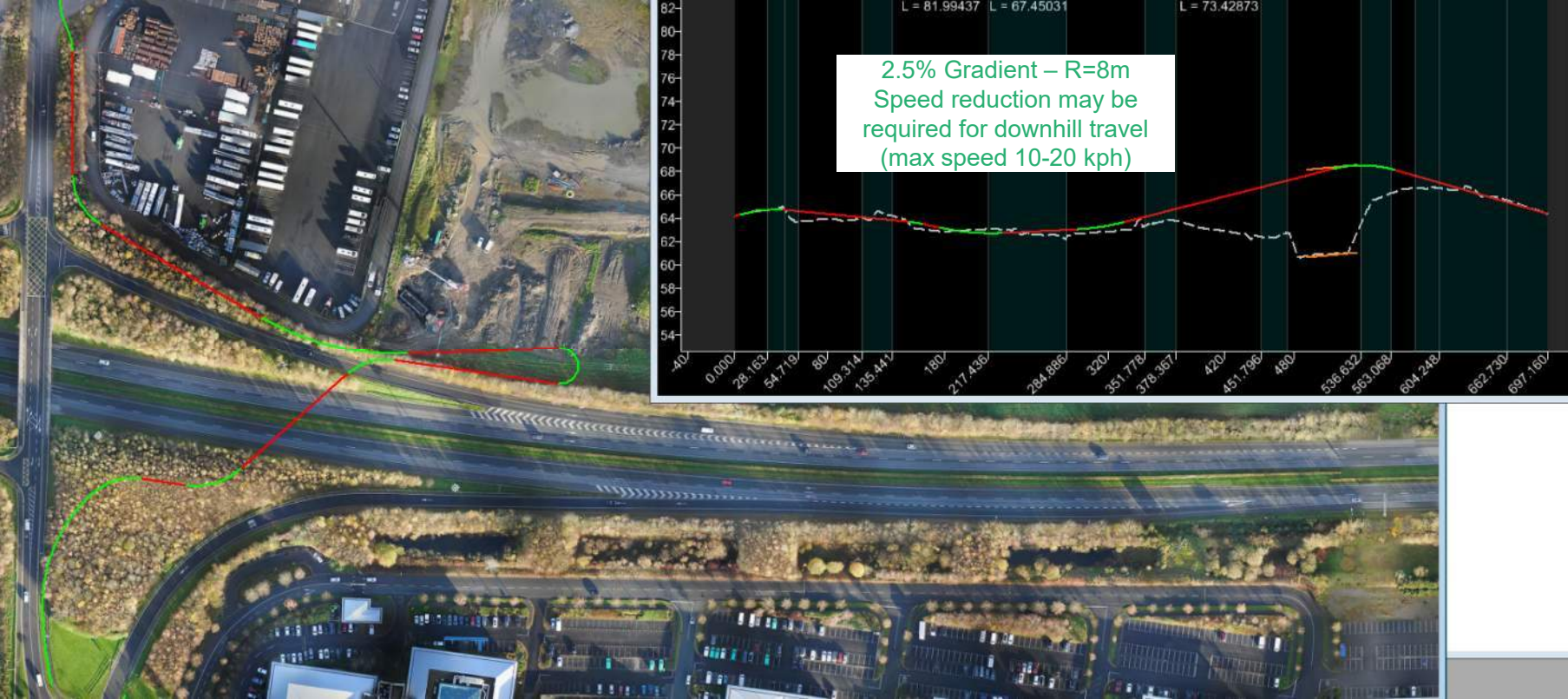
New Bridge and Linkage to the East



Junction 7 - Maynooth

Option 1 – Improve Existing Junction – Active Travel

New Bridge and Linkage Offline



Junction 7 - Maynooth

Option 1 – Improve Existing Junction – Active Travel

New Bridge and Linkage to the West



Proposed toucan crossing at existing Straffan Road Roundabout as part of junction improvement and optimisation

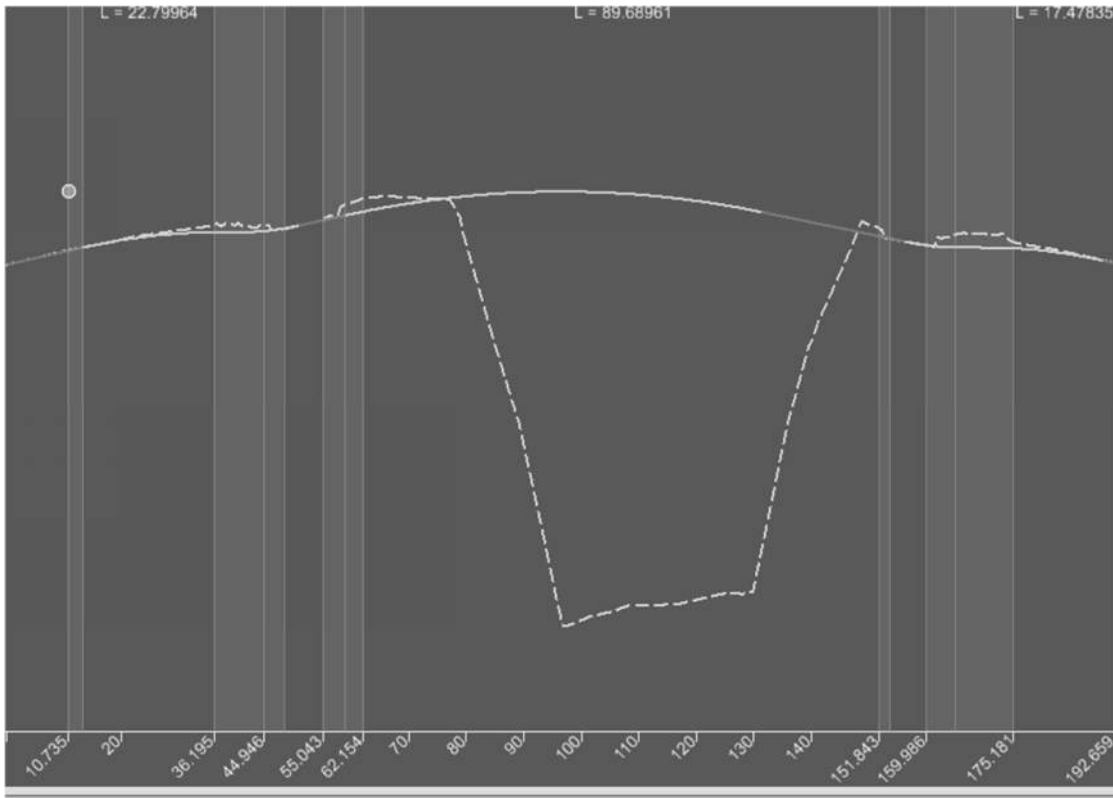
Crossing of the western slip roads to be upgraded to signal controlled crossing as part of junction signalisation and optimisation

- Active travel facility 4m wide adjacent to existing bridge structure.
- Ties in to existing on both sides of the bridge. Levels replicate existing as much as possible.

Junction 7 - Maynooth

Option 1 – Improve Existing Junction – Active Travel

New Bridge and Linkage to the West



- Ties in to existing on both sides of the bridge. Levels replicate existing as much as possible.
- Crossing of the western slip roads need to be converted to signal controlled crossing.

Junction 7 - Maynooth

Option 1 – Improve Existing Junction – Active Travel Bridge and Linkage

[M11 at Herbert Rd](#)



Junction 7 - Maynooth

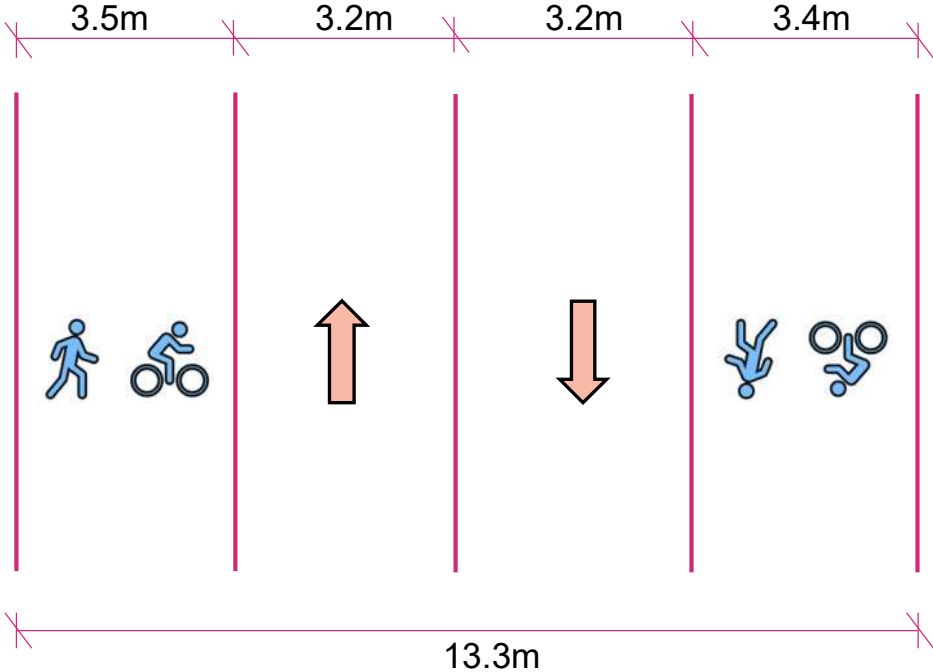
Option 1 – Improve Existing Junction – Active Travel Bridge and Linkage

N4 Junction 3 at Woodie's



Junction 7 - Maynooth

Option 2 - Proposed Cross Section (no widening) to existing overbridge



Junction 7 - Maynooth

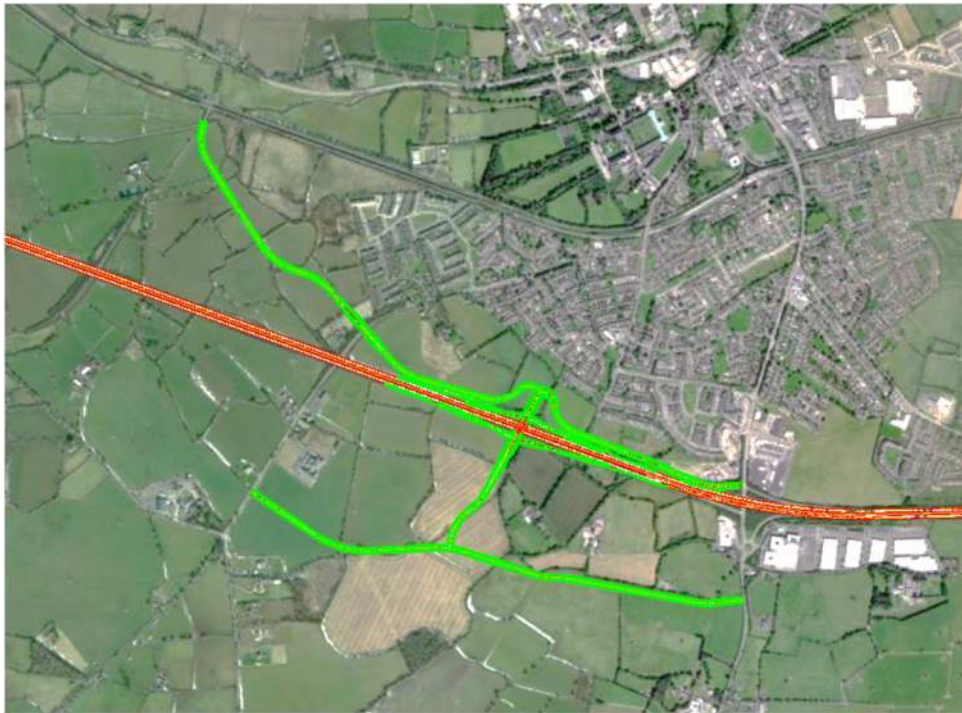
Option 2 – Signalised Diamond Junction



Existing M4 Junction 7 – to be converted to an Overbridge

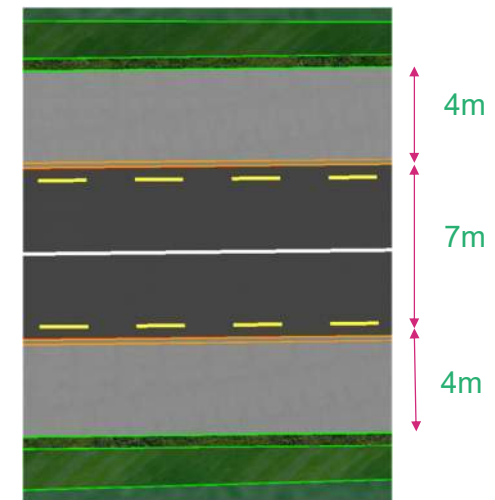
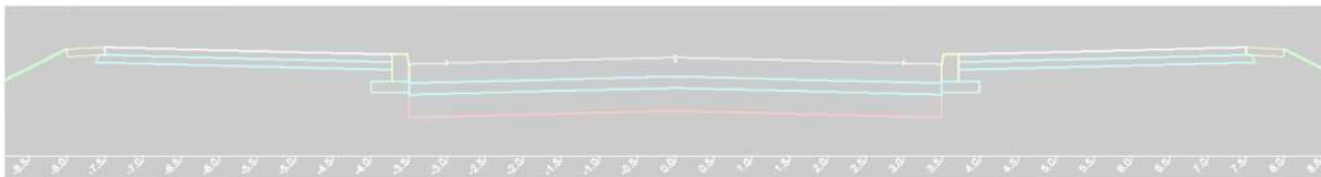
Junction 7 - Maynooth

Option 2 – New Junction + Link Roads



Link Roads Cross Section:

- Type 3 Single Carriageway (3.5m lanes)
- Design Speed 60km/h
- Active travel facility 4m wide on northern side of the proposed link road

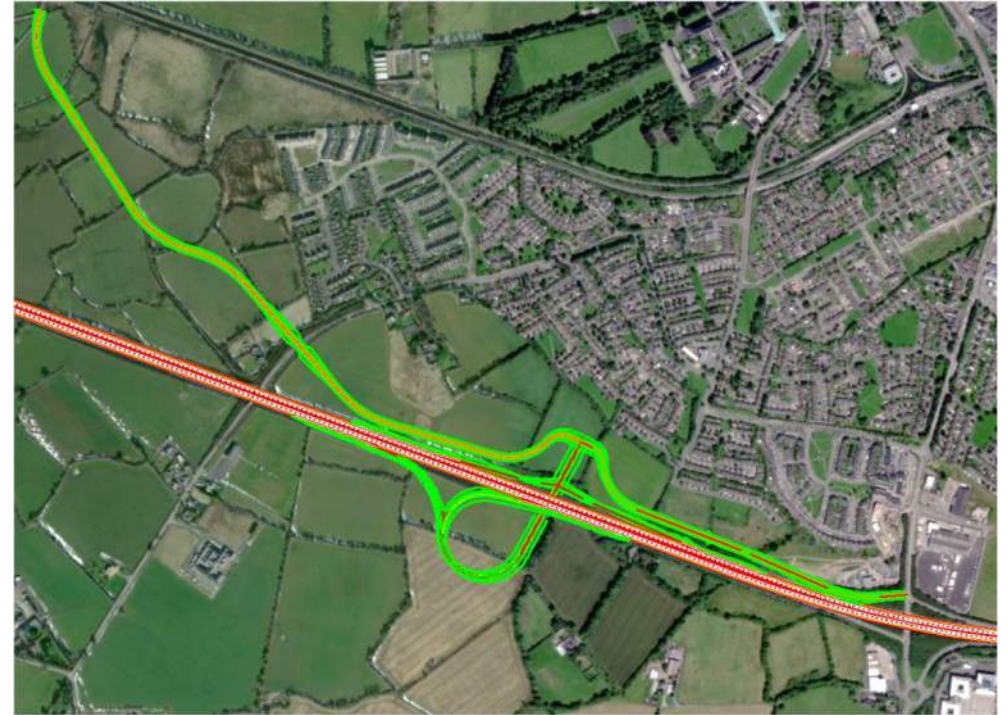


Junction 7 - Maynooth

Option 2 – Scenario A: Northern Link Roads



Option 2 – Scenario A1: Signalled Diamond



Option 2 – Scenario A2: Loop

Junction 7 - Maynooth

Option 2 – Scenario A1: Signalised Diamond Junction

Tie-in south of Jackson's Bridge



Signalised Junction at Newtown Road

Signalised Junction at Straffan Road

Scenario A –

- New Grade Separated Junction
- Northern Link Road from Straffan Road to Millfarm (Jackson's Bridge)
- Signalised Junction at Straffan Road
- Signalised Junction at Newtown Road
- Tie-in at Millfarm - south of Jackson's Bridge
- No proposed linkage south of M4 between Straffan Road and Newtown Road

Junction 7 - Maynooth

Option 2 – Scenario A2: Loop



Scenario A –

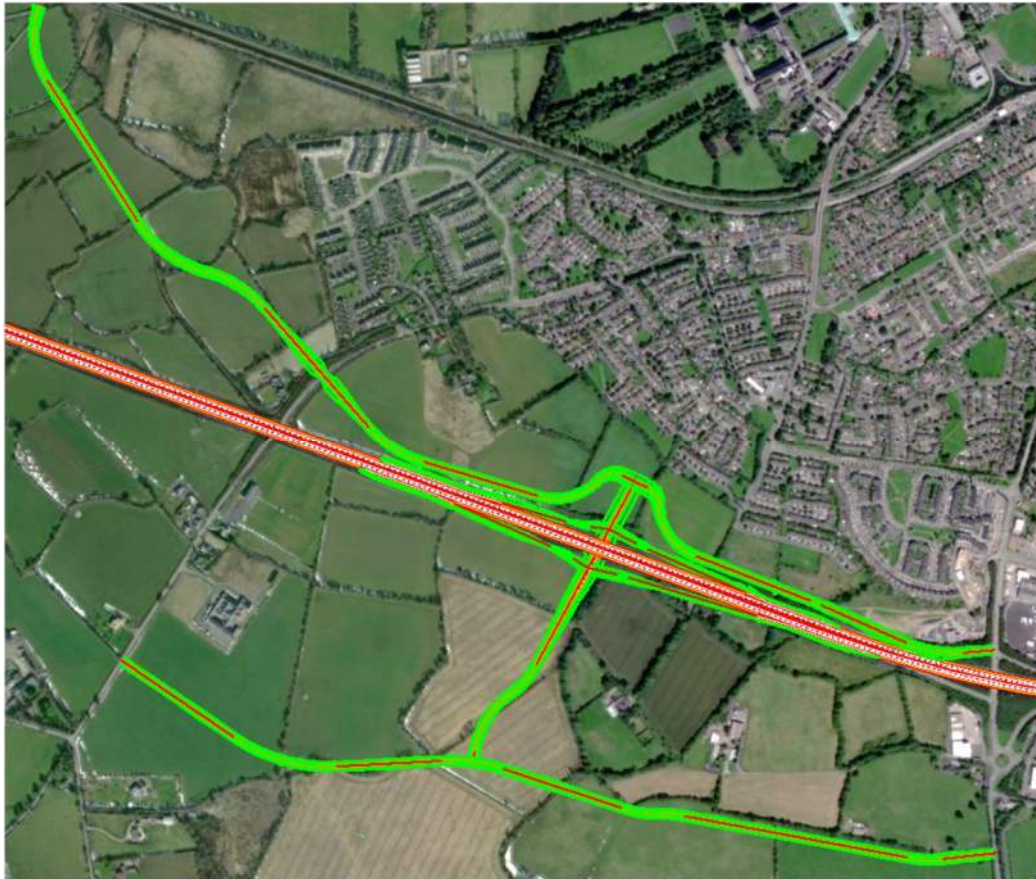
- New Grade Separated Junction (Signalised Diamond northern side / Loop southern side).
- Northern Link Road from Straffan Road to Millfarm (Jackson's Bridge)
- Signalised Junction at Straffan Road
- Signalised Junction at Newtown Road
- Tie-in at Millfarm - south of Jackson's Bridge
- No proposed linkage south of M4 between Straffan Road and Newtown Road

Signalised Junction at Straffan Road

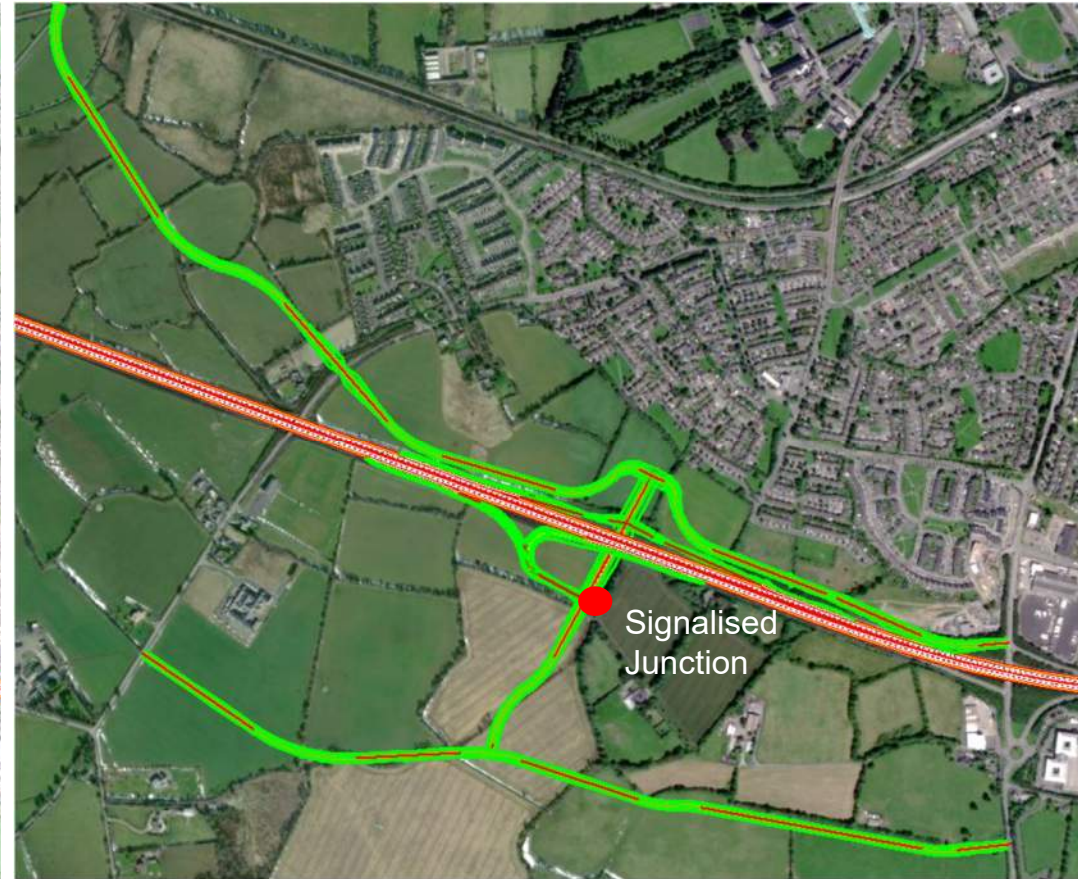
Junction 7 - Maynooth

Option 2 – Scenario B: Northern + Southern Link Roads

Scenario B1: Signalised Diamond Junction

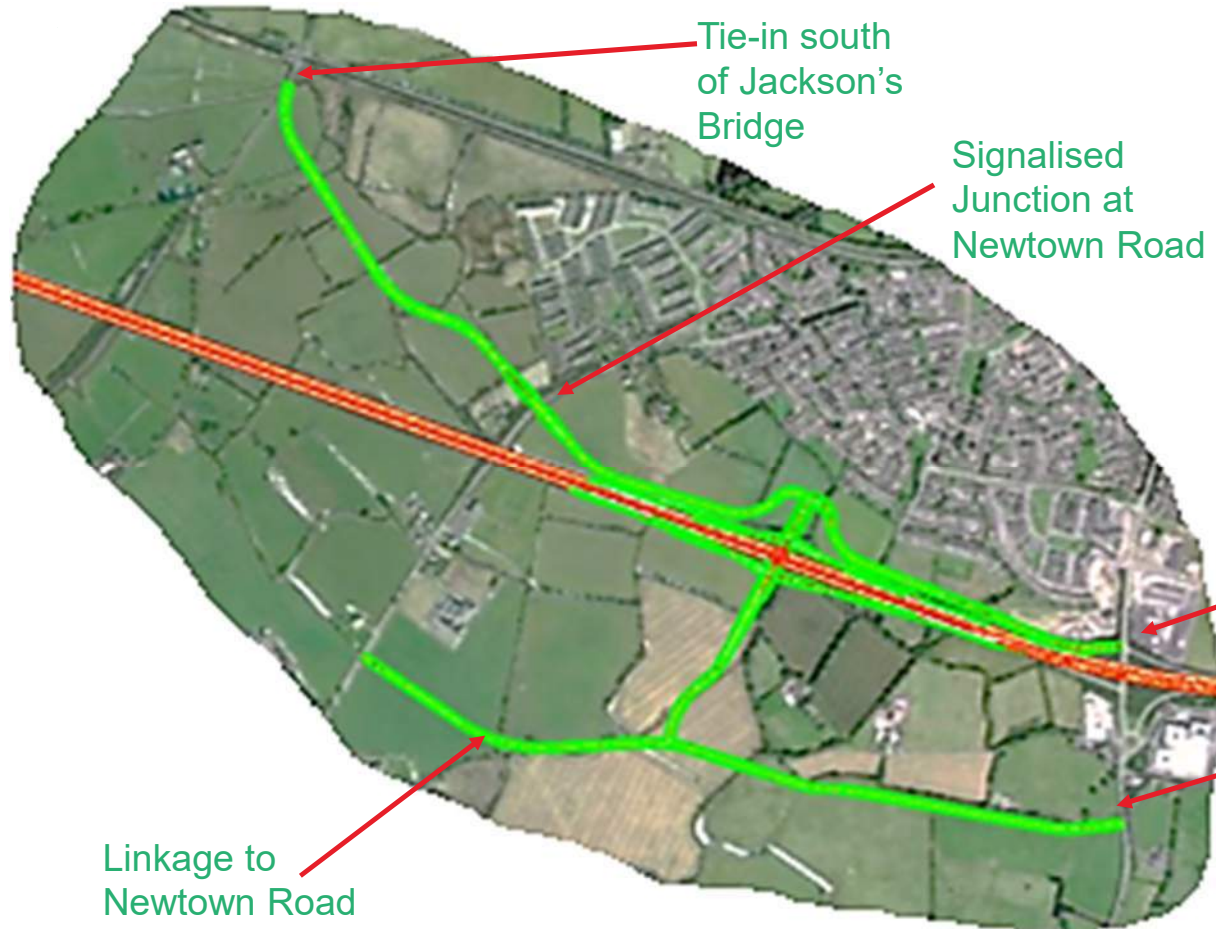


Scenario B2: Loop with Signalised Junction



Junction 7 - Maynooth

Option 2 – Scenario B1:



Scenario B –

- New Grade Separated Junction
- Northern Link Road from Straffan Road to Millfarm (Jackson's Bridge)
- Signalised Junction at Straffan Road
- Signalised Junction at Newtown Road
- Tie-in at Millfarm - south of Jackson's Bridge
- Proposed linkage south of M4 to both Straffan Road and Newtown Road

Signalised Junction at Straffan Road

Linkage to Straffan Road

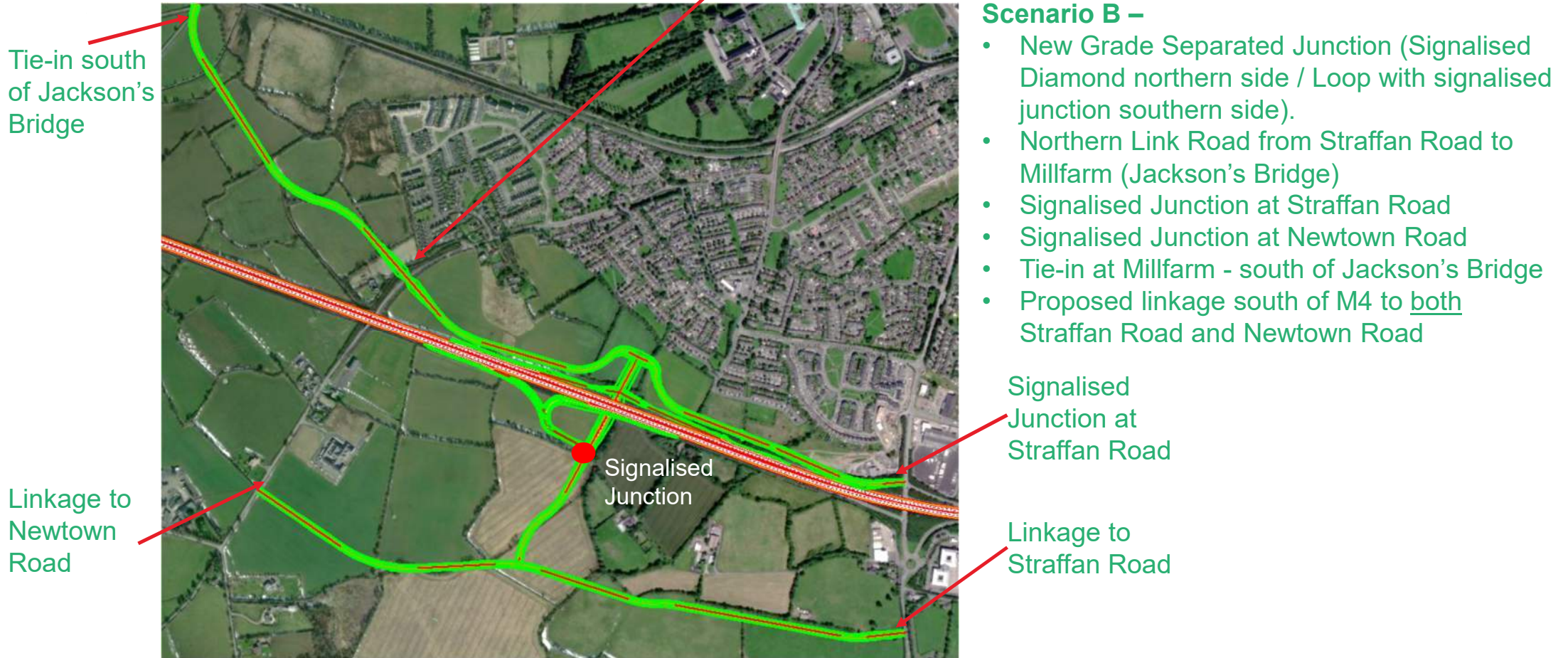
Linkage to Newtown Road

Tie-in south of Jackson's Bridge

Signalised Junction at Newtown Road

Junction 7 - Maynooth

Option 2 – Scenario B2:

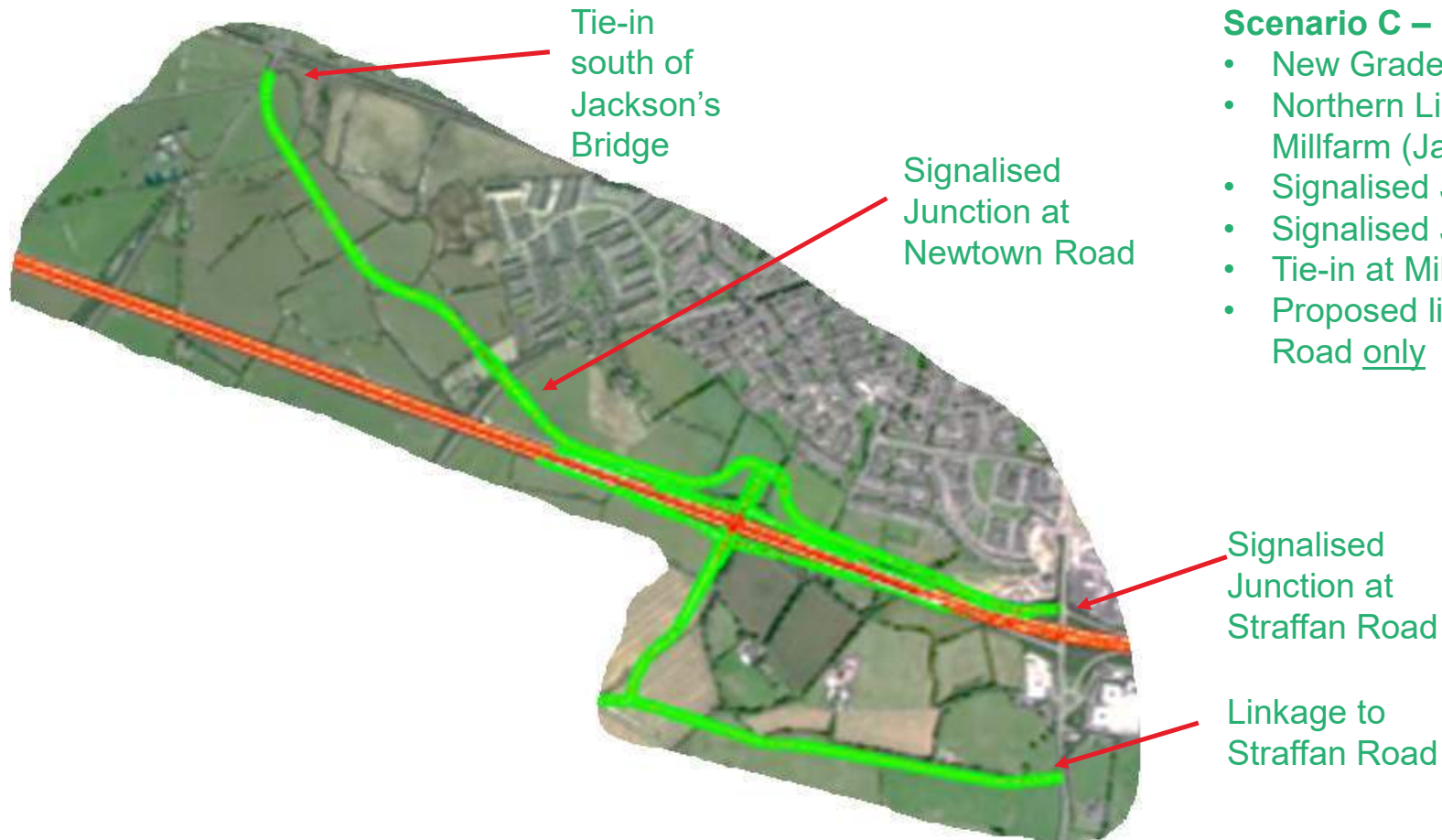


Scenario B –

- New Grade Separated Junction (Signalised Diamond northern side / Loop with signalised junction southern side).
- Northern Link Road from Straffan Road to Millfarm (Jackson's Bridge)
- Signalised Junction at Straffan Road
- Signalised Junction at Newtown Road
- Tie-in at Millfarm - south of Jackson's Bridge
- Proposed linkage south of M4 to both Straffan Road and Newtown Road

Junction 7 - Maynooth

Option 2 – Scenario C: Northern + South-East Link Roads

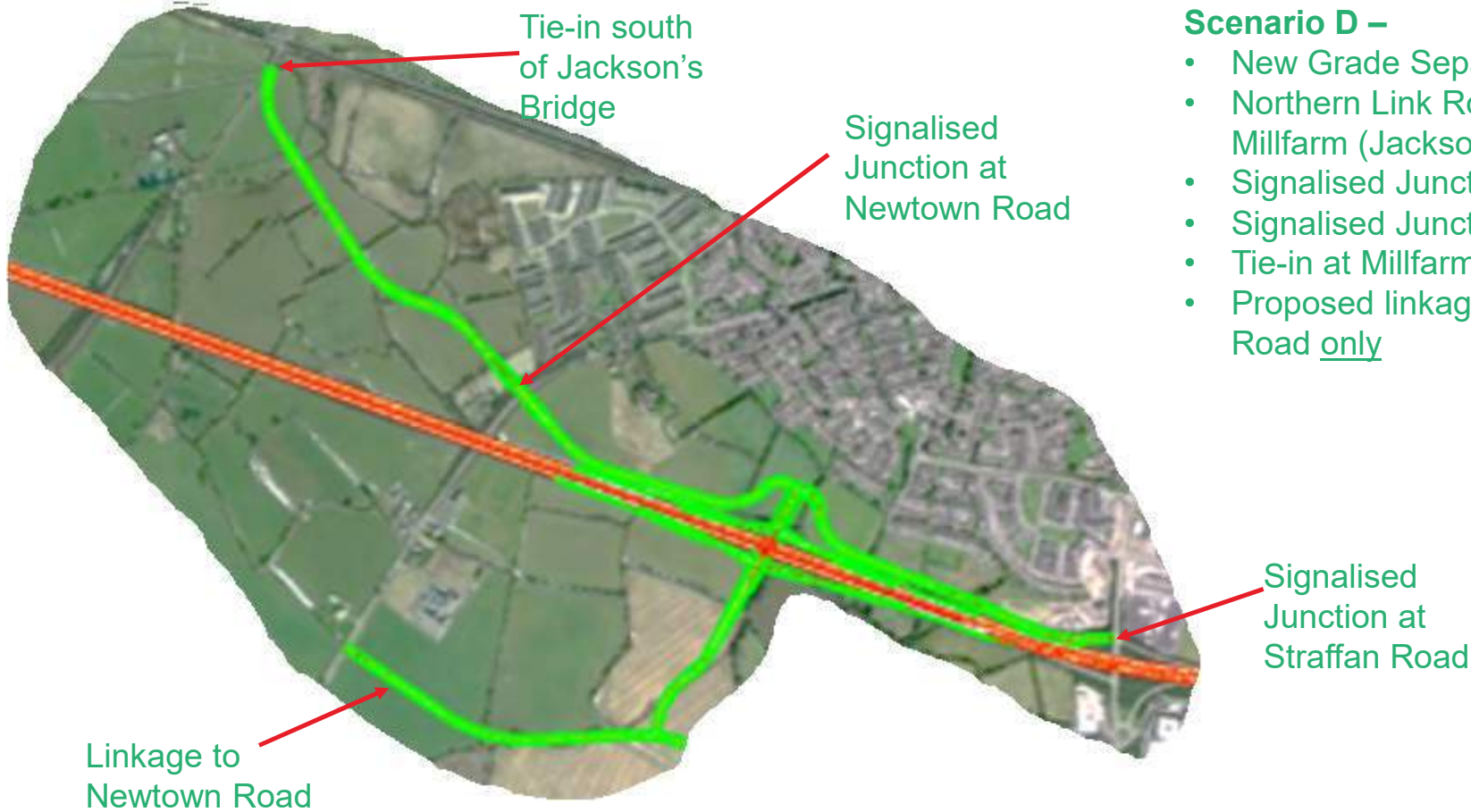


Scenario C –

- New Grade Separated Junction
- Northern Link Road from Straffan Road to Millfarm (Jackson's Bridge)
- Signalised Junction at Straffan Road
- Signalised Junction at Newtown Road
- Tie-in at Millfarm - south of Jackson's Bridge
- Proposed linkage south of M4 to Straffan Road only

Junction 7 - Maynooth

Option 2 – Scenario D: Northern + South-West Link Roads



Scenario D –

- New Grade Separated Junction
- Northern Link Road from Straffan Road to Millfarm (Jackson's Bridge)
- Signalised Junction at Straffan Road
- Signalised Junction at Newtown Road
- Tie-in at Millfarm - south of Jackson's Bridge
- Proposed linkage south of M4 to Newtown Road only

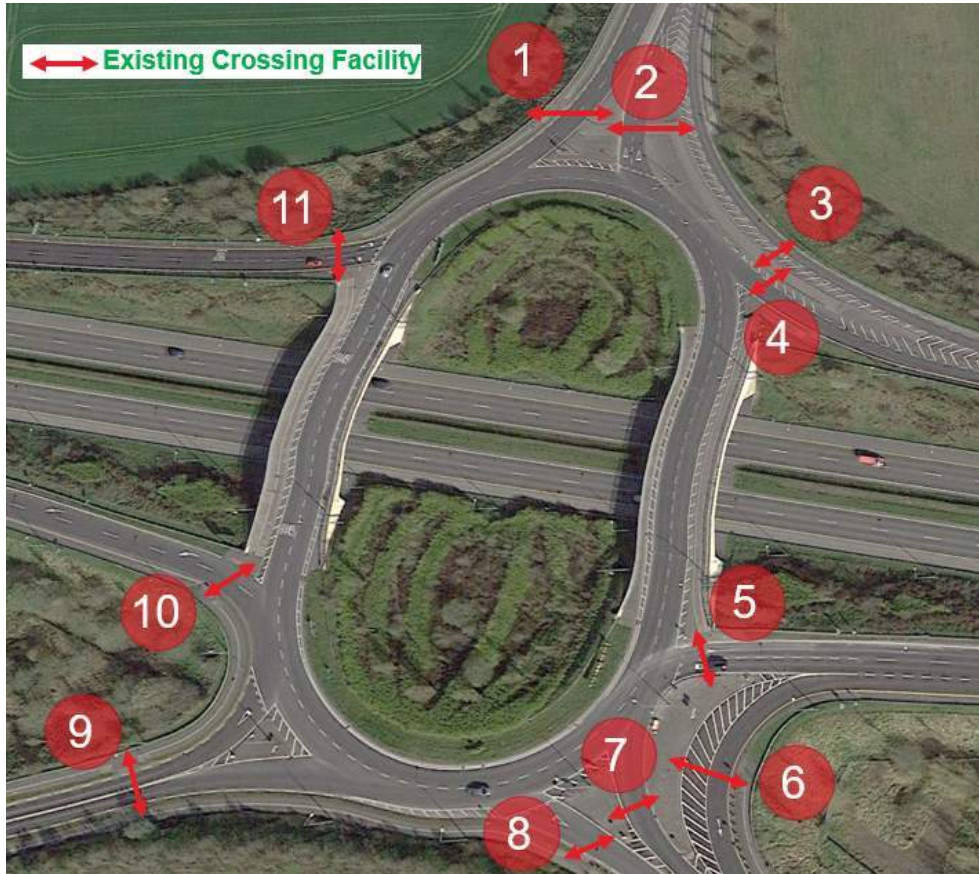
Junction 6 - Celbridge

Existing Conditions



Junction 6 - Celbridge

Existing Conditions

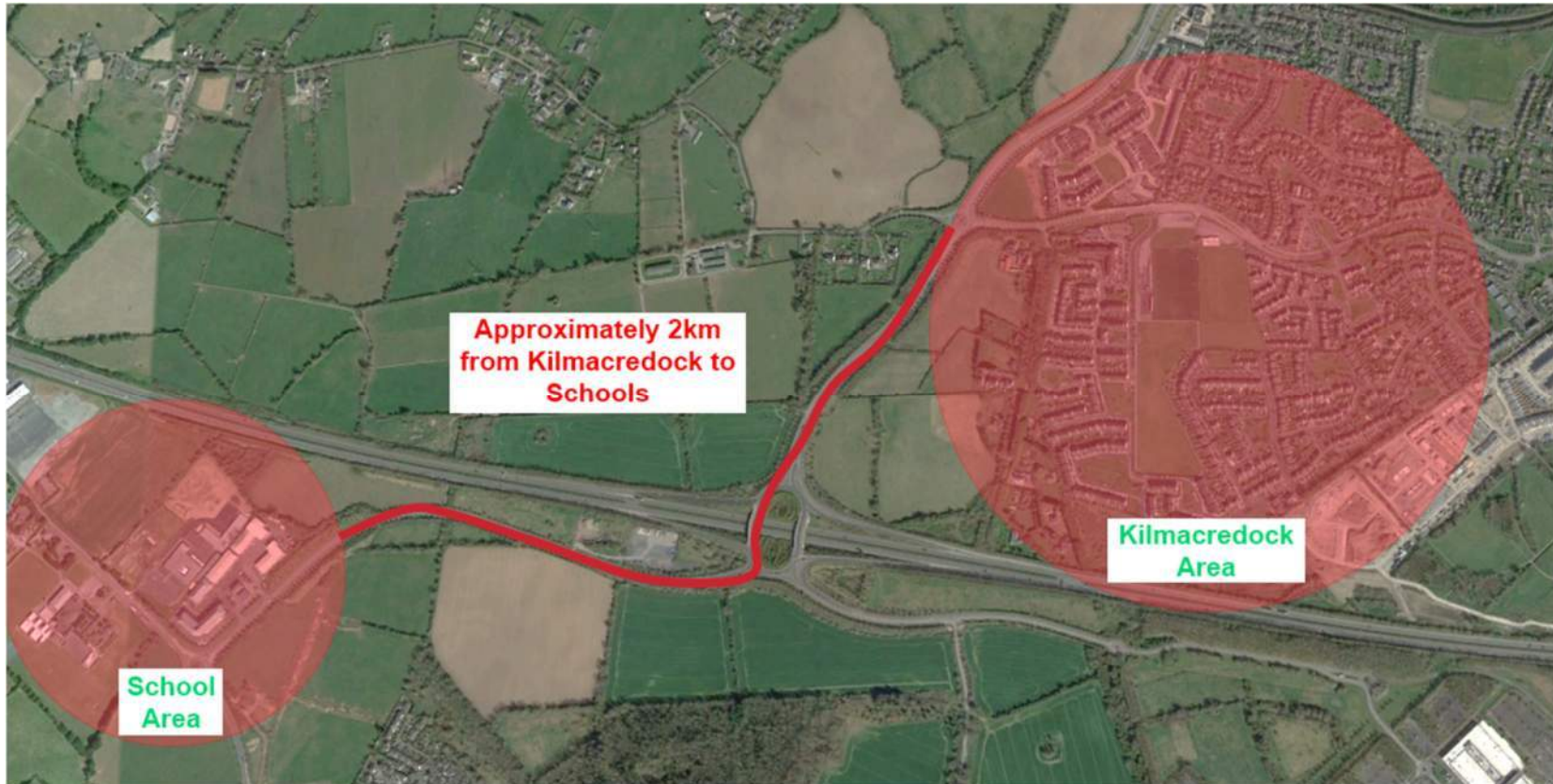


There are uncontrolled pedestrian crossings throughout Junction 6 comprising of dropped kerbs and tactile/ ladder paving. Utilising the western side of the Junction 6 structure is favourable due to less crossing movements required to navigate through the junction.



Junction 6 - Celbridge

Existing Conditions



Junction 6 – Celbridge

Existing Conditions

- Users commuting to schools appear to utilise the eastern side of the Junction 6 structure. The eastern side of the Junction 6 structure has six crossing points. Each crossing point can be seen as a conflict point where vulnerable users are required to interact with vehicular traffic to make a safe movement.
- Vehicular traffic travelling through Junction 6 may be travelling at a high speed as they are approaching the junction from a motorway environment with a 120km/hr speed limit. The potential for excessive speed is evident and was also noted by numerous residents who utilise the junction.
- The geometric design of the junction may promote excessive speed due to a lack of self-enforcing speed reduction.
- The main cohort utilising the junction and its surrounding road network is anticipated to be school children. This was noted by local residents who stated that the risk to their children is excessive, giving them no option other than driving their children to school. When questioned on the risk, it was noted that excessive speed, difficulties in safely utilising a designated crossing point and bad driver decisions were noted numerous times.
- Upon review, it can be ascertained that vulnerable users making the journey to/from the school area/Kilmacredock is at risk.

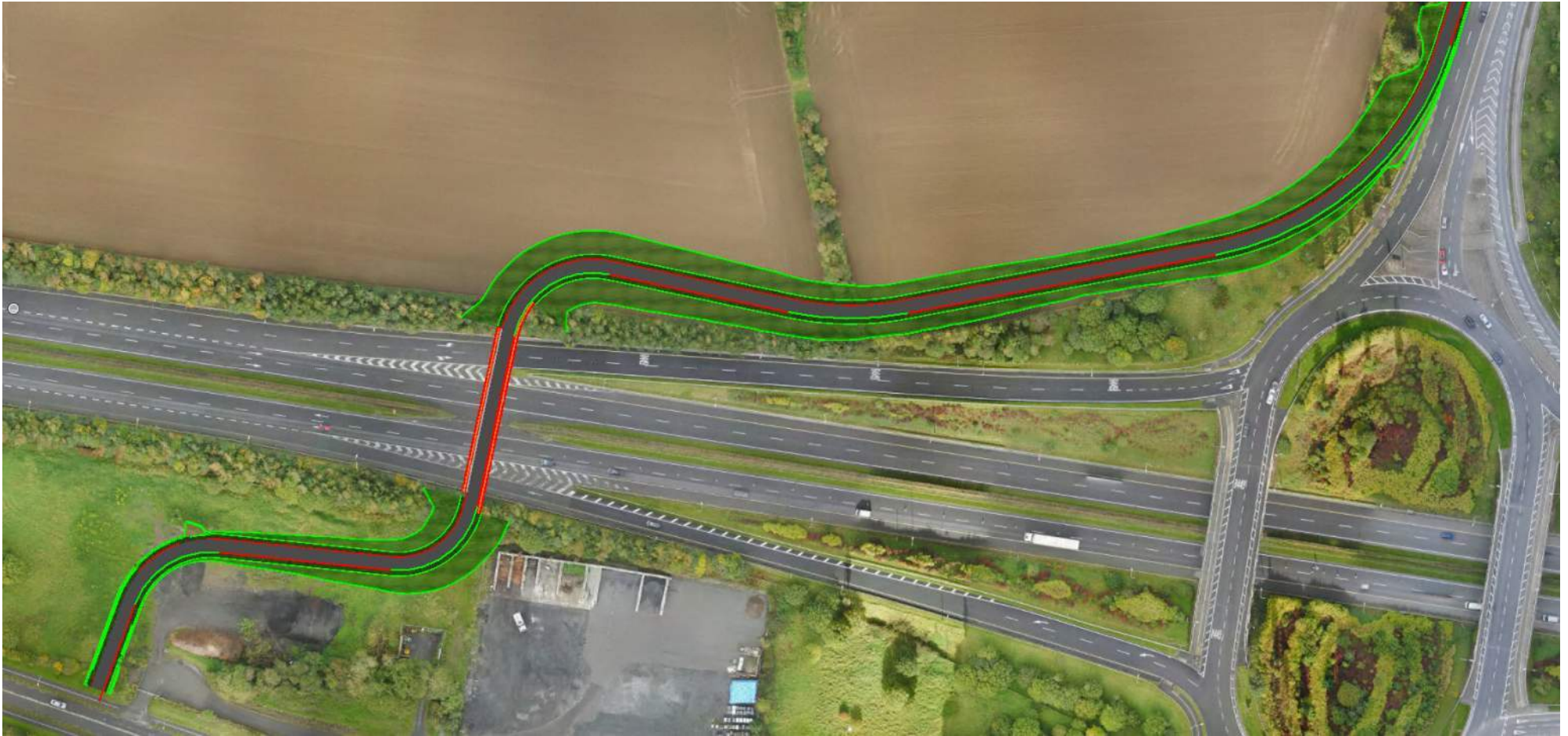
Junction 6 – Celbridge

Option 1 – New Active Travel Bridge

- A new structure to be reserved for use of active travel only would remove vulnerable users from the existing Junction 6 overbridge and the vehicular traffic. A common theme throughout the public consultation was a low level of comfort for vulnerable users navigating this overbridge.
- An approach could be implemented with resultant improvements to all road users.
- An additional structure could be constructed to the east or the west of the existing Junction 6 overbridge.
- An additional structure to the west of the existing Junction 6 overbridge would be favourable due to a reduction in crossing points on the R449 on approach and departure from schools.

Junction 6 – Celbridge

Option 1 – New Active Travel Bridge West of Existing Junction



Junction 6 – Celbridge

Option 1 – New Active Travel Bridge West of Existing Junction



4m wide active travel facility.
25m horizontal radius

On 3% downhill speed reached
could be more than 30kph →
 $R(DM) = 25m$ (USED)

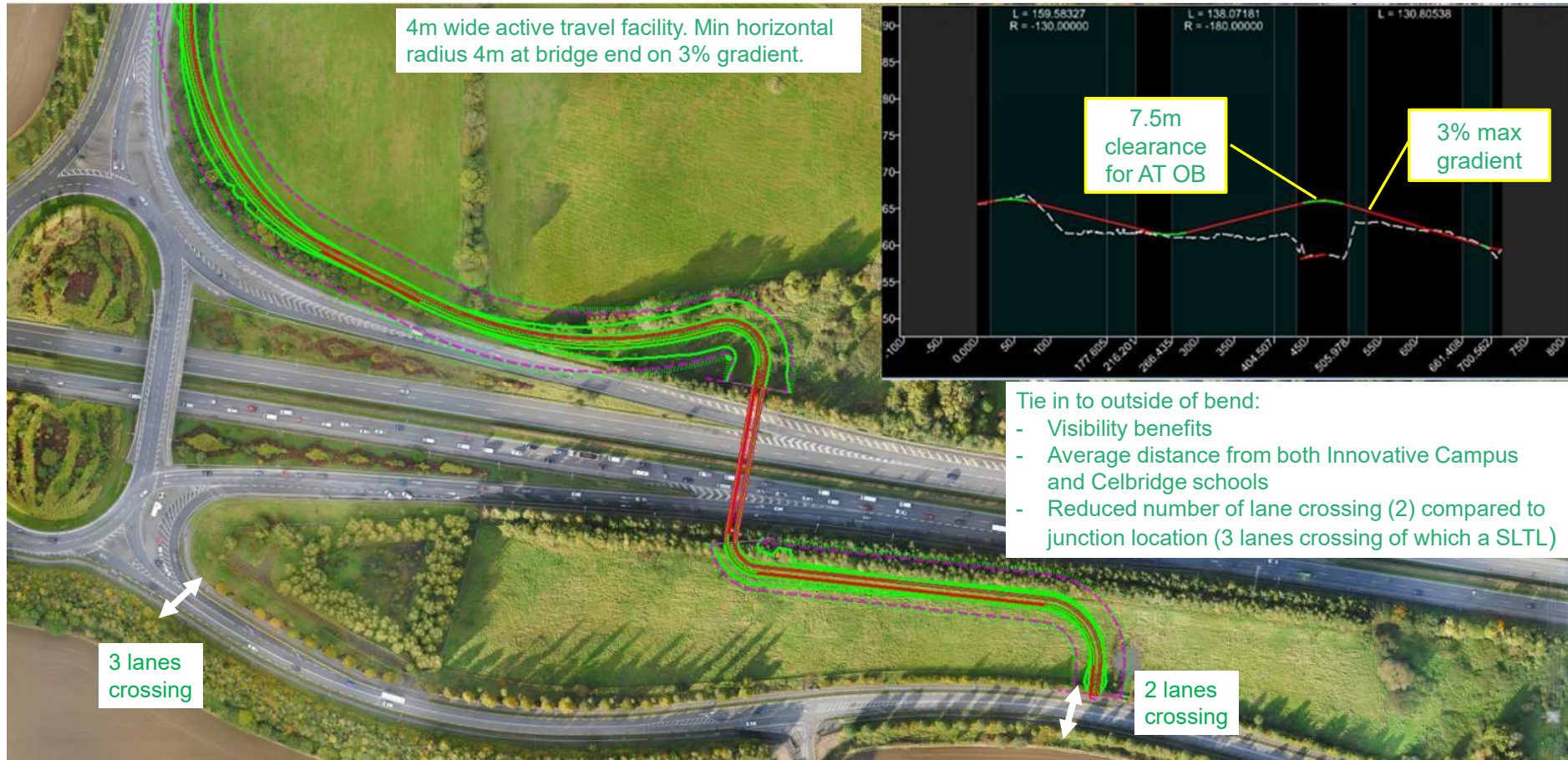
Junction 6 – Celbridge

Option 1 – New Active Travel Bridge West of Existing Junction



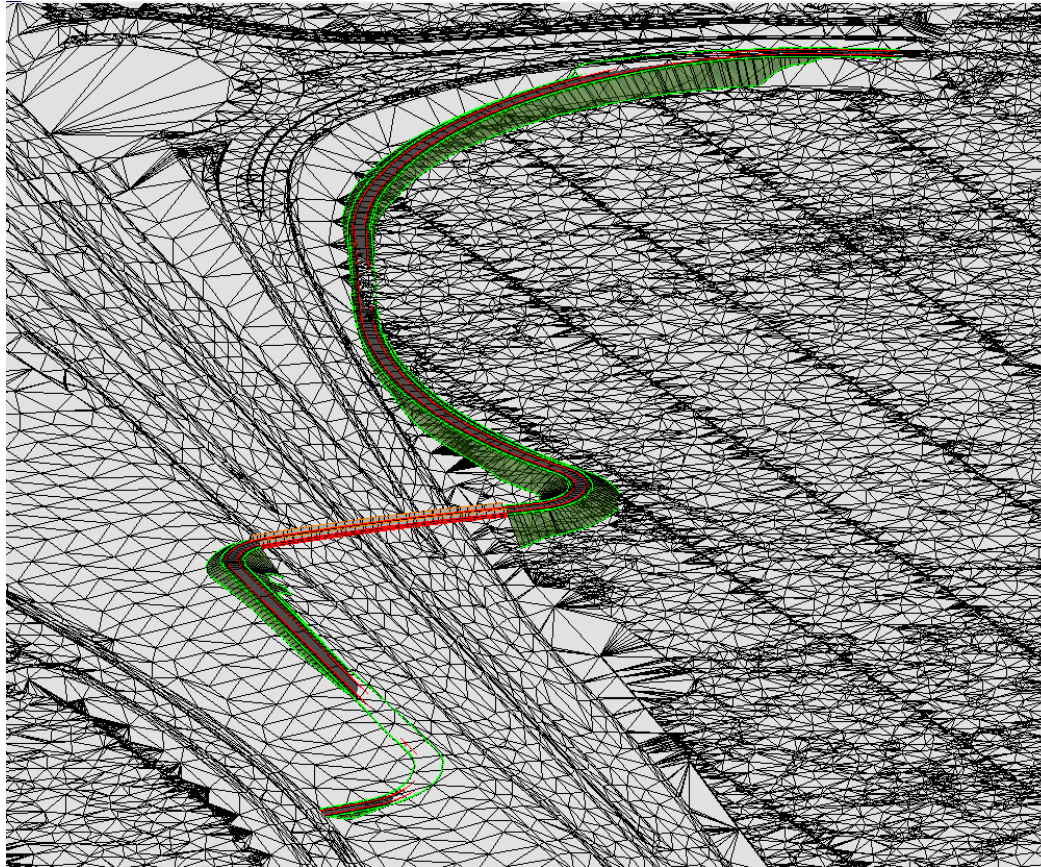
Junction 6 – Celbridge

Option 1 – New Active Travel Bridge East of Existing Junction



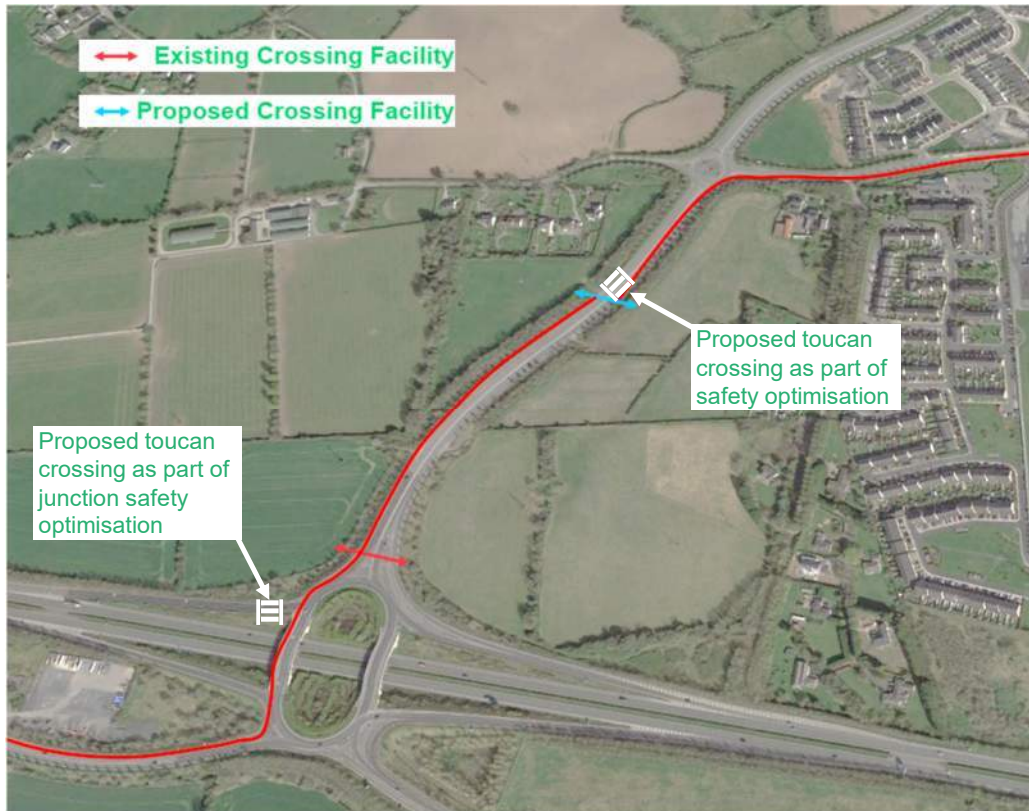
Junction 6 – Celbridge

Option 1 – New Active Travel Bridge East of Existing Junction



Junction 6 – Celbridge

Option 2 – Improve Existing Junction



The aim of the options process is to optimise safety and strike a balance between safety for both vehicular traffic and vulnerable road users.

The aim of having vulnerable road users utilise the western side of the Junction 6 structure is seen as advantageous to the safety of all road users. There are two conflict zones for vulnerable users on the western side compared to five on the eastern side. To aid in achieving priority usage to the eastern side, it is proposed to include a controlled crossing (toucan) point on the northern side of the R449. This will provide an additional choice to users exiting/entering Kilmacredock.

Junction 6 Options

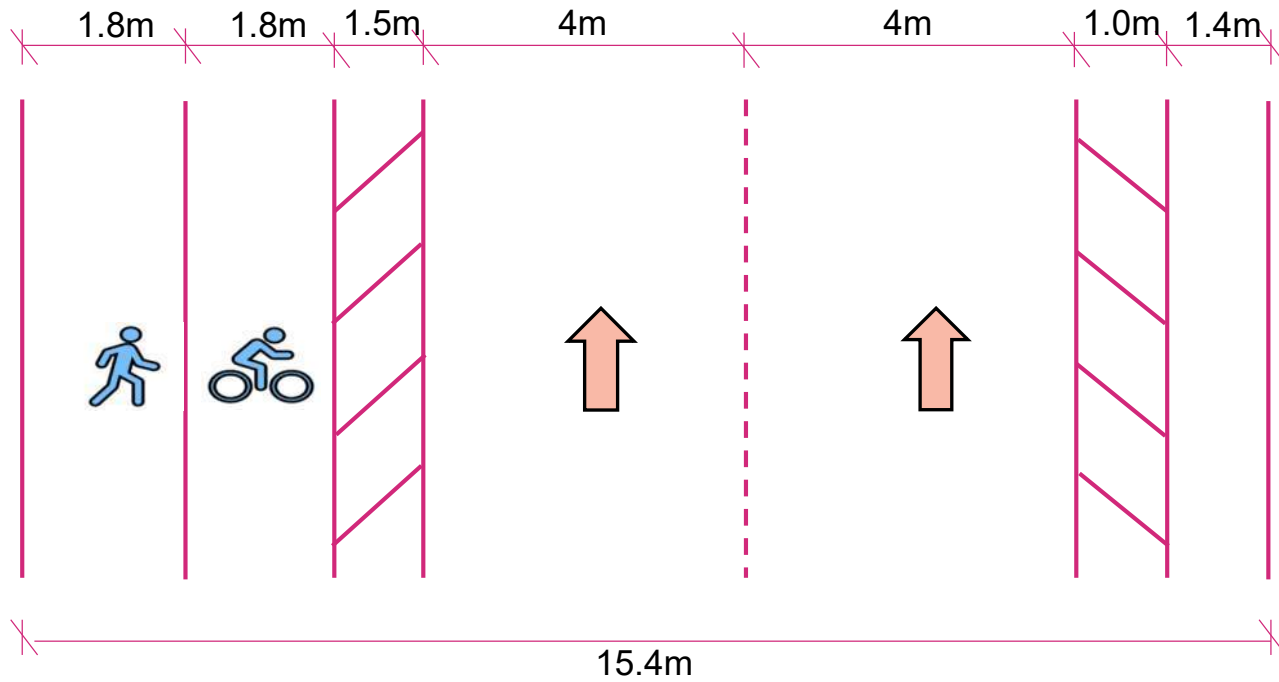
Do Min

Improve active travel facilities on existing structure and approaches (widening not required)

New active travel bridge

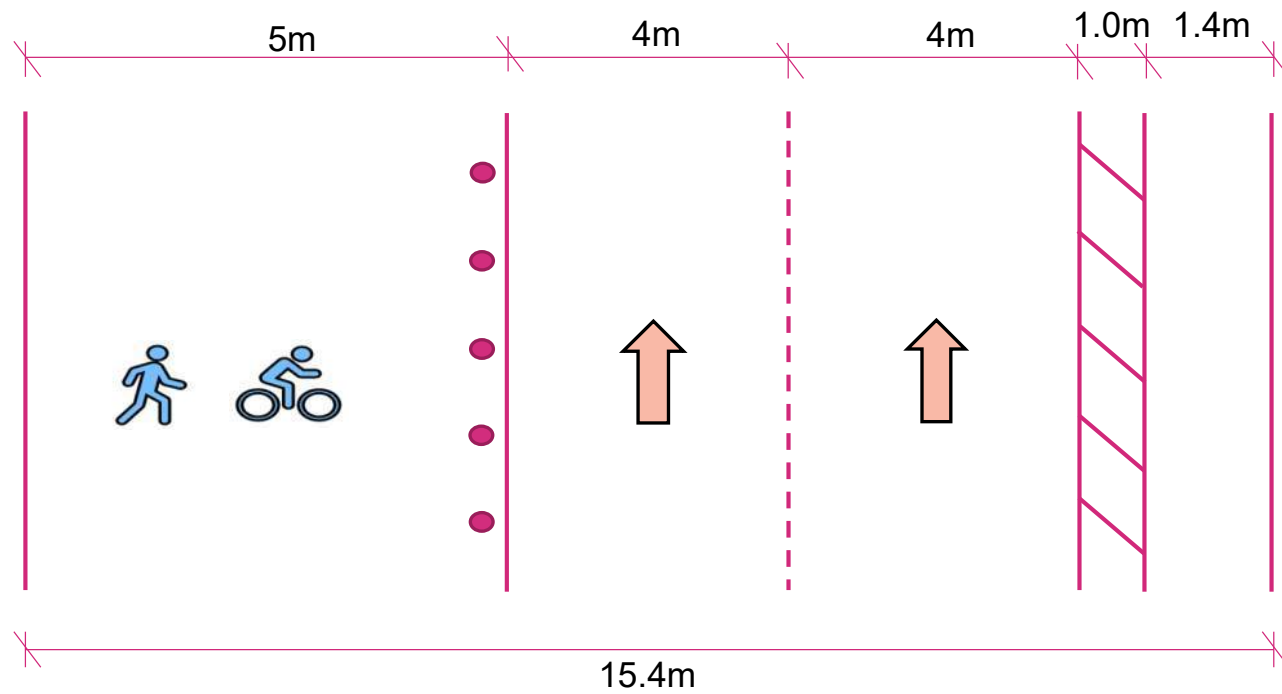
Junction 6 - Celbridge

Indicative Existing Cross Section – R449 North direction on overbridge



Junction 6 - Celbridge

Proposed Cross Section



Junction 5 - Leixlip

Existing Conditions – Diamond Junction (no traffic signals to north, signals to south)



Junction 5 - Leixlip

The key issues identified in the vicinity of Junction 5 include the following:

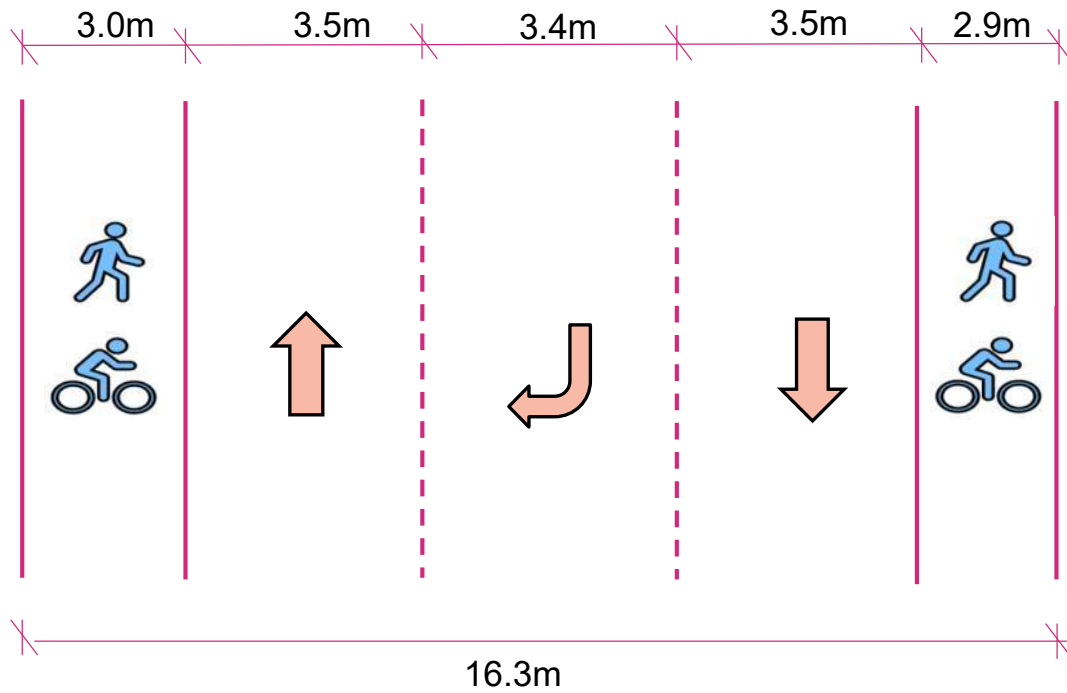
- 1. Bespoke junction layout** whereby the southern side of the junction is a typical signalized diamond junction, while the northern side of the junction is an unclassified junction layout with a priority junction for the eastbound diverge and a roundabout at the eastbound merge tie in to the R148 and the R403.
- 2. Eastbound merge ramp** includes 100m of a 2-way section to provide full access for two private dwelling houses located between the M4/N4 mainline and the merging ramp (Figure 11). Moreover, 2 additional direct accesses present between the Junction 5 eastbound merge and the Junction 4A eastbound diverge and a distance of approximately 300m between consecutive merge and diverge which increases weaving issues and potential conflict points.
- 3. Vulnerable road users accessibility and safety.** There are several uncontrolled crossing points at the junction as well as not fully segregated active travel facilities that can decrease the attractiveness of the route for vulnerable road user

For simplicity of assessment, the Junction 5 area has been broken down in four sections identified as key problematic areas. The scenarios for each section are generally interchangeable:

- Eastbound merge;
- Eastbound diverge;
- Active travel provision on the overbridge;
- Junction 5 to Junction 4A Eastbound Carriageway.

Junction 5 - Leixlip

Indicative Existing Cross Section

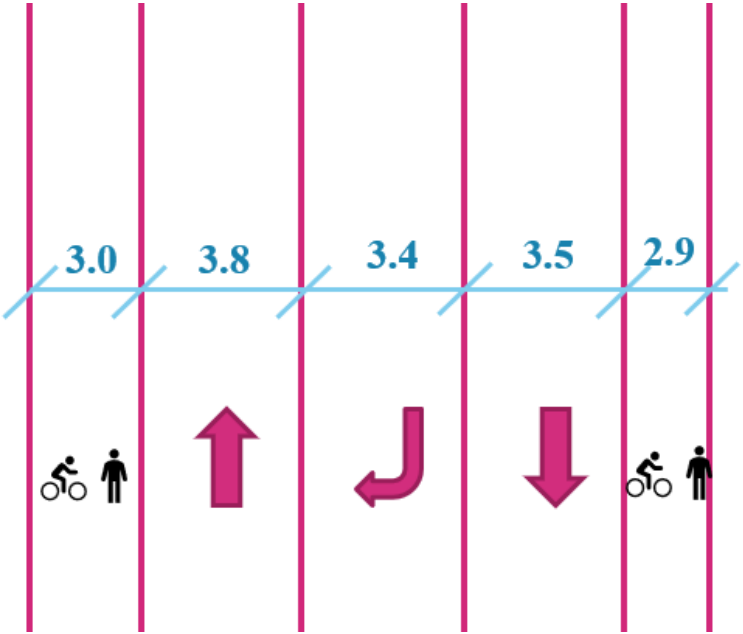


Junction 5 - Leixlip

Active Travel Provision on Overbridge Scenario 1 – Do Minimum

Potential Improvements:

- 1. Rationalize width of traffic lanes and footpath
- 2. Provide signalized crossing along the western side to R403 to Celbridge



Existing Cross Section (looking north)

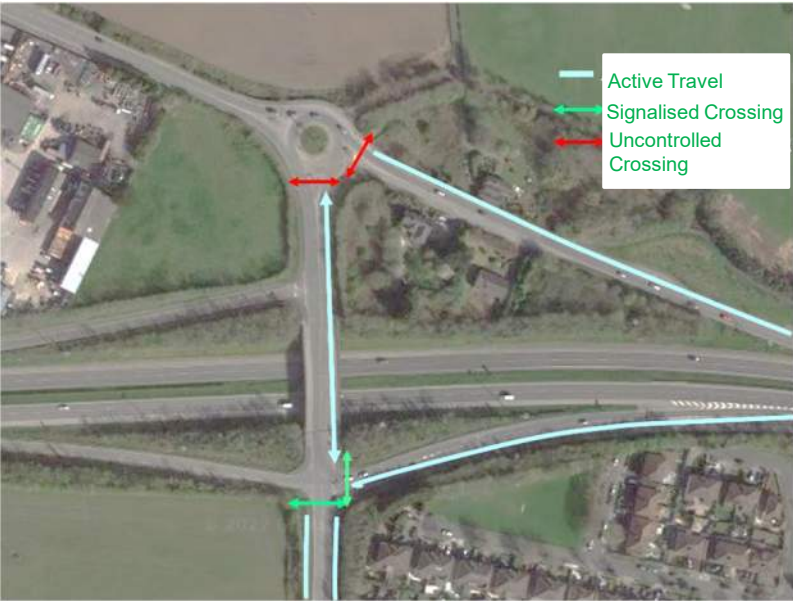
Junction 5 - Leixlip

Active Travel Provision on Overbridge Scenario 2 – Active Travel Facility on Eastern side only

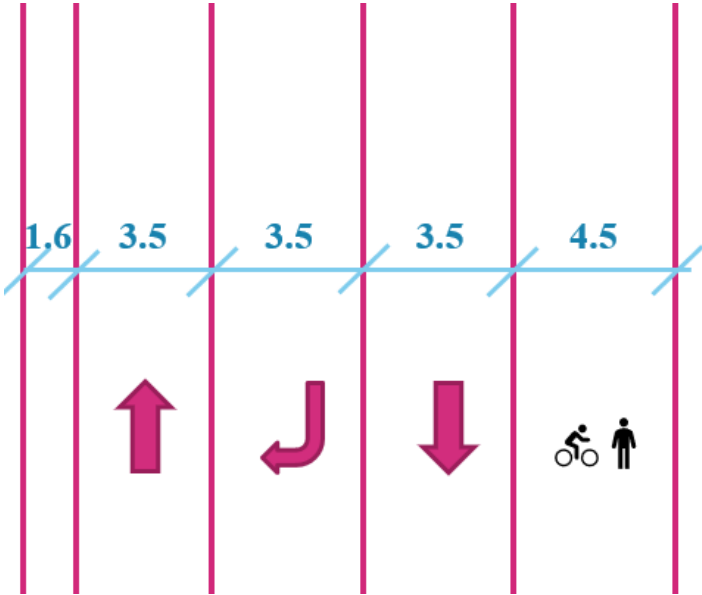
Two way Active Travel facility on the eastern side of the bridge.

Advantages:

- Reduced number of crossing, especially for origin and destination on the same side of the road.



Crossing Points



Proposed Cross Section (looking north)

Junction 5 - Leixlip

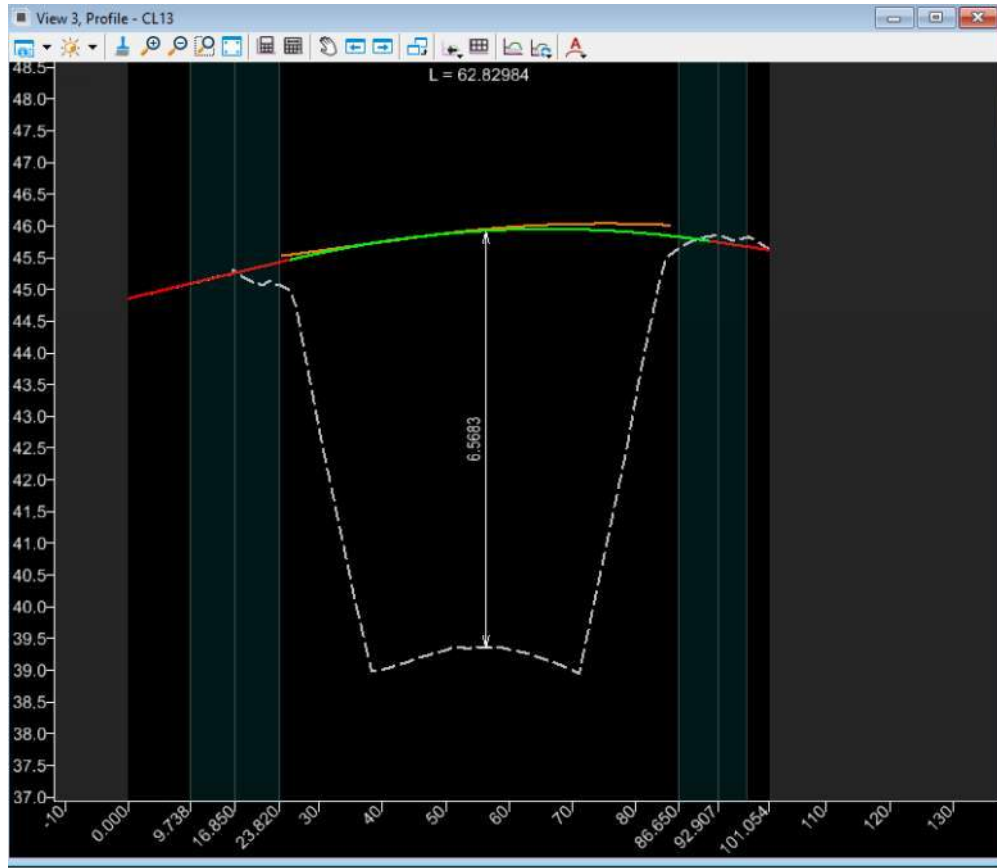
New Active Travel Bridge to east of Existing Overbridge

- Active travel facility 4m wide adjacent to existing bridge structure as part of design optimisation.
- Ties in to existing facility in the north (2m wide) and to the existing controlled crossing point in the south.



Junction 5 - Leixlip

New Active Travel Bridge to east of Existing Overbridge



- Max gradient 2.4% on the northern tie in.
- 6.6m clearance/headroom to the mainline.
- The vertical profile of the existing overbridge is shown in orange.

Junction 5 - Leixlip

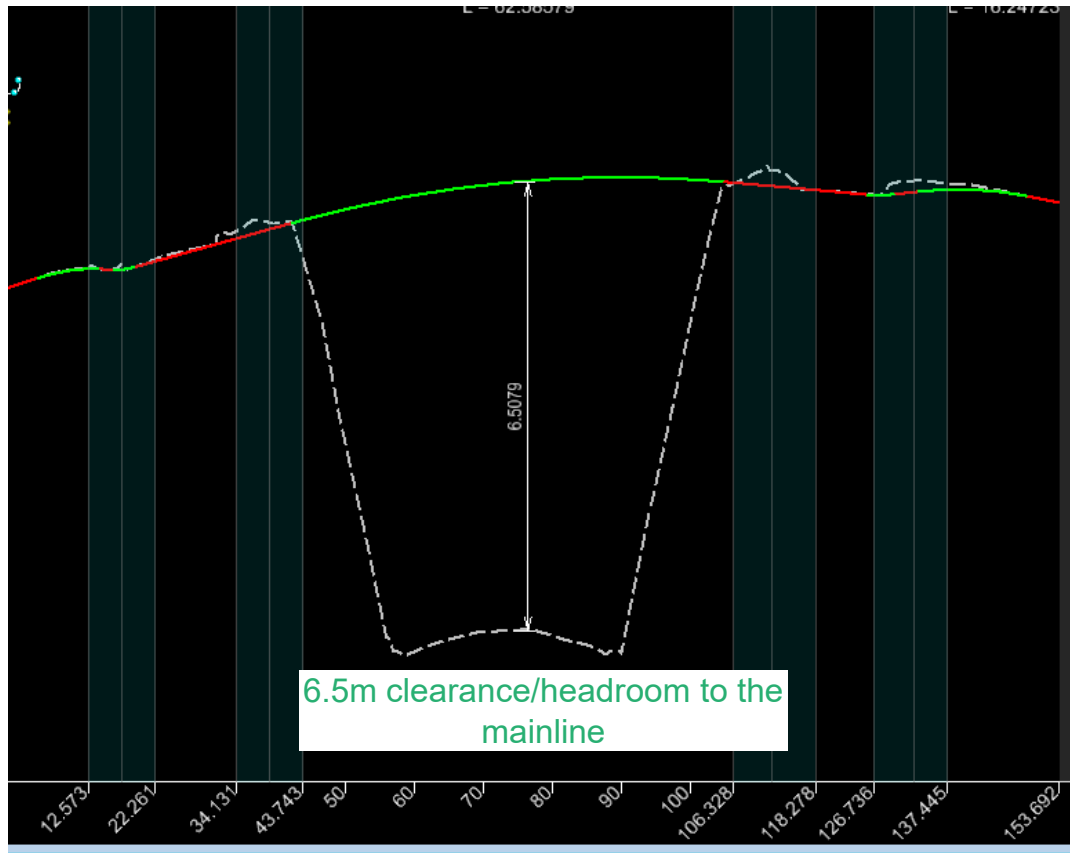
New Active Travel Bridge to west of Existing Overbridge



- Active travel facility 4m wide adjacent to existing bridge structure. Ties in to existing on both sides of the bridge (existing facility is approx. 2m wide).
- On the western side there are no controlled crossings for active travel users. Controlled crossing points are proposed as part of this option.

Junction 5 - Leixlip

New Active Travel Bridge to west of Existing Overbridge

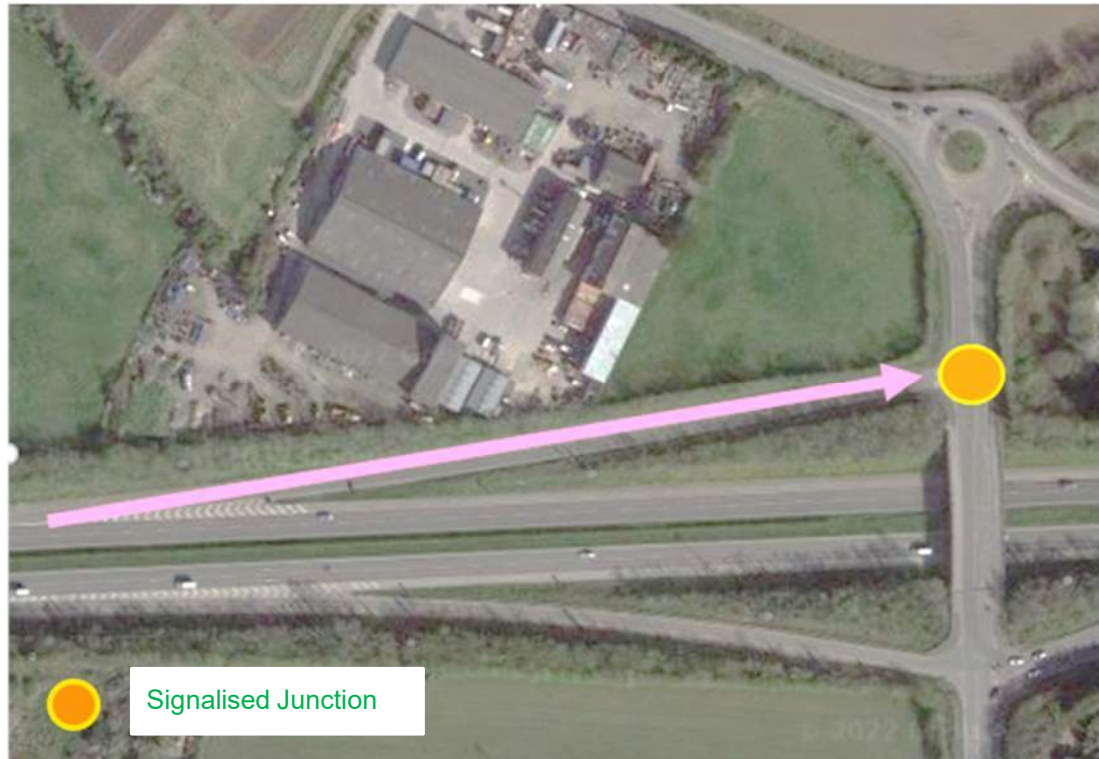


Junction 5 - Leixlip

Eastbound Diverge Scenario 1 – Do Minimum

Potential Improvements:

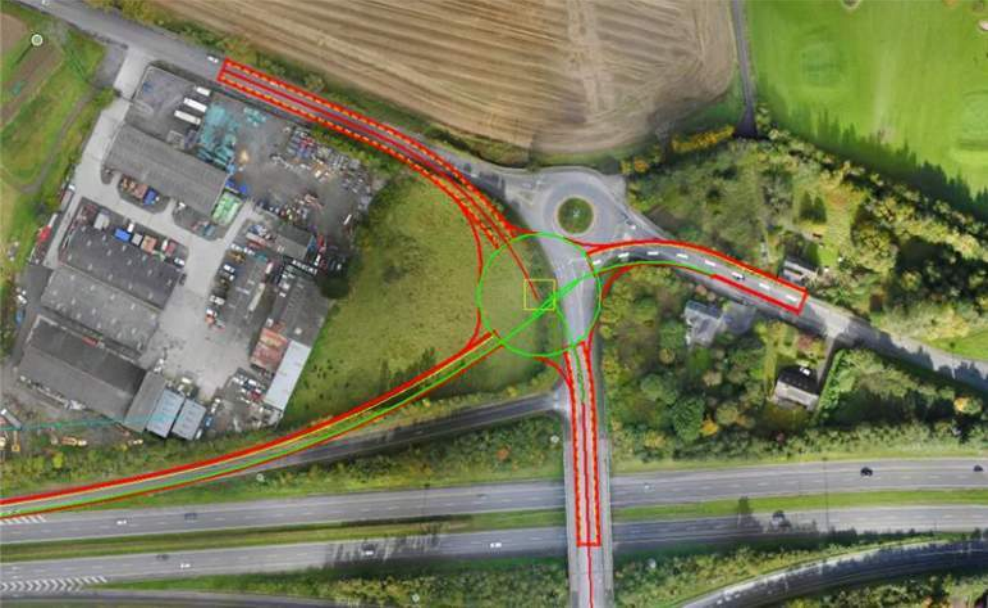
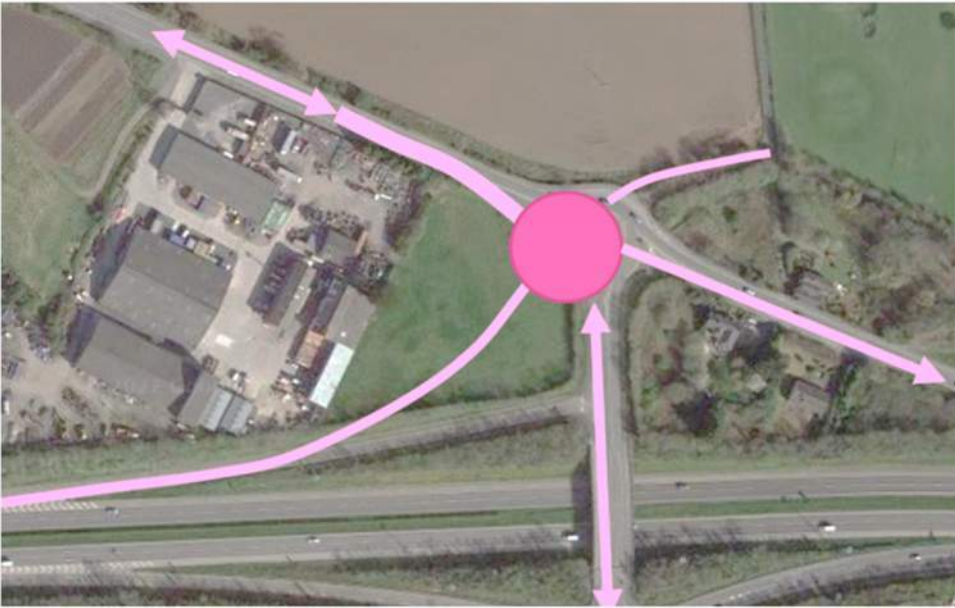
1. Signalise Junction



Junction 5 - Leixlip

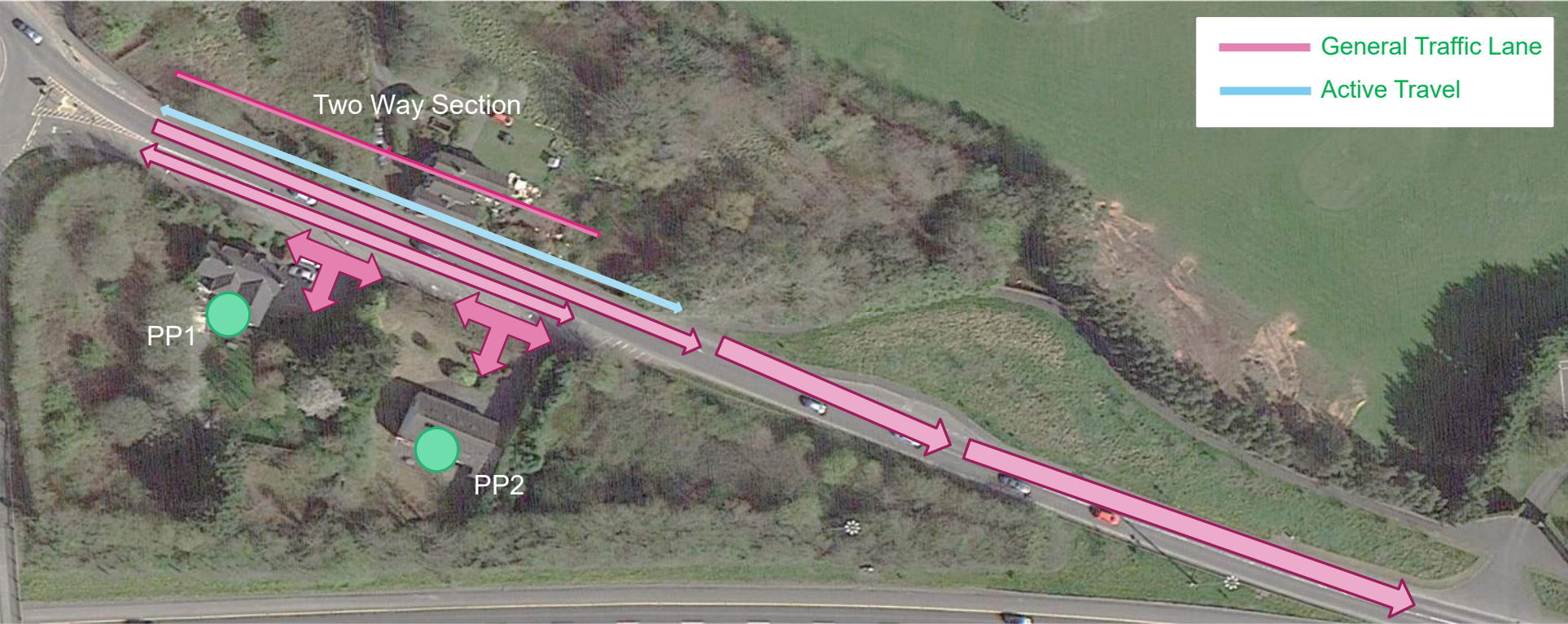
Eastbound Diverge Scenario 2 – Dumbbell

Realignment of eastbound diverge slip road would require relocation and amending the roundabout to balance the approach arms.



Junction 5 - Leixlip

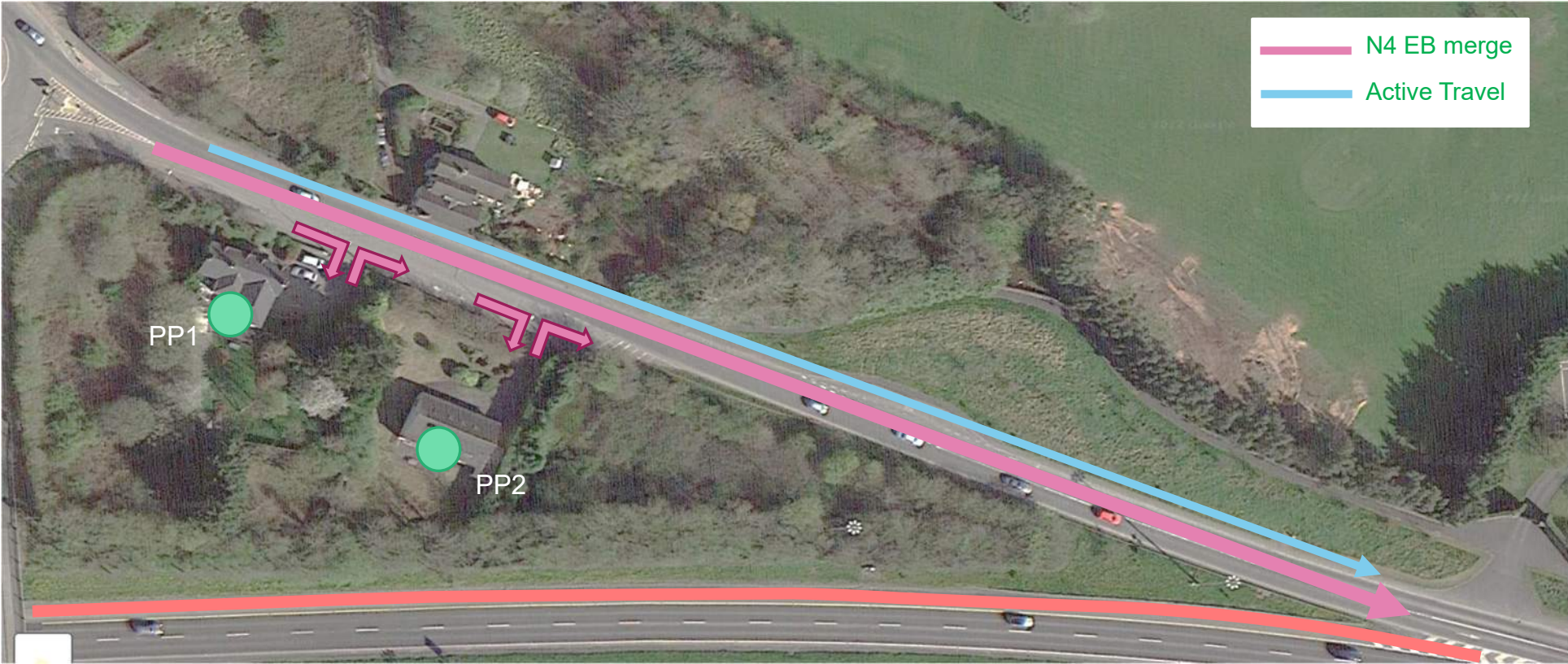
Eastbound Merge Scenario 1 – Do Minimum (existing scenario)



Junction 5 - Leixlip

Eastbound Merge Scenario 2 – One Way Slip Road

PP1 & PP2
2.5km detour
via N4 to
come back to
J5 (Leixlip)



Junction 5 - Leixlip

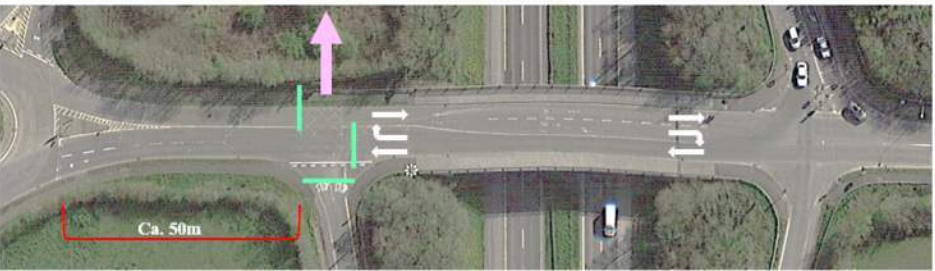
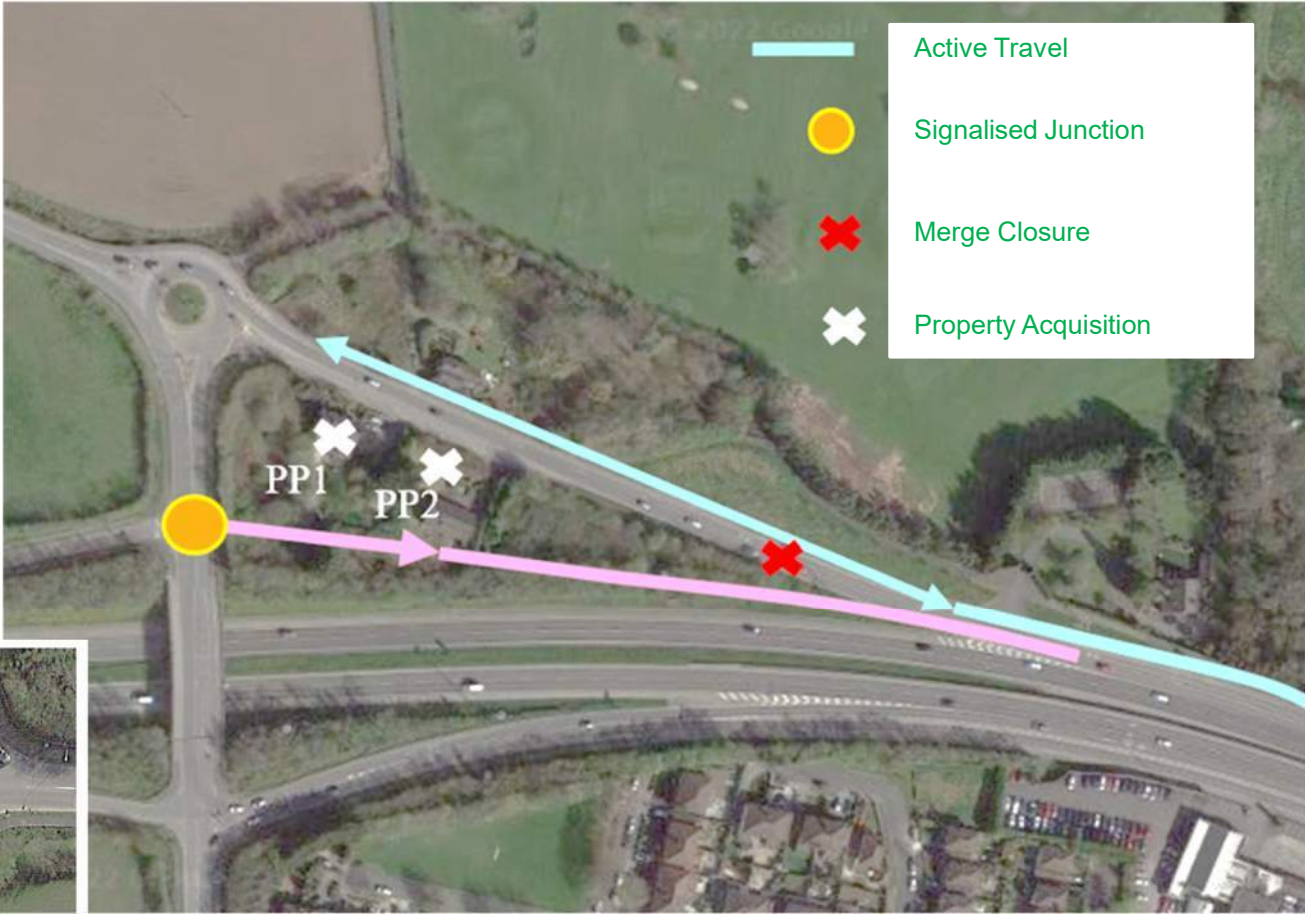
Eastbound Merge Scenario 3 – Diamond

Advantages:

- Standard junction layout;
- Segregated Active Travel facility from merging ramp
- Removal of conflict points on merging ramp

Disadvantages:

- Close proximity between the roundabout and the diamond junction may be problematic for storage at the signalised junction for traffic coming from the R148 traveling south
- The existing bridge cross section may not accommodate for the right-turn lanes required at both signalized junctions.



Junction 5 - Leixlip

Eastbound between Junction 5 and Junction 4a – Existing Issues

Existing weaving issues given the close proximity of the junctions and the direct accesses.

High percentage of rear end shunt collision likely attributable to a combination breaking, weaving.

Other factors for these collisions include:

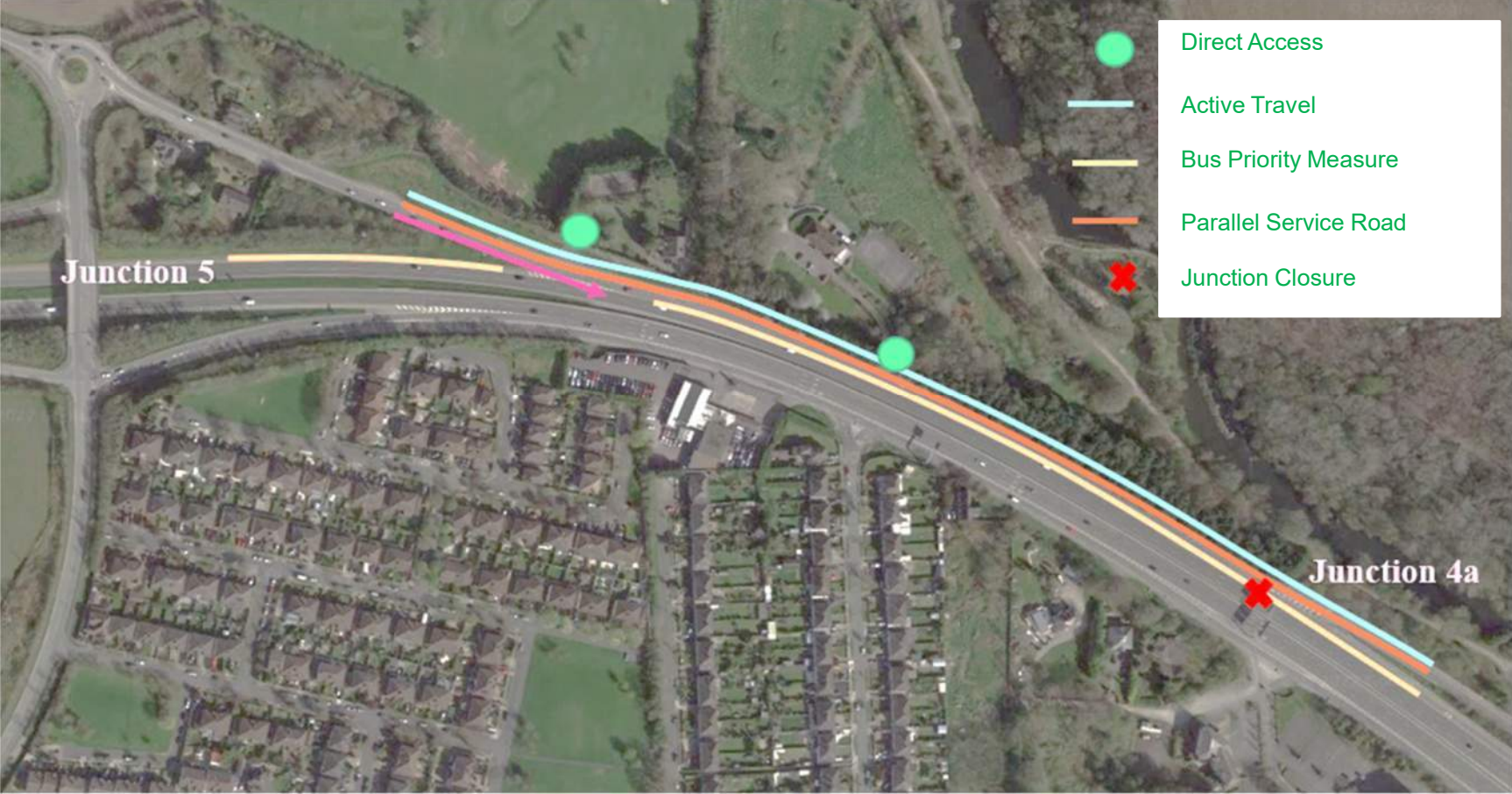
- Transition from motorway to dual carriageway environment
- Speed limit reduction from 120km/h to 80km/h
- Tight hor. curvature

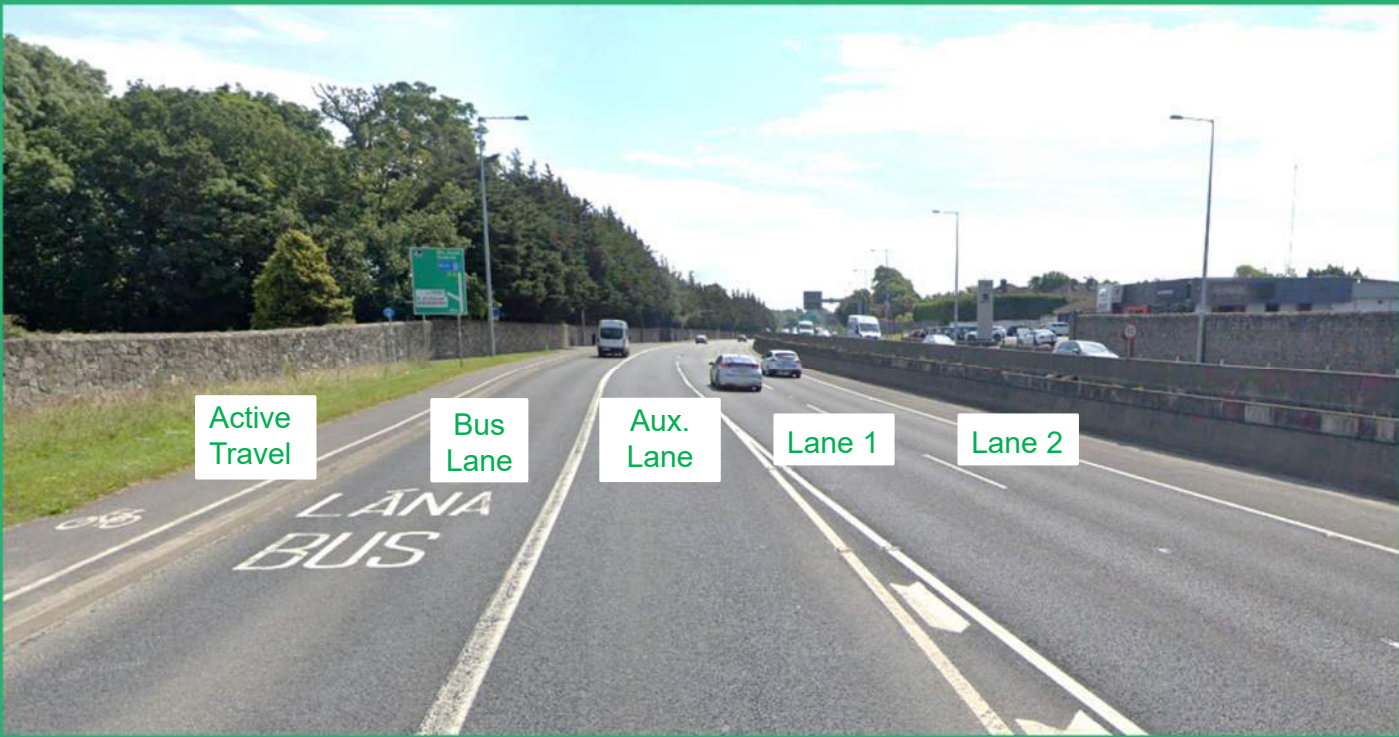


Junction 5 - Leixlip

Eastbound Parallel Service Road between Junction 5 and Junction 4a

Traffic on the M4/N4 that wants to exist at Junction 4a would be required to exit at Junction 5 and use the parallel road.





Active
Travel

Bus
Lane

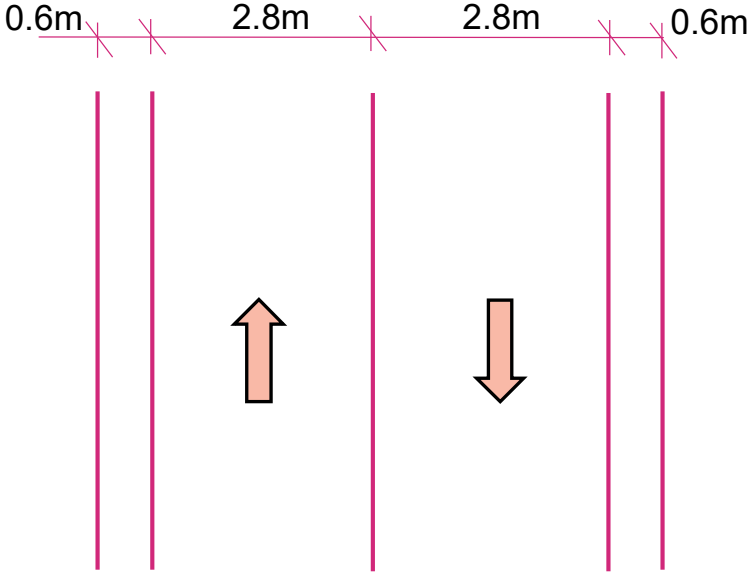
Aux.
Lane

Lane 1

Lane 2

L5041 Millfarm Overbridge

Existing Conditions

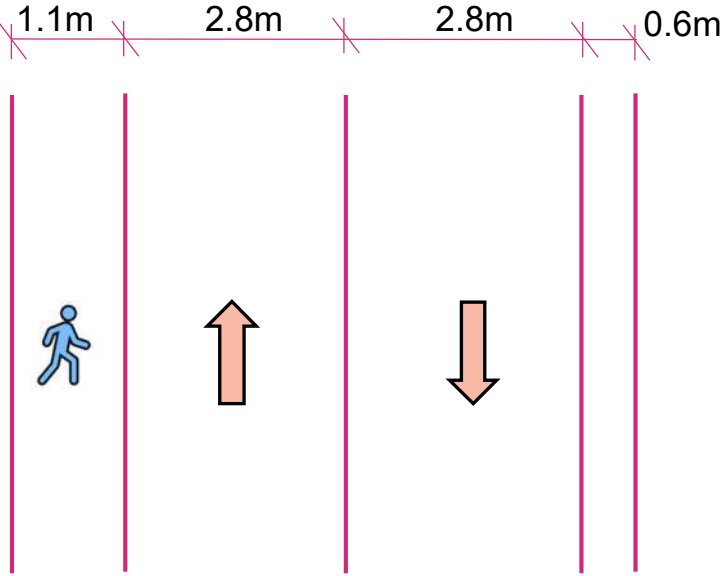


Existing Overbridge Cross Section



R408 Newtown Road Overbridge

Existing Conditions

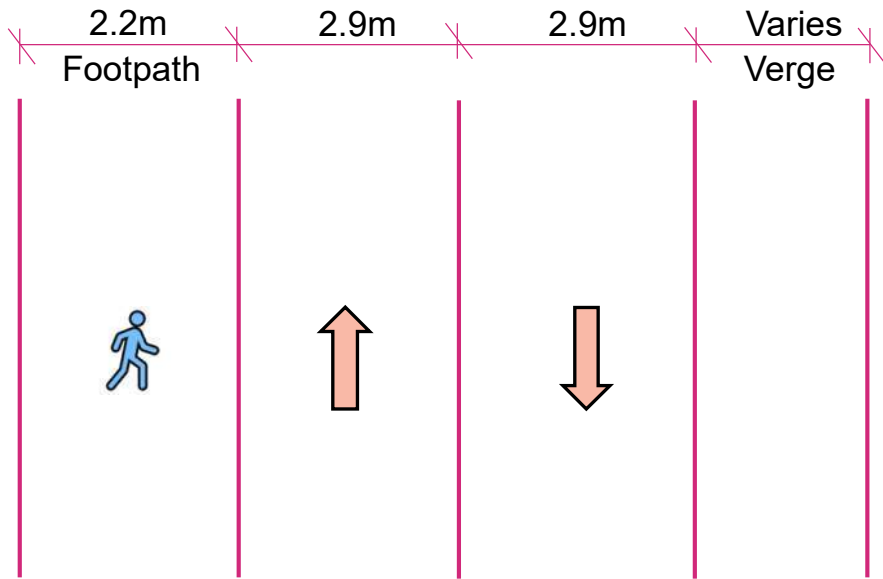


Existing Overbridge Cross Section

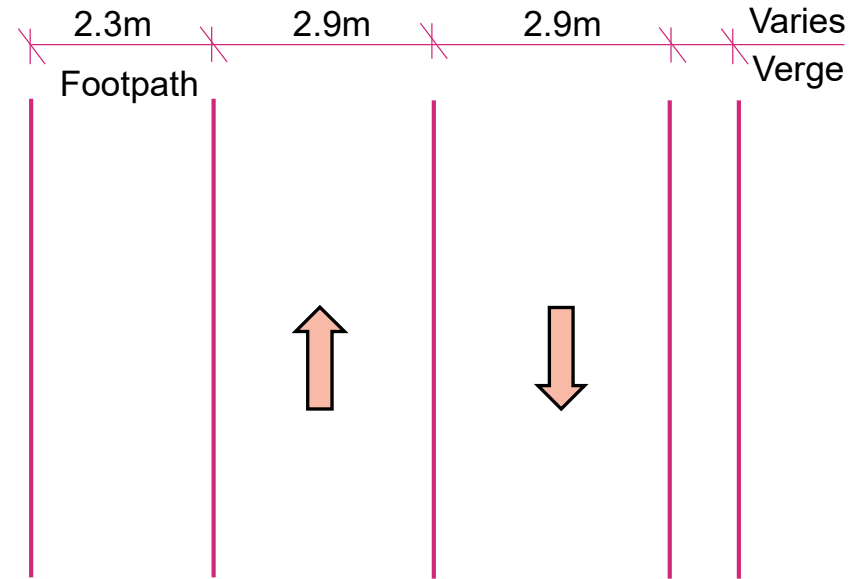


R408 Newtown Road Overbridge

Existing Conditions



Newtown Road Northern



Newtown Road Southern

R408 Newtown Road Overbridge

Existing Conditions

- Southern Tie-In
 - 2 x 2.9m Carriageway with Grassed Verge on Each Side
- Northern Tie-In
 - 2 x 2.9m Carriageway with 2.2m Footpath on Western Side and Grassed Verge on Eastern Side
- VRS Sporadically Located within Verge Throughout Length of Newtown Road
- Posted Speed Limit Varies Throughout Length of Newtown Road (80kph, 60kph and 50kph Observed)



R408 Newtown Road Overbridge

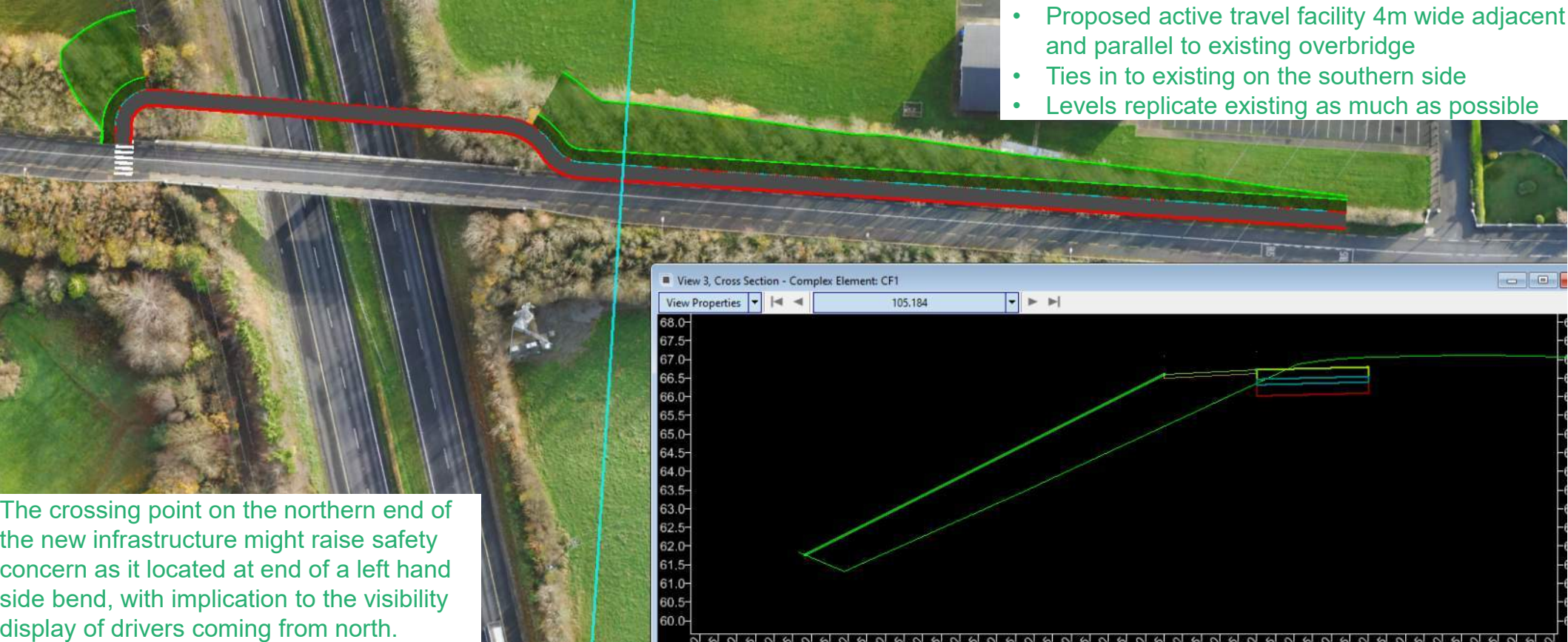
Sensitive Receptors

- Maynooth Town Football Club
- Maynooth Lodge Nursing Home
- Robinson Farms



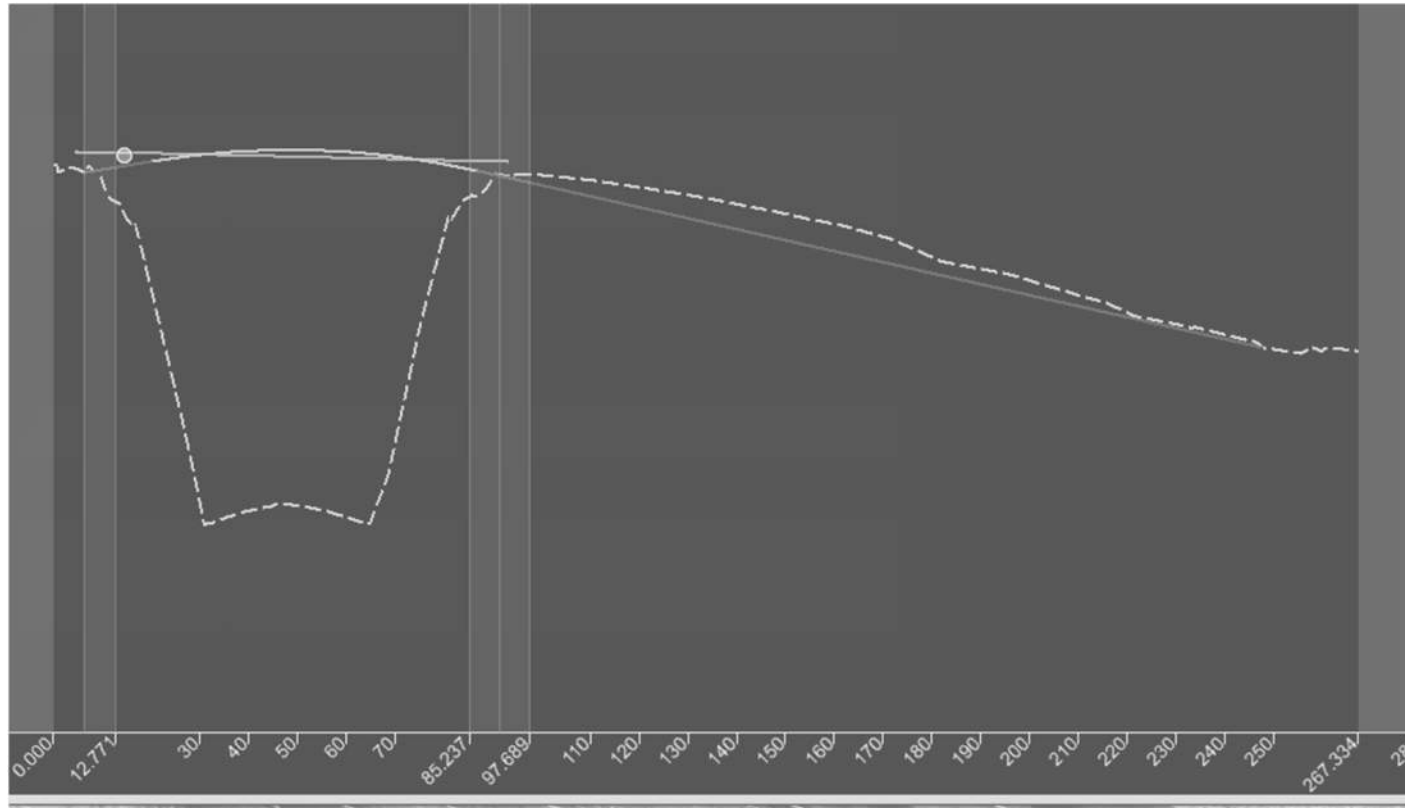
R408 Newtown Road Overbridge

New Active Travel Bridge to east of Existing Overbridge



R408 Newtown Road Overbridge

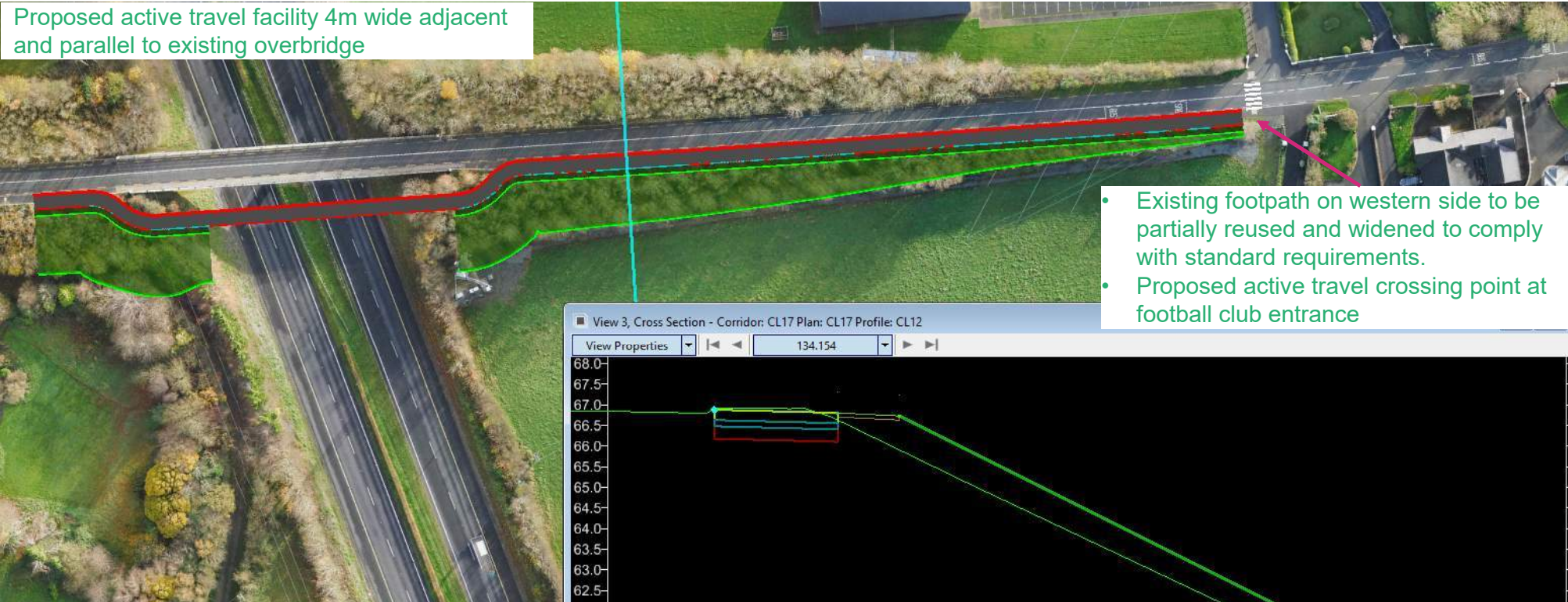
New Active Travel Bridge to east of Existing Overbridge



R408 Newtown Road Overbridge

New Active Travel Bridge to west of Existing Overbridge

Proposed active travel facility 4m wide adjacent and parallel to existing overbridge



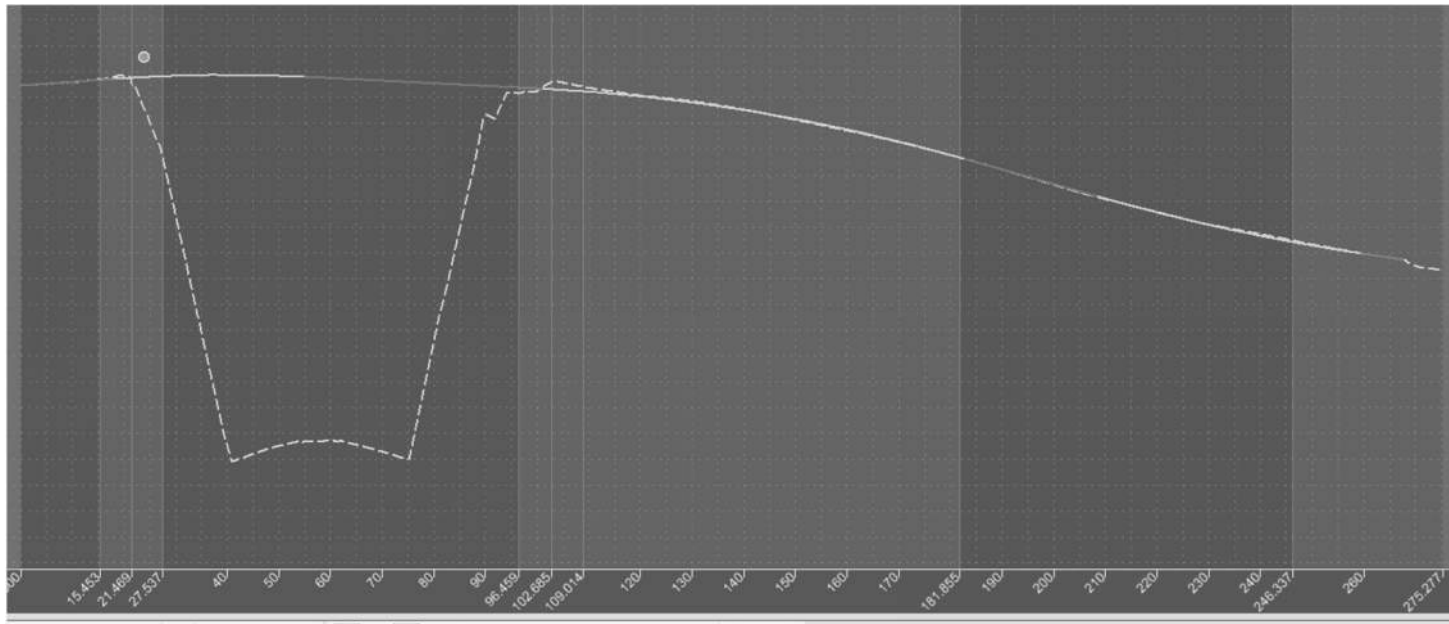
- Existing footpath on western side to be partially reused and widened to comply with standard requirements.
- Proposed active travel crossing point at football club entrance

- Ties in to existing on both sides of the bridge.
- Levels replicate existing as much as possible.
- Existing 1.7m wide footpath on western side



R408 Newtown Road Overbridge

New Active Travel Bridge to west of Existing Overbridge

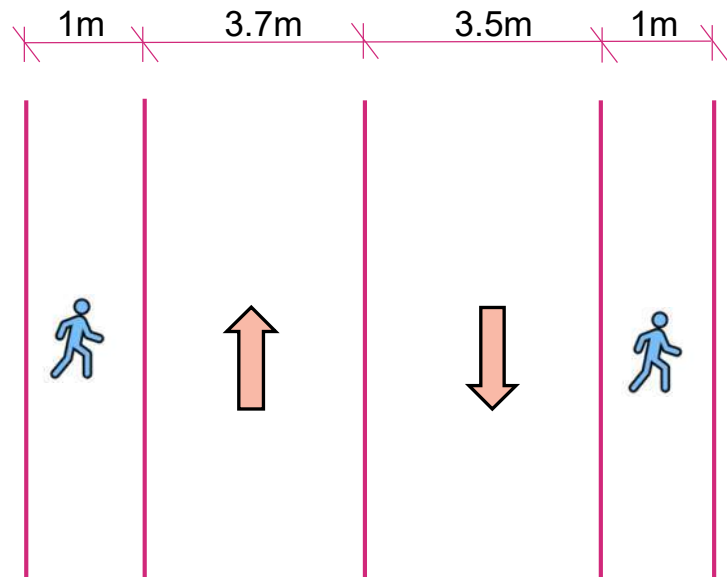


- Ties in to existing on both sides of the bridge
- Levels replicate existing as much as possible
- The existing overbridge includes a 1m wide footpath, which is retained
- Existing footpath on western side to be partially reused and widened to comply with standard requirements.
- Proposed active travel crossing point at football club entrance

R405 Ballygoran Overbridge

R405 Ballygoran Overbridge

Existing Conditions



Overbridge Cross Section



- The existing overbridge has 1m wide footpaths on both sides
- There are no existing facilities for active travel on the R405 or north and south of the overbridge

R405 Ballygoran Overbridge

Improve Active Travel Facilities on Existing Overbridge



- Upgrade the existing Overbridge to include 4m wide Pedestrian and Cycle facilities on both side of carriageway.
- North of overbridge, facilities to link into footpath on Southern side of R405 towards Maynooth.
- South of overbridge, facilities to link into exiting Ped/Cycle facilities joining Junction 6

R405 Ballygoran Overbridge Options

Do Min

Widen existing bridge to improve active travel facilities

New active travel bridge

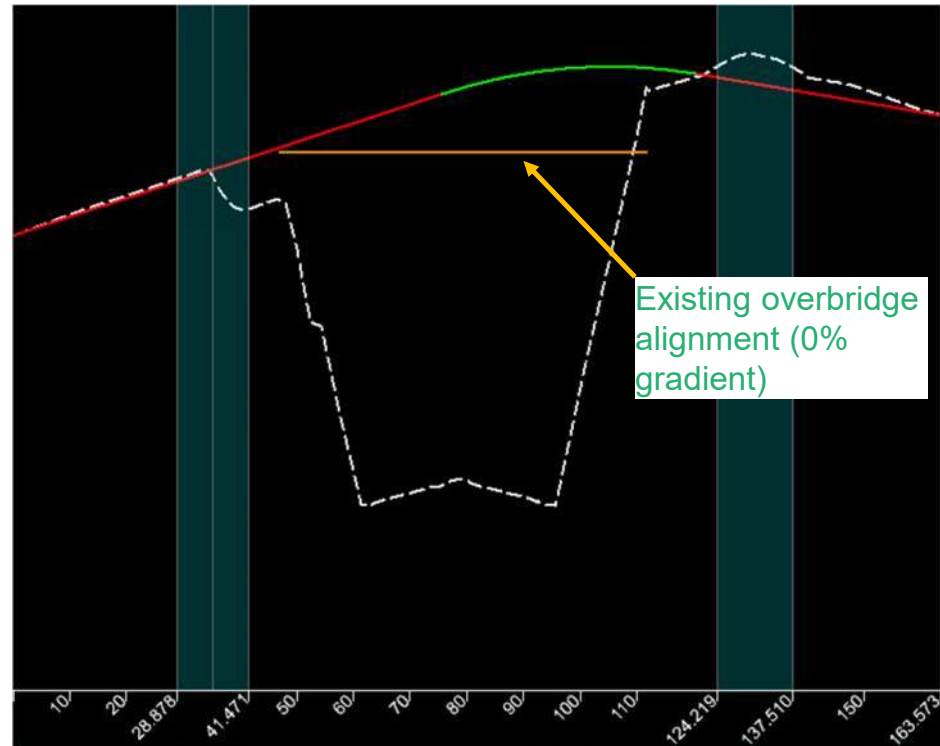
R405 Ballygoran Overbridge

New Active Travel Bridge to east of Existing Overbridge



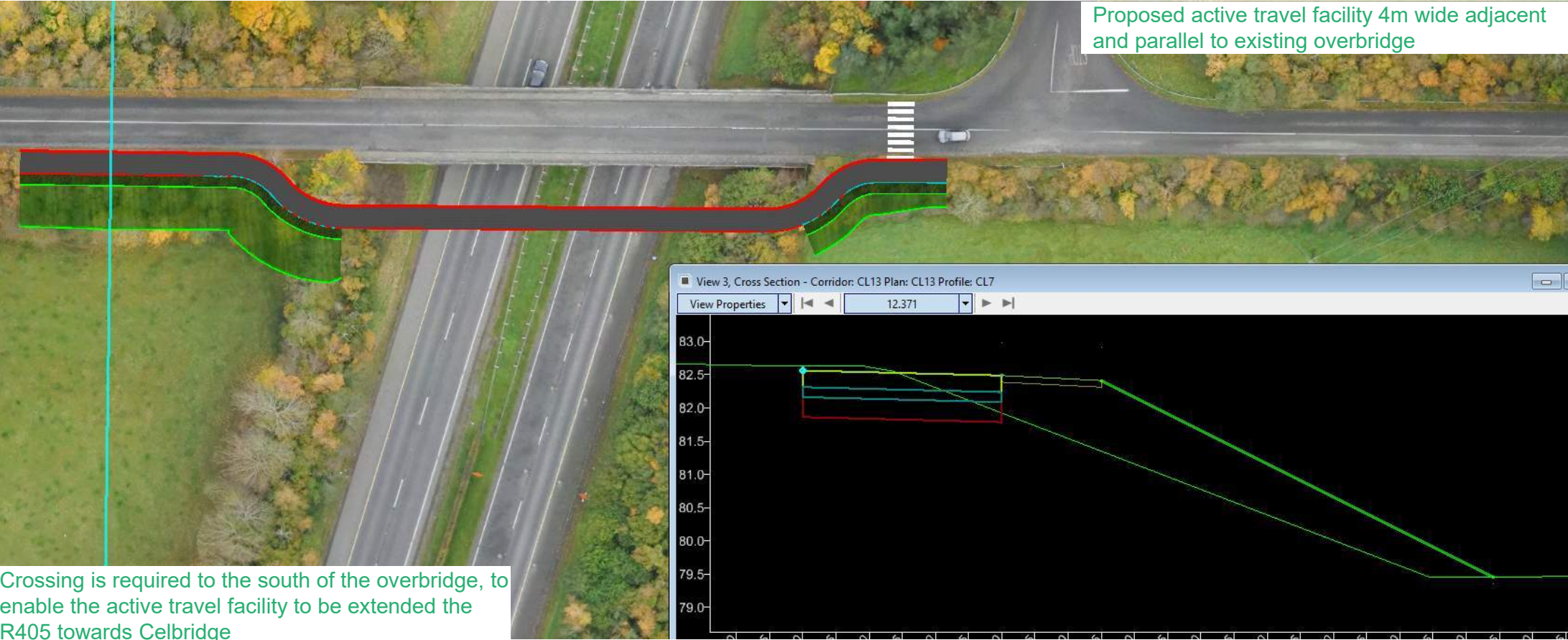
R405 Ballygoran Overbridge

New Active Travel Bridge to east of Existing Overbridge



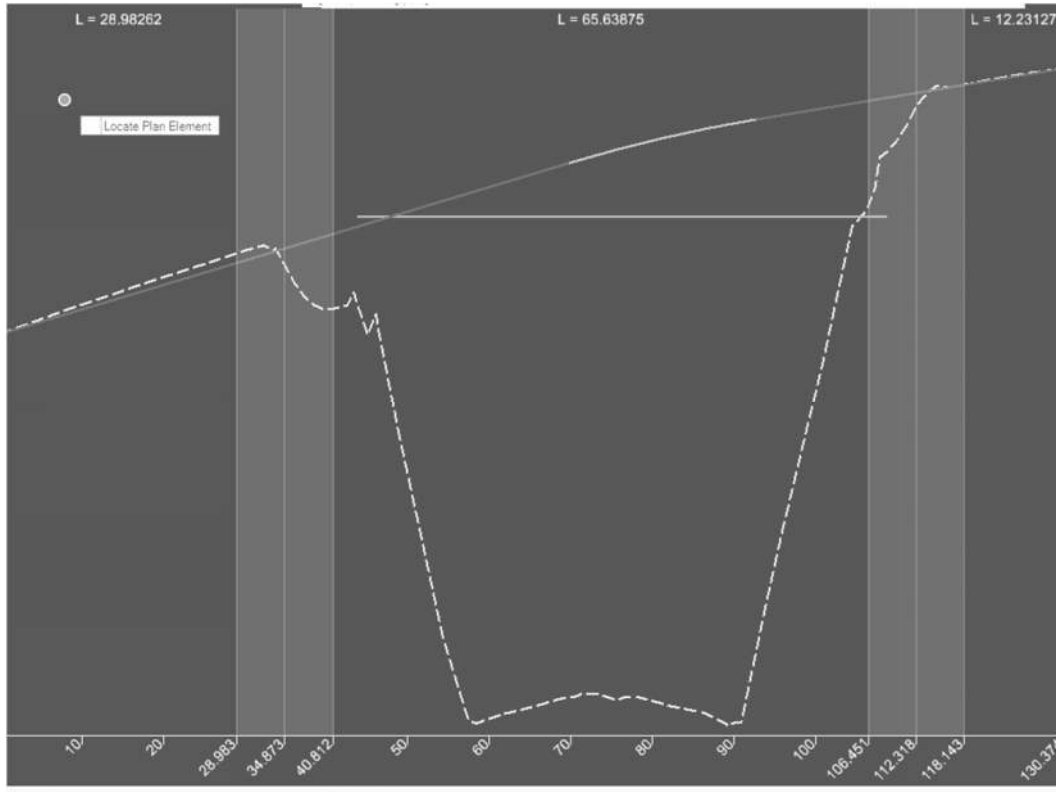
R405 Ballygoran Overbridge

New Active Travel Bridge to west of Existing Overbridge



R405 Ballygoran Overbridge

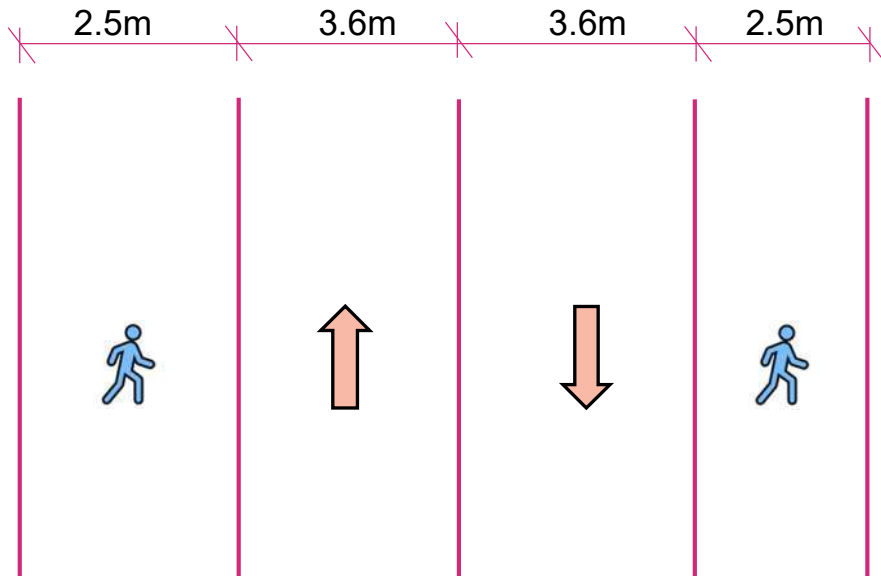
New Active Travel Bridge to west of Existing Overbridge



- Ties in to existing on both sides of the overbridge.
- The existing bridge gradient is 0% and shown in orange.
- The proposed vertical alignment for the active travel overbridge defers from the road OB alignment with a 3% max gradient on the northern side (Ch 0 to Ch 70) tying in the existing levels on both sides.

R404 Celbridge Overbridge

Existing Conditions



Overbridge Cross Section



- The existing overbridge has 2.5m wide footpaths on both sides
- There are no existing active travel facilities on the R405 immediately north or south of the overbridge

R404 Celbridge Overbridge

Existing Conditions



Cross Section north of Overbridge
(looking north at Wonderful Barn)



Cross Section south of Overbridge
(looking north at Kildare Innovation Campus)

R404 Celbridge Overbridge

Do Nothing

Required Widths - Technical Standards

TII National Roads – Active Travel

		Desirable Min (m)	One Step Below Desirable Min (m)
Shared Use One Way Cycle Facility with Pedestrians	Low Volume	3.0	2.0
	High Volume	4.0	3.0

*Threshold between High and Low volume is 1500 users/day.

It is assumed that the current use of the existing infrastructure is under 1500 users/day. The existing 2.5m is below desirable minimum for a National Road. Given that the R404 is a regional road, this may be acceptable.

However, Kildare Innovation Campus is being further developed with a focus on Sustainable Mobility. New technical industries establishing their operations will result in an increase of active travel users on the R404.

National Cycle Manual – Width Calculator

Width Calculator



A Inside Edge	B Cycling Regime	C Outside Edge	D Additional Features
Kerb 0.25m	Single File 0.75m	30kph, 3.0m wide lane 0.50m	Uphill 0.25m Sharp bends 0.25m
Channel Gully 0.25m	Single File + Overtaking, Partially using next lane 1.25m	50kph, 3.0m wide lane 0.75m	Cyclist stacking, Stopping and starting 0.50m
Wall, Fence or Crash Barrier 0.65m	Basic Two-Way 1.75m	Raised kerb, dropped Kerb or physical barrier 0.50m	Around primary schools, Interchanges, or for larger tourist bikes 0.25m
Poles or Bollards 0.50m	Single File + Overtaking, Partially using next lane 2.00m	Kerb to vegetation etc. (ie. cycleway) 0.25m	Taxi ranks, loading, line of parked cars 1.00m (min 0.8m)
	2 Abreast + overtaking (tracks and cycleways) 2.50m		Turning pocket cyclists 0.50m

R404 Overbridge: 0.65m + 1.25m + 0.50m = 2.4m
Existing width complies with the NCM

R404 Celbridge Overbridge

Do Something - New dedicated Active Travel Bridge (Parallel to Existing)



This option includes a 4m wide active travel facility

May not be required, given the proposed active travel bridge proposed by others, west of the existing R404 Celbridge Overbridge

R404 Celbridge Overbridge Options

Do Min

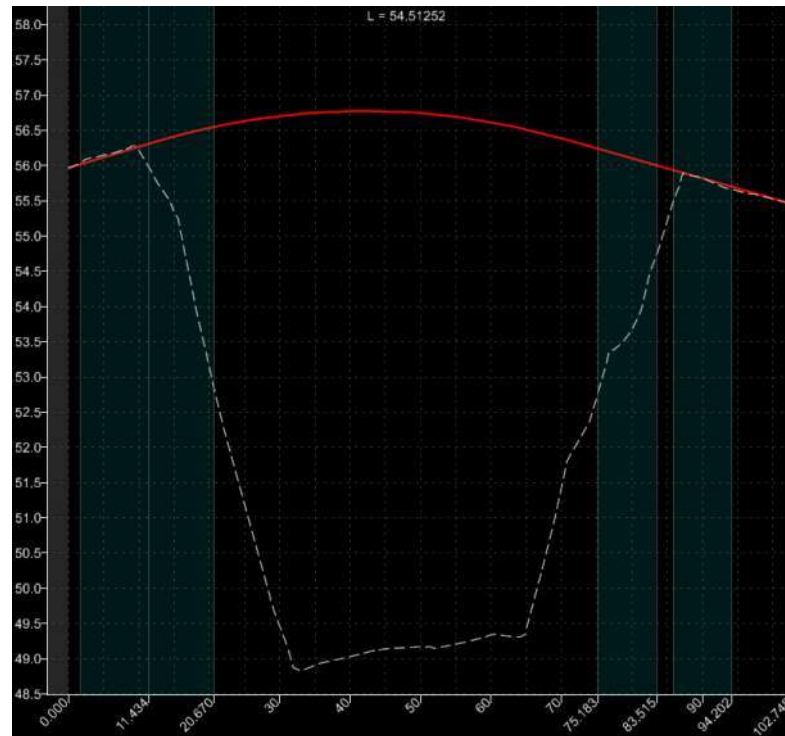
Widen existing bridge to improve active travel facilities

New active travel bridge

R404 Celbridge Overbridge

Do Something - New dedicated Active Travel Bridge (Parallel to Existing)

Vertical Alignment



R404 Celbridge Overbridge

Improve Existing Overbridge



Upgrade the existing Overbridge to include Cycle facilities on either side of carriageway. Footpath of approx. 2m already in place on bridge and north and south of bridge.

North of overbridge, facilities to link into entrance for Wonderful Barn

South of the overbridge, facilities to link into exiting footpath on both sides of carriageway



MAYNOOTH TO LEIXLIP PROJECT

Appendix 6.2A
Stage 2 PAM
Costs (OCE's) - Corridors

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Project title Maynooth to Leixlip Project

Job number

272691-00

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4-03-03-7-2

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Date

16 March 2023

Subject Phase 2 Stage 2 Project Appraisal Matrix (PAM) Cost Estimate – Corridor Options

1 Introduction

Arup has been appointed by Kildare County Council to provide multi-disciplinary technical consultancy services for the delivery of the Maynooth to Leixlip Project, on behalf of Kildare County Council and South Dublin County Council.

The Maynooth to Leixlip Project is being progressed in accordance with Transport Infrastructure Ireland’s Project Management Guidelines (PMGs). These guidelines provide a framework for the management, development and delivery of national road and public transport capital projects. The PMGs divide the evolution and progression of a project into an eight-phase process (Phase 0 – 7 inclusive). Arup has been appointed to progress the delivery of the project through Phases 1 to 4 of the PMGs.

The purpose of this assessment is to assess the likely costs for the Corridor options. An order of magnitude estimate has been developed using the feasibility design as a basis, which is deemed appropriate for Phase 2 Stage 2 of the project.

The purpose of this Technical Note is to present the findings of this assessment and to provide a summary of the Phase 2 Stage 2 cost estimate work completed to date.

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2 Overview

Corridor Option 1 and Corridor Option 2 have been advanced to Stage 2. The geometric design of Corridor Option 1 and Corridor Option 2 has not changed from Stage 1. Therefore, the Stage 2 corridor options design is identical to the Stage 1 design.

Corridor Option 1 consists of proposed hard shoulder bus priority measures within the hard shoulder in both the eastbound and westbound directions. Land required is within the current road reserve boundary.

Corridor Option 2 consists of proposed hard shoulder bus priority measures within the hard shoulder in both the eastbound and westbound directions. However, it differs to Corridor Option 1 in that it includes an additional third traffic lane in the westbound direction. Land required is within the current road reserve boundary.

3 Assumptions and Methodology

This section details the assumptions and methodology applied in developing the Stage 2 Option Comparison Estimates. The Option Comparison Estimates are presented in full in **Appendix A**.

Rates have been sourced and benchmarked against the following:

- Estimate costs for the M7 Naas to Newbridge Upgrade project, using cost information supplied by Kildare National Roads Office (KNRO);
- Estimate costs prepared for other TII projects, including the N11/M11 and N40; and
- TII Schedule of Rates (2019)¹ with 20% inflation on unit rates to bring costs in line with 2022.

¹ Transport Infrastructure Ireland, TII Schedule of Rates (CC-GMP-00054), October 2019

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4 Construction Cost Estimate

4.1 Overview

The methodology of developing the quantities and rates for each discipline are outlined in the following sections.

4.2 Site Clearance

A site clearance area was determined using the following approach:

- An offset of 3m at each verge and a 7m wide strip accounting for the central reserve was utilised in determining an approximate area to be considered for site clearance. A 20% contingency was applied to this number.
- A rate of €2,400/ha has been applied for site clearance for the corridor options. The TII Schedule of Rates provides a range of €250 to €2,000/ha for site clearance and it is assumed that €2,000 with a 20% inflation providing a 2022 rate of €2,400 is more appropriate due to the constrained nature of the corridor.

4.3 Fencing

- It has been assumed that new boundary fencing would be required where there were gaps in the existing fencing.
- A rate of €36/m has been applied for fencing for the corridor options. This rate is consistent with the TII Schedule of Rates 2019 with 20% inflation to bring unit costs to 2022 levels.

4.4 Safety Barriers

Based on a desktop review, many of the road restraint systems (safety barriers and bridge parapets) in-situ on the existing M4/N4 would appear not to be compliant with current TII standards. Due to the proposed works and sub-standard in-situ VRS, new safety barriers would typically be required on both the central reserve and the verge side. The following assumptions were made for safety barrier provision in compliance with the design of safety barriers as set out in *DN-REQ-03034 The Design of Road Restraint Systems (Vehicle and Pedestrian) for Roads and Bridges*:

- A vertical concrete barrier (VCB) is typically required along the full length of the central reserve. For the purposes of the high-level cost estimation for Option 1 (Widening), a VCB was priced for areas where the existing barrier was being impacted due to the widening of the carriageway. These VCB will provide a working width of W2 and achieve a minimum H2 level of containment. The corridor options will require amendments to the existing central reserve barrier.
- Additionally, for the corridor options, on the nearside verge side, a VRS (steel/VCB) is required at locations where hazards such as bridge piers / gantry supports / slopes require protection. A length of 65m with containment level H2 has been assumed for each such major hazard within the verge along the corridor. This allows for an approach length of 30m, departure length of 15m, assumed hazard length of 10m and terminal lengths of 5m each.

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- A rate of €120/m and €72/m was applied for VCBs in the central reserve and verge, respectively. This rate is consistent with the TII Schedule of Rates 2019 and 2022 inflation.

4.5 Drainage and Service Ducts

The majority of widening required for the corridor options will be into the central reserve. This will reduce the need of drainage intervention in the verge, where the majority of drainage infrastructure currently sits. However, Corridor Option 2 does widen into the verge.

A rate of €300,000/km has been applied for Corridor Option 1 and €350,000/km has been applied for Corridor Option 2, for the provision of new drainage infrastructure. This is developed taking cognisance of drainage costs for the M7 Naas to Newbridge Upgrade project, a widening project located in a constrained environment with a full drainage rebuild in both directions.

4.6 Earthworks

Cut and fill earthworks quantities have been extracted from the Open Roads Designer (ORD) 3D model. The extent of earthworks for the corridor options are limited and predominantly involves cutting into existing cut slopes to allow for the widened cross section.

The following rates have been applied for the various earthworks elements:

- Excavation of acceptable material – €4.75/m³
- Disposal of acceptable material – €5.09/m³

These are extracted from the upper band rates of the TII Schedule of Rates (2019) and include 20% inflation.

4.7 Pavement

The following approach has been assumed for pavement works:

- Pavement widening associated with each corridor options require new full depth pavement construction (sub-base, base, binder, and surface course). Pavement widening areas have been defined as areas where the proposed pavement edge extends beyond the existing pavement edge.
- For the corridor options, the existing hard shoulder will require full depth pavement construction. An example of pavement widening area is shown in Figure 1.

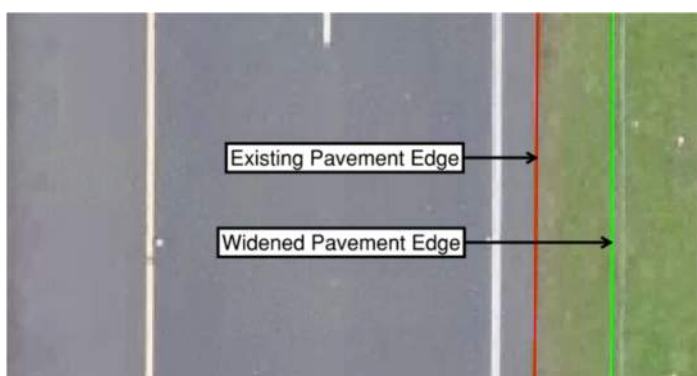


Figure 1: Example of Pavement Widening into the Central Reserve

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- Additionally, for the corridor options, it has been assumed that the existing pavement in lane 1 and lane 2 will be rehabilitated. This has been defined as removal and replacement of the surface course and binder course.
- An allowance for regulating course has not been made at this stage.
- The following approximate rates have been applied for the various elements of pavement construction depending on new versus existing pavement:
 - Sub-base, Granular Type B to Clause 804, 150mm thick – €28.20/m³
 - Road Base (AC 32 Dense base 40/60) 2 Layers – €20.40/m² per layer
 - Binder Course (AC 20 Dense bin 55mm) – €9.00/m² - €12/m²
 - Surface Course (SMA 40mm) – €10.20/m²

These are extracted from the TII Schedule of Rates (2019) and sit between the lower and upper bands of the rates with a 20% uplift for 2022 inflation values.

4.8 Kerbs, Footways and Paved Areas

An allowance of €25,000/km has been applied for the provision of kerbs, footways, and paved areas along the length of the project for the corridor options. This is a per km rate taking cognisance of the costs of the M7 Naas to Newbridge Upgrade project.

4.9 Traffic Signs & Road Markings

An allowance of €68,400/km has been applied for the provision of general traffic signs and road markings for the corridor options.

This is a per km rate which has been derived from the costs for the M7 Naas to Newbridge Upgrade project and is expected to cover the relocation of impacted signage, and re-application of line markings to suit the revised alignment for the project.

Associated additional signage for the corridor options has been allocated based on guidance outlined in the emerging TII standard for the implementation of bus facilities on motorways and dual carriageways. The standard calls for signage at entry points – including all merges, exit points – including all diverges and at 1km intervals. Signage should be positioned in the nearside verge and display full operational speeds. A rate of €20,000/km has been allocated for the specific hard shoulder bus priority measure signage based on a desktop review of the sign sizes adopted on the M1 Belfast project. The rate represents the upper bound of the TII Schedule of Rates for a sign approximately 10m² supported by three tubular posts. It is noted that this is based on information currently available and may need to be amended during future design development.

4.10 Lighting and Electrical

An allowance of €16,560/km for lighting and electrical has been applied for both corridor options. This is a per km rate taking cognisance of the costs of the M7 Naas to Newbridge Upgrade project and is expected to cover the relocation of any impacted lighting columns. An allowance for permanent ITS equipment to monitor the safe operations of the bus priority measures has been included under this heading.

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4.11 Landscaping and Environmental

An allowance of €27,600/km has been applied for landscaping and environmental works for the corridor options. This is a per km rate which has been derived from the costs for the M7 Naas to Newbridge Upgrade project.

4.12 Structures

Allowances for remedial works to the River Liffey Bridge have been made based on the extent of works on the bridges.

A rate of €300/m² has been applied for the corridor options which is expected to cover remedial works including removal existing concrete verges, widening of trafficable areas, replacement of parapets etc.

A rate of €4,000/m² has been applied for a new structure to carry the hard shoulder bus priority measure over the River Liffey.

4.13 Accommodation Works

At this stage, accommodation works are not envisaged to impact greatly on either corridor option. A rate of €10,000/km has been applied for Corridor Option 1 and €30,000/km for Corridor Option 2.

4.14 Statutory Authorities & Utilities

The high-level cost estimate has been developed prior to the undertaking of site investigation works, therefore the impacts on utilities and utility diversions may need to be amended during future design development. Considering the above, the following approach has been taken:

- A general allowance of €100,000/km for the corridor options has been made for costs associated with statutory authorities and utilities. This allowance has been made based on an estimated proportion of total contract cost only, and these costs are subject to change during future design development.

4.15 Preliminaries

A 20% rate has been applied for Preliminaries for the corridor options including traffic management.

4.16 Risk Contingency

A 20% risk contingency has been allowed for the corridor options which is considered appropriate for this stage of the design development.

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4.17 Main Construction Contract Estimate

The Main Construction Contract (MCC) estimate and breakdown for the corridor options by discipline is presented in Table 1. These have been developed based on information currently available and are subject to change during future design development. The estimate is provided in further detail in **Appendix A**.

Table 1: Total Main Construction Contract (MCC) Cost Estimate – Corridor Options

Item Description	Corridor Option 1	Corridor Option 2
Site Clearance	€31,000	€31,000
Fencing	€144,000	€144,000
Safety Barriers	€898,000	€898,000
Drainage and Service Ducts	€2,493,000	€2,908,000
Earthworks	€167,000	€352,000
Pavement	€7,868,000	€9,911,000
Kerbs, Footways and Paved Areas	€207,000	€207,000
Traffic Signs & Road Markings	€734,000	€734,000
Lighting and Electrical	€137,000	€137,000
Landscaping & Environmental	€229,000	€229,000
Structures	€828,000	€3,948,000
Accommodation Works	€83,000	€249,000
Statutory Authorities and Utilities	€831,000	€831,000
Any Other Obligations and Liabilities of the Contractor	€831,000	€831,000
Preliminaries @ 20% incl. Temporary Traffic Management	€3,063,000	€4,249,000
Project Specific Risk Contingency @ 20%	€3,676,000	€5,099,000
MCC Base Cost Total (excl. VAT)	€22,060,000	€30,599,000
Add VAT @ 13.5%	€2,978,000	€4,130,000
MCC Base Cost Total	€25,038,000	€34,730,000

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5 Total Level 2 Estimate

5.1 Overview

The methodology for developing the Level 2 Estimate is outlined in the following sections.

5.2 Main Construction Contract

Refer to Section 4.

5.3 Land and Property

Land and property costs are not envisaged to be high due to the minimum widening required for the corridor options. Corridor Option 1 has no envisaged land and property costs. Corridor Option 2 has been provided with a lump sum of €1,000,000.

5.4 Planning and Design

The cost of the Local Authority's fees and the Consultant's fees are included in this item based on a percentage of Main Construction Contract base cost.

A 5% rate of the Main Construction Contract base cost has been applied for the corridor options, which is deemed appropriate for Phase 2 Stage 2 of the project.

5.5 Archaeology

Corridor Option 1 has been given a lump sum rate of €200,000. Corridor Option 2 has a lump sum rate of €400,000.

5.6 Enabling Works and Other Contracts

A 2.5% rate of the Main Construction Contract base cost has been applied for the corridor options, which is deemed appropriate for Phase 2 Stage 2 of the project.

5.7 Main Contract Supervision (Employer's Costs)

A rate of 5% of the Main Construction Contract base cost has been applied for the corridor options, which is deemed appropriate for Phase 2 Stage 2 of the project.

5.8 Walking/Cycling/Asset Renewal

A rate of 5% of the Main Construction Contract base cost has been applied for the corridor options, which is deemed appropriate for Phase 2 Stage 2 of the project.

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5.9 Summary

The Total Level 2 Estimate and breakdown for the Corridor Options is presented in Table 2. These have been developed based on information currently available and are subject to change during future design development. The estimate is provided in further detail in **Appendix A**. Please note the following:

- Figures are inclusive of VAT;
- Figures are inclusive of Project Specific Risk Contingency;
- Figures are inclusive of provision for Inflation; and
- Total base costs include for all qualifying costs under each cost heading.

Table 2: Total Level 2 Estimate – Corridor Options

Description	Corridor Option 1	Corridor Option 2
Main Construction Contract	€25,038,000	€34,730,000
Land and Property	-	€1,100,000
Planning and Design	€1,665,000	€2,309,000
Archaeology	€256,000	€513,000
Advance Works and Other Contracts	€733,000	€1,072,000
Main Contract Supervision (Employer's Costs)	€1,665,000	€2,309,000
Walking/Cycling/Asset Renewal	€1,546,000	€2,144,000
Total Level 2 Estimate	€30,943,000	€44,179,000

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6 Conclusions

The Phase 2 Stage 2 Total Level 2 Estimates have been determined as follows:

- Corridor Option 1: circa €31m including VAT; and
- Corridor Option 2: circa €44m including VAT;

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	Gerard Hall	Stephen Barry	Zita Langenbach
Signature			

Appendix A
Estimate Breakdown

Maynooth to Leixlip Project		16/03/2023		S3-P01	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Corridor Option 1			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€31,116
b	Fencing	Various	m	Various	€144,000
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€898,200
d	Drainage and Service Ducts	Various	km	460000	€2,493,300
e	Earthworks	Various	m3	Various	€167,327
f	Pavement	Various	Various	Various	€7,868,964
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€207,775
h	Traffic Signs & Roadmarkings	Various	Various	Various	€568,472
k	Lighting and Electrical	Various	Various	Various	€137,630
l	Landscaping and Environmental	Various	Various	Various	€229,384
m	Structures	Various	Various	Various	€828,000
n	Accommodation Works	Various	Various	Various	€83,110
p	Statutory Authorities & Utilities	Various	Various	Various	€831,100
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€831,100
s	Preliminaries	Various	Various	Various	€3,063,896
Total Base Cost for Main Construction Contract (Excluding VAT)					€18,383,374
Add Project Specific Risk Contingency					20% €3,676,675
Sub-Total exclusive of VAT					€22,060,049
Add VAT at					13.5% €2,978,107
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€25,038,156
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	€0
Total Base Cost for Land and Property					€0
Add Project Specific Risk Contingency					10% €0
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€0
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known				5%	€1,251,908
Add Project Specific Risk Contingency				10%	€125,191
Add VAT at				23%	€287,939
Total P&D Base Cost plus Project Specific Risk Contingency					€1,665,037
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€200,000
Add Project Specific Risk Contingency				10%	€20,000
Add VAT at				18.3%	€36,600
Total Archaeology Base Cost plus Project Specific Risk Contingency					€256,600
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known				2.5%	€625,954
Add Project Specific Risk Contingency				10%	€62,595
Add VAT at				13.5%	€84,504
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€773,053
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known				5%	€1,251,908
Add Project Specific Risk Contingency				10%	€125,191
Add VAT at				23%	€287,939
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€1,665,037
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost				5%	€1,251,908
Add Project Specific Risk Contingency				10%	€125,191
Add VAT at				13.5%	€169,008
Total Residual Network Base Cost plus Project Specific Risk Contingency					€1,546,106
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€30,943,990
Mainline Length		8.3	km	Rate per km	€3,723,257
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project		16/03/2023	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Corridor Option 1	
Arup		Gerard Hall	
Main Construction Cost - Base Cost Estimate			
Summary			
A	Site Clearance		€31,116
B	Fencing		€144,000
C	Safety Barriers and Pedestrian Guardrails		€898,200
D	Drainage and Service Ducts		€2,493,300
E	Earthworks		€167,327
F	Pavement		€7,868,964
G	Kerbs, Footways and Paved Areas		€207,775
H	Traffic Signs		€568,472
J	Roadmarking		€0
K	Lighting and Electrical		€137,630
L	Landscaping and Environmental		€229,384
M	Structures (Including Tunnels to be separately identified)		€828,000
N	Accommodation Works		€83,110
P	Statutory Authorities & Utilities		€831,100
Q	Any Other Obligations and Liabilities of the Contractor		€831,100
	Sub-Total		€15,319,479
S	Preliminaries		€3,063,896
MCC Base Cost Total excluding Project Specific Risk Contingency			€18,383,374
Add Project Specific Risk Contingency		20 %	€3,676,675
MCC Base Cost Total including Project Specific Risk Contingency			€22,060,049
Add VAT at		13.5 %	€2,978,107
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€25,038,156
Mainline Length		8.3 km	
MCC Cost per km based on Mainline Length Only		€3,012,653	
Schedule of Works			
		Quantity	Unit
			Rate/Prices
			Totals
A	Site Clearance		
A1.1	General Site Clearance (Greenfield)	13.0	Ha
	Site Clearance Total to Summary		€31,116
B	Fencing		
B.1	Permanent Boundary Fencing	4,000	m
	Fencing Total to Summary		€144,000
C	Safety Barrier and Pedestrian Guardrails		
C.1	Safety Barrier (Specify Type)	11,760	m
C.2	Median Barrier (Specify Type e.g. Concrete or Wire)	429	m
	Safety Barrier and Pedestrian Guardrails Total to Summary		€898,200
D	Drainage and Service Ducts		
D.1	Drainage and Service Ducts per km (Mainline)	8.3	km
	Drainage and Service Ducts Total to Summary		€2,493,300
E	Earthworks		

Maynooth to Leixlip Project		16/03/2023			
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Corridor Option 1			
Arup		Gerard Hall			
Mainline					
E.1 Excavation - Acceptable	18,118	m3	€4.75	€86,097	
E.2 Disposal - U1	15,965	m3	€5.09	€81,230	
Earthworks Sub-Total				€167,327	
F Pavement					
New Pavement					
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	8,630	m3	€28.20	€243,377	
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	115,072	m2	€20.40	€2,347,469	
F.3 Binder Course (AC 20 Dense bin 55mm)	57,536	m2	€9.00	€517,824	
F.4 Surface Course (SMA 40mm)	57,536	m2	€10.20	€586,867	
F.5 Milling Existing Pavement (100mm including disposal)	57,536	m2	€6.00	€345,216	
Existing Pavement					
F.2 Binder Course (AC 20 Dense bin 55mm)	145,008	m2	€12.00	€1,740,096	
F.3 Surface Course (SMA 40mm)	145,008	m2	€10.20	€1,479,082	
F.4 Milling Existing Pavement (100mm including disposal)	145,008	m2	€4.20	€609,034	
Pavement Total to Summary				€7,868,964	
G Kerbs Footways and Paved Areas					
Allowance based on project scope and historical costs	8.3	km	€25,000	€207,775	
				€207,775	
H Traffic Signs & Roadmarkings					
Additional Signage for Bus Priority Measures	8.3	km	€20,000	€166,220	
Allowance based on project scope and historical costs	8.3	km	€68,400	€568,472	
				€734,692	
J Roadmarkings					
Allowance based on project scope and historical costs	8.3	sum		€0	
K Lighting and Electrical					
Allowance based on project scope and historical costs	8.3	sum	€16,560	€137,630	
				€137,630	
L Landscaping and Environmental					
Allowance based on project scope and historical costs	8.3	sum	€27,600	€229,384	
				€229,384	
M Structures (Including Tunnels to be separately identified)					
Liffey Bridge - Remedial					
M.1 Remedial works to existing bridge	2,760	m2	€300	€828,000	
Structures Total to Summary				€828,000	
N Accommodation Works					
Allowance based on project scope and historical costs	8.3	sum	€10,000	€83,110	
				€83,110	
P Statutory Authorities & Utilities					
Allowance based on project scope and historical costs	8.3	sum	€100,000	€831,100	
				€831,100	
Q Any Other Obligations and Liabilities of the Contractor					
Allowance based on project scope and historical costs	8.3	sum	€100,000	€831,100	
				€831,100	
S Preliminaries					
R.2 All Preliminary Items inc. TTM	20%	sum	€3,063,896	€3,063,896	
Preliminaries Total to Summary				€3,063,896	
N.B. Figures are exclusive of VAT except where expressly stated above.					
Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.					
Total base costs to include for ALL qualifying costs under each cost heading.					
Refer to the NRA Cost Management Manual for information on coverage and format of back-up.					
See attached Budget Assumptions Sheet for Further Scheme Information.					

Maynooth to Leixlip Project		16/03/2023		S3-P01	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Corridor Option 2			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€31,116
b	Fencing	Various	m	Various	€144,000
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€898,200
d	Drainage and Service Ducts	Various	km	460000	€2,908,850
e	Earthworks	Various	m3	Various	€352,691
f	Pavement	Various	Various	Various	€9,911,815
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€207,775
h	Traffic Signs & Roadmarkings	Various	Various	Various	€568,472
k	Lighting and Electrical	Various	Various	Various	€137,630
l	Landscaping and Environmental	Various	Various	Various	€229,384
m	Structures	Various	Various	Various	€3,948,000
n	Accommodation Works	Various	Various	Various	€249,330
p	Statutory Authorities & Utilities	Various	Various	Various	€831,100
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€831,100
s	Preliminaries	Various	Various	Various	€4,249,893
Total Base Cost for Main Construction Contract (Excluding VAT)					€25,499,356
Add Project Specific Risk Contingency					20% €5,099,871
Sub-Total exclusive of VAT					€30,599,227
Add VAT at					13.5% €4,130,896
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€34,730,123
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	€1,000,000
Total Base Cost for Land and Property					€1,000,000
Add Project Specific Risk Contingency					10% €100,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€1,100,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €1,736,506
Add Project Specific Risk Contingency					10% €173,651
Add VAT at					23% €399,396
Total P&D Base Cost plus Project Specific Risk Contingency					€2,309,553
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€400,000
Add Project Specific Risk Contingency					10% €40,000
Add VAT at					18.3% €73,200
Total Archaeology Base Cost plus Project Specific Risk Contingency					€513,200
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €868,253
Add Project Specific Risk Contingency					10% €86,825
Add VAT at					13.5% €117,214
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€1,072,293
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €1,736,506
Add Project Specific Risk Contingency					10% €173,651
Add VAT at					23% €399,396
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€2,309,553
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €1,736,506
Add Project Specific Risk Contingency					10% €173,651
Add VAT at					13.5% €234,428
Total Residual Network Base Cost plus Project Specific Risk Contingency					€2,144,585
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€44,179,307
Mainline Length		8.3	km	Rate per km	€5,315,763
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	16/03/2023
Phase 2 Stage 2: Project Appraisal Matrix (PAM)	Corridor Option 2
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€31,116
B	Fencing		€144,000
C	Safety Barriers and Pedestrian Guardrails		€898,200
D	Drainage and Service Ducts		€2,908,850
E	Earthworks		€352,691
F	Pavement		€9,911,815
G	Kerbs, Footways and Paved Areas		€207,775
H	Traffic Signs		€568,472
J	Roadmarking		€0
K	Lighting and Electrical		€137,630
L	Landscaping and Environmental		€229,384
M	Structures (Including Tunnels to be separately identified)		€3,948,000
N	Accommodation Works		€249,330
P	Statutory Authorities & Utilities		€831,100
Q	Any Other Obligations and Liabilities of the Contractor		€831,100
	Sub-Total		€21,249,463
S	Preliminaries		€4,249,893
MCC Base Cost Total excluding Project Specific Risk Contingency			€25,499,356
	Add Project Specific Risk Contingency	20 %	€5,099,871
MCC Base Cost Total including Project Specific Risk Contingency			€30,599,227
	Add VAT at	13.5 %	€4,130,896
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€34,730,123
	Mainline Length	8.3 km	
	MCC Cost per km based on Mainline Length Only	€4,178,814	

Schedule of Works		Quantity	Unit	Rate/Prices	Totals
A Site Clearance					
A1.1	General Site Clearance (Greenfield)	13.0	Ha	€2,400	€31,116
Site Clearance Total to Summary					€31,116
B Fencing					
B.1	Permanent Boundary Fencing	4,000	m	€36	€144,000
Fencing Total to Summary					€144,000

Maynooth to Leixlip Project		16/03/2023		
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Corridor Option 2		
Arup		Gerard Hall		
C Safety Barrier and Pedestrian Guardrails				
C.1 Safety Barrier (Specify Type)	11,760	m	€72	€846,720
C.2 Median Barrier (Specify Type e.g. Concrete or Wire)	429	m	€120	€51,480
Safety Barrier and Pedestrian Guardrails Total to Summary				€898,200
D Drainage and Service Ducts				
D.1 Drainage and Service Ducts per km (Mainline)	8.3	km	€350,000	€2,908,850
Drainage and Service Ducts Total to Summary				€2,908,850
E Earthworks				
Mainline				
E.1 Excavation - Acceptable	37,036	m3	€4.75	€175,995
E.2 Disposal - U1	34,728	m3	€5.09	€176,696
Earthworks Sub-Total				€352,691
F Pavement				
New Pavement				
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	12,994	m3	€28.20	€366,420
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	173,248	m2	€20.40	€3,534,259
F.3 Binder Course (AC 20 Dense bin 55mm)	86,624	m2	€9.00	€779,616
F.4 Surface Course (SMA 40mm)	86,624	m2	€10.20	€883,565
F.5 Milling Existing Pavement (100mm including disposal)	86,624	m2	€6.00	€519,744
Existing Pavement				
F.2 Binder Course (AC 20 Dense bin 55mm)	145,008	m2	€12.00	€1,740,096
F.3 Surface Course (SMA 40mm)	145,008	m2	€10.20	€1,479,082
F.4 Milling Existing Pavement (100mm including disposal)	145,008	m2	€4.20	€609,034
Pavement Total to Summary				€9,911,815
G Kerbs Footways and Paved Areas				
Allowance based on project scope and historical costs	8.3	km	€25,000	€207,775
				€207,775
H Traffic Signs & Roadmarkings				
Additional Signage for Bus Priority Measures	8.3	km	€20,000	€166,220
Allowance based on project scope and historical costs	8.3	km	€68,400	€568,472
				€734,692
J Roadmarkings				
Allowance based on project scope and historical costs	8.3	sum		€0
K Lighting and Electrical				
Allowance based on project scope and historical costs	8.3	sum	€16,560	€137,630
				€137,630
L Landscaping and Environmental				
Allowance based on project scope and historical costs	8.3	sum	€27,600	€229,384
				€229,384
M Structures (Including Tunnels to be separately identified)				
Liffey Bridge				
M.1 Remedial works to existing bridge	2,760	m2	€300	€828,000
M.2 New Structure in Westbound Direction only	780	m2	€4,000	€3,120,000
Structures Total to Summary				€3,948,000
N Accommodation Works				
Allowance based on project scope and historical costs	8.3	sum	€30,000	€249,330
				€249,330
P Statutory Authorities & Utilities				
Allowance based on project scope and historical costs	8.3	sum	€100,000	€831,100
				€831,100
Q Any Other Obligations and Liabilities of the Contractor				

Maynooth to Leixlip Project		16/03/2023		
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Corridor Option 2		
Arup		Gerard Hall		
Allowance based on project scope and historical costs	8.3	sum	€100,000	€831,100
				€831,100
S Preliminaries				
R.2 All Preliminary Items inc. TTM	20%	sum	€4,249,893	€4,249,893
Preliminaries Total to Summary				€4,249,893
<p>N.B. Figures are exclusive of VAT except where expressly stated above.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>				



MAYNOOTH TO LEIXLIP PROJECT

Appendix 6.2B

Stage 2 PAM

Costs (OCE's) - Junction 7

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Project title	Maynooth to Leixlip Project	Job number	272691-00
cc	Stephen Cummins Kevin Tynan Zita Langenbach Stephen Barry	File reference	4-03-03-7-3
Prepared by	Gerard Hall	Date	28 September 2023
Subject	Phase 2 Stage 2 Project Appraisal Matrix (PAM) Cost Estimate – Junction 7 Options		

1 Introduction

Arup has been appointed by Kildare County Council to provide multi-disciplinary technical consultancy services for the delivery of the Maynooth to Leixlip Project, on behalf of Kildare County Council and South Dublin County Council.

The Maynooth to Leixlip Project is being progressed in accordance with Transport Infrastructure Ireland's Project Management Guidelines (PMGs). These guidelines provide a framework for the management, development and delivery of national road and public transport capital projects. The PMGs divide the evolution and progression of a project into an eight-phase process (Phase 0 – 7 inclusive). Arup has been appointed to progress the delivery of the project through Phases 1 to 4 of the PMGs.

The purpose of this assessment is to assess the likely costs of the Junction 7 options. An order of magnitude estimate has been developed using the feasibility design as a basis, which is deemed appropriate for Phase 2 Stage 2 of the project.

The purpose of this Technical Note is to present the findings of this assessment and to provide a summary of the Phase 2 Stage 2 cost estimate work.

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2 Overview

Two options have been brought forward to Phase 2 Stage 2:

- Option 1: Maintain and Optimise/Improve the existing junction; and
- Option 2: Provide one new junction and convert the existing junction to an overbridge.

3 Assumptions and Methodology

This section details the assumptions and methodology applied in developing the Stage 2 Option Comparison Estimates. The Option Comparison Estimates are presented in full in Appendix A.

Rates have been sourced and benchmarked against the following:

- Estimate costs for the M7 Naas to Newbridge Upgrade project, using cost information supplied by Kildare National Roads Office (KNRO);
- Professional judgement based on market rates and inflation in 2023;
- Estimate costs prepared for other TII projects, including the N11/M11 and N40; and
- TII Schedule of Rates (2023) - Upper.

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4 Construction Cost Estimate – Junction 7 Options

4.1 Overview

The methodology of developing the quantities and rates for each discipline are outlined in the following sections.

4.2 Site Clearance

A rate of €4,094/Ha as per Schedule of Rates (2023) - Upper was applied. Professional judgement dictated that a lump sum rate of €50,000 be applied for the Junction 7 Options.

4.3 Fencing

It has been assumed that new boundary fencing would be required along the perimeter of the Junction 7 Options. A rate of €48/m has been applied for fencing for the Junction 7 Options. This rate is consistent with the TII Schedule of Rates 2023.

4.4 Safety Barriers

It has been assumed that new Safety Barriers (N2 single sided) would be required along 75% of the perimeter for the Junction 7 Options. A rate of €108/m has been applied for safety barriers for the Junction 7 Options. This rate is consistent with the TII Schedule of Rates 2023.

4.5 Drainage and Service Ducts

A rate of €250,000/km has been applied for Junction 7 Options, for the provision of new drainage infrastructure. This is developed taking cognisance of drainage costs for the M7 Naas to Newbridge Upgrade project, a widening project located in a constrained environment with a full drainage rebuild in both directions.

4.6 Earthworks

Cut and fill earthworks quantities have been extracted from the Open Roads Designer (ORD) 3D model. The following rates have been applied for the various earthworks elements:

- Excavation of acceptable material – €6.32/m³
- Disposal of acceptable material – €18.21/m³

These are extracted from the TII Schedule of Rates (2023) - Upper.

4.7 Pavement

The following approximate rates have been applied for the various elements of pavement construction:

- Sub-base, Granular Type B to Clause 804, 150mm thick – €38.03/m³

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- Road Base (AC 32 Dense base 40/60) 2 Layers – €25.66/m² per layer
- Binder Course (AC 20 Dense bin 55mm) – €25.66/m²
- Surface Course (SMA 40mm) – €16.81/m²

These are extracted from the TII Schedule of Rates (2023).

4.8 Kerbs, Footways and Paved Areas

An allowance of €75,000/km has been applied for the provision of kerbs, footways, and paved areas along the length of the project for the Junction 7 Options. This is a per km rate taking cognisance of the costs of the M7 Naas to Newbridge Upgrade project.

4.9 Traffic Signs & Road Markings

An allowance of €70,000/km has been applied for the provision of general traffic signs and road markings for the Junction 7 Options.

This is a per km rate which has been derived from the costs for the M7 Naas to Newbridge Upgrade project and is expected to cover the relocation of impacted signage, and re-application of line markings to suit the revised alignment for the project.

4.10 Lighting and Electrical

An allowance of €20,000/km for lighting and electrical has been applied for the Junction 7 Options. This is a per km rate taking cognisance of the costs of the M7 Naas to Newbridge Upgrade project and is expected to cover the relocation of any impacted lighting columns.

4.11 Landscaping and Environmental

An allowance of €30,000/km has been applied for landscaping and environmental works for the Junction Options. This is a per km rate which has been derived from the costs for the M7 Naas to Newbridge Upgrade project.

4.12 Structures

Following consultation with the Arup Bridges and Civil Structures team, a rate of €3,000/m² has been applied for the Junction 7 Option 2 overbridge.

4.13 Accommodation Works

Accommodation works are not envisaged to impact greatly on the Junction Options. A rate of €30,000/km has been applied for the Junction 7 Options.

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4.14 Statutory Authorities & Utilities

The high-level cost estimate has been developed prior to the undertaking of site investigation works, therefore the impacts on utilities and utility diversions may need to be amended during future design development. Considering the above, the following approach has been taken:

- A general allowance of €200,000/km for the Junction 7 Options has been made for costs associated with statutory authorities and utilities. This allowance has been made based on an estimated proportion of total contract cost only, and these costs are subject to change during future design development.

4.15 Preliminaries

A 20% rate has been applied for Preliminaries for the Junction 7 Options including traffic management.

4.16 Risk Contingency

A 20% risk contingency has been allowed for the Junction 7 options which is considered appropriate for this stage of the design development.

4.17 Main Construction Contract Estimate – Junction 7

The Main Construction Contract (MCC) estimate and breakdown for the Junction 7 Options by discipline is presented in Table 1. These have been developed based on information currently available and are subject to change during future design development. The Maynooth Outer Orbital Road (MOOR), which has been included in both Junction 7 Options, has been estimated as a standalone road for future proofing. An estimate is provided in further detail in **Appendix A**.

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Table 1: Total Main Construction Contract (MCC) Cost Estimate – Junction 7 Options

Item Description	Option 1 (Junction 7)	Option 1 (MOOR)	Option 1 (Total)	Option 2 (Junction 7)	Option 2 (MOOR)	Option 2 (Total)
Site Clearance	€50,000	€50,000	€100,000	€50,000	€50,000	€100,000
Fencing	€90,000	€260,000	€350,000	€260,000	€260,000	€520,000
Safety Barriers	€150,000	€440,000	€590,000	€430,000	€440,000	€870,000
Drainage and Service Ducts	€350,000	€1,000,000	€1,350,000	€980,000	€1,010,000	€1,990,000
Earthworks	€250,000	€390,000	€640,000	€1,210,000	€390,000	€1,600,000
Pavement	€570,000	€2,630,000	€3,200,000	€970,000	€2,240,000	€3,210,000
Kerbs, Footways and Paved Areas	€140,000	€400,000	€540,000	€390,000	€400,000	€790,000
Signs & Road Markings	€130,000	€380,000	€510,000	€370,000	€380,000	€750,000
Lighting and Electrical	€40,000	€110,000	€150,000	€100,000	€110,000	€210,000
Landscaping	€60,000	€160,000	€220,000	€160,000	€160,000	€320,000
Structures	-	-	-	€2,660,000	-	€2,660,000
Accommodation Works	€60,000	€160,000	€220,000	€160,000	€160,000	€320,000
Statutory Authorities and Utilities	€380,000	€540,000	€920,000	€1,050,000	€540,000	€1,590,000
Any Other Obligations and Liabilities of the Contractor	€380,000	€540,000	€920,000	€1,050,000	€540,000	€1,590,000
Preliminaries @ 20% incl. TTM	€530,000	€1,410,000	€1,940,000	€1,970,000	€1,330,000	€3,300,000
Project Specific Risk Contingency @ 20%	€640,000	€1,690,000	€2,330,000	€2,360,000	€1,600,000	€3,960,000
MCC Base Cost Total (excl. VAT)	€3,820,000	€10,160,000	€13,980,000	€14,170,000	€9,610,000	€23,780,000
Add VAT @ 13.5%	€515,700	€1,371,600	€1,887,300	€1,912,950	€1,297,350	€3,210,300
MCC Base Cost Total	€4,335,700	€11,531,600	€15,867,300	€16,082,950	€10,907,350	€26,990,300

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5 Total Level 2 Estimate

5.1 Overview

The methodology for developing the Level 2 Estimate is outlined in the following sections. All rates assumed hereunder are deemed appropriate for Phase 2 Stage 2 of the project.

5.2 Main Construction Contract

Refer to Section 4.

5.3 Land and Property

It has been assumed that Land and Property impacted by the Junction 7 Options would fall within the proposed Maynooth LAP and comprise the following zonings:

- New Residential;
- Open Space and Amenity;
- Agriculture; and
- Strategic Reserve.

The generic rates per hectare outlined below are based on an analysis of recent market transactions, supported by market knowledge derived from our Valuation sub-consultant's experience. Valuations are supported by this market evidence. The process and methodology undertaken to populate the rates involved detailed consultation and input from various departments within our Valuation sub-consultant's organisation, including:

- Valuations and CPO team;
- Research Department;
- Agency Departments in various Land Zone classifications, including:
 - Residential;
 - Commercial / Mixed use;
 - Industrial; and
 - Hope value / Land with future potential.

The rates for each of the above zonings are provided in Table 2.

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Table 2: Land and Property Rates

Land Zoning Description	Unit	Rate / ha.	
		Lower Band	Upper Band
New Residential	hectare	€865,000	€1,100,000
Open Space & Amenity	hectare	€60,000	€125,000
Agriculture	hectare	€125,000	€150,000
Strategic Reserve	hectare	€250,000	€370,000

5.4 Planning and Design

The cost of the Local Authority's fees and the Consultant's fees are included in this item based on a percentage of Main Construction Contract base cost.

A 5% rate of the Main Construction Contract base cost has been applied for the Junction 7 Options.

5.5 Archaeology

A rate of €200,000 has been applied for the Junction 7 Options with respect to Archaeology.

5.6 Enabling Works and Other Contracts

A 2.5% rate of the Main Construction Contract base cost has been applied for the Junction 7 Options.

5.7 Main Contract Supervision (Employer's Costs)

A rate of 5% of the Main Construction Contract base cost has been applied for the Junction 7 Options.

5.8 Walking/Cycling/Asset Renewal

A rate of 7.5% of the Main Construction Contract base cost has been applied for the Junction 7 Options.

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5.9 Summary

The Total Level 2 Estimate and breakdown for the Junction 7 Options is presented in Table 3. These have been developed based on information currently available and are subject to change during future design development. The estimate is provided in further detail in **Appendix A**. Please note the following:

- Figures are inclusive of VAT;
- Figures are inclusive of Project Specific Risk Contingency;
- Figures are inclusive of provision for Inflation; and
- Total base costs include for all qualifying costs under each cost heading.

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Table 3: Total Level 2 Estimate – Junction 7 Options

Item Description	Option 1 (Junction 7)	Option 1 (MOOR)	Option 1 (Total)	Option 2 (Junction 7)	Option 2 (MOOR)	Option 2 (Total)
Main Construction Contract	€4,320,000	€11,510,000	€15,830,000	€16,080,000	€10,910,000	€26,990,000
Land and Property	€550,000	€5,500,000	€6,050,000	€2,200,000	€5,500,000	€7,700,000
Planning and Design	€290,000	€770,000	€1,060,000	€1,070,000	€730,000	€1,800,000
Archaeology	€260,000	€2,570,000	€2,830,000	€260,000	€260,000	€520,000
Advance Works and Other Contracts	€130,000	€360,000	€490,000	€500,000	€340,000	€840,000
Main Contract Supervision (Employer's Costs)	€290,000	€770,000	€1,060,000	€1,070,000	€730,000	€1,800,000
Walking/ Cycling/ Asset Renewal	€400,000	€1,070,000	€1,470,000	€1,490,000	€1,010,000	€2,500,000
Total Level 2 Estimate	€6,240,000	€22,550,000	€28,790,000	€22,670,000	€19,480,000	€42,150,000

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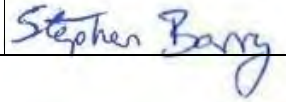
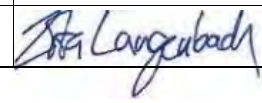
28 September 2023

6 Conclusions

The Phase 2 Stage 2 Total Level 2 Estimates have been determined as follows:

- Junction 7 Option 1: €28.8m including VAT; and
- Junction 7 Option 2: €42.2m including VAT;

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	Gerard Hall	Stephen Barry	Zita Langenbach
Signature			

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Appendix A Estimate Breakdown

Maynooth to Leixlip Project		17/08/2023		S0-P01	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Junction 7 Option 1			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€50,000
b	Fencing	Various	m	Various	€91,819
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€153,161
d	Drainage and Service Ducts	Various	km	460000	€353,004
e	Earthworks	Various	m3	Various	€254,834
f	Pavement	Various	Various	Various	€566,355
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€141,202
h	Traffic Signs & Roadmarkings	Various	Various	Various	€131,788
k	Lighting and Electrical	Various	Various	Various	€37,654
l	Landscaping and Environmental	Various	Various	Various	€56,481
m	Structures	Various	Various	Various	€0
n	Accommodation Works	Various	Various	Various	€56,481
p	Statutory Authorities & Utilities	Various	Various	Various	€376,537
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€376,537
s	Preliminaries	Various	Various	Various	€529,170
Total Base Cost for Main Construction Contract (Excluding VAT)					€3,175,022
Add Project Specific Risk Contingency					20% €635,004
Sub-Total exclusive of VAT					€3,810,026
Add VAT at					13.5% €514,354
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€4,324,380
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€2,106,700
Add Project Specific Risk Contingency					10% €210,670
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€2,317,370
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €216,219
Add Project Specific Risk Contingency					10% €21,622
Add VAT at					23% €49,730
Total P&D Base Cost plus Project Specific Risk Contingency					€287,571
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€200,000
Add Project Specific Risk Contingency					10% €20,000
Add VAT at					18.3% €36,600
Total Archaeology Base Cost plus Project Specific Risk Contingency					€256,600
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €108,109
Add Project Specific Risk Contingency					10% €10,811
Add VAT at					13.5% €14,595
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€133,515
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €216,219
Add Project Specific Risk Contingency					10% €21,622
Add VAT at					23% €49,730
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€287,571
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					7.5% €324,328
Add Project Specific Risk Contingency					10% €32,433
Add VAT at					13.5% €43,784
Total Residual Network Base Cost plus Project Specific Risk Contingency					€400,546
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€8,007,553
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project		17/08/2023	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Junction 7 Option 1	
Arup		Gerard Hall	
Main Construction Cost - Base Cost Estimate			
Summary			
A	Site Clearance		€50,000
B	Fencing		€91,819
C	Safety Barriers and Pedestrian Guardrails		€153,161
D	Drainage and Service Ducts		€353,004
E	Earthworks		€254,834
F	Pavement		€566,355
G	Kerbs, Footways and Paved Areas		€141,202
H	Traffic Signs		€131,788
J	Roadmarking		€0
K	Lighting and Electrical		€37,654
L	Landscaping and Environmental		€56,481
M	Structures (Including Tunnels to be separately identified)		€0
N	Accommodation Works		€56,481
P	Statutory Authorities & Utilities		€376,537
Q	Any Other Obligations and Liabilities of the Contractor		€376,537
	Sub-Total		€2,645,852
S	Preliminaries		€529,170
MCC Base Cost Total excluding Project Specific Risk Contingency			€3,175,022
Add Project Specific Risk Contingency		20	% €635,004
MCC Base Cost Total including Project Specific Risk Contingency			€3,810,026
Add VAT at		13.5	% €514,354
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€4,324,380
Junction Perimeter		1.9	km
MCC Cost per km based on Junction Perimeter Only		€2,296,919	
Schedule of Works			
		Quantity	Unit
			Rate/Prices
			Totals
A	Site Clearance		
A1.1	General Site Clearance (Greenfield)	1.00	Ha €4,094
	Site Clearance Total to Summary		€50,000
B	Fencing		
B.1	Permanent Boundary Fencing	1,883	m €49
	Fencing Total to Summary		€91,819
C	Safety Barrier and Pedestrian Guardrails		
C.1	Safety Barrier (Specify Type)	1,412	m €108
C.2	Median Barrier (Specify Type e.g. Concrete or Wire)		m €247
	Safety Barrier and Pedestrian Guardrails Total to Summary		€153,161
D	Drainage and Service Ducts		
D.1	Drainage and Service Ducts per km (Mainline)	1.4	km €250,000
	Drainage and Service Ducts Total to Summary		€353,004

Maynooth to Leixlip Project		17/08/2023			
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Junction 7 Option 1			
Arup		Gerard Hall			
E Earthworks					
Junction 7 Option 1					
E.1 Disposal - U1 - Cut	13,963	m3	€18.21	€254,264	
E.2 Excavation - Acceptable - Fill	90	m3	€6.32	€570	
Earthworks Sub-Total				€254,834	
F Pavement					
New Pavement					
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	791	m3	€38.03	€30,083	
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	10,547	m2	€25.66	€270,641	
F.3 Binder Course (AC 20 Dense bin 55mm)	5,274	m2	€25.66	€135,320	
F.4 Surface Course (SMA 40mm)	5,274	m2	€16.81	€88,649	
F.5 Milling Existing Pavement (100mm including disposal)	5,274	m2	€7.90	€41,661	
Pavement Total to Summary				€566,355	
G Kerbs Footways and Paved Areas					
Allowance based on project scope and historical costs (Active Travel)		1.9	km	€75,000	€141,202
				€141,202	
H Traffic Signs & Roadmarkings					
Allowance based on project scope and historical costs		1.9	km	€70,000	€131,788
				€131,788	
J Roadmarkings					
Allowance based on project scope and historical costs		1.9	sum		€0
				€0	
K Lighting and Electrical					
Allowance based on project scope and historical costs		1.9	sum	€20,000	€37,654
				€37,654	
L Landscaping and Environmental					
Allowance based on project scope and historical costs		1.9	sum	€30,000	€56,481
				€56,481	
M Structures (Including Tunnels to be separately identified)					
New Bridge Structure & Associated Works		-	m2	€3,000	€0
Structures Total to Summary				€0	
N Accommodation Works					
Allowance based on project scope and historical costs		1.9	sum	€30,000	€56,481
				€56,481	
P Statutory Authorities & Utilities					
Allowance based on project scope and historical costs		1.9	sum	€200,000	€376,537
				€376,537	
Q Any Other Obligations and Liabilities of the Contractor					
Allowance based on project scope and historical costs		1.9	sum	€200,000	€376,537
				€376,537	
S Preliminaries					
R.2 All Preliminary Items inc. TTM		20%	sum	€529,170	€529,170
Preliminaries Total to Summary				€529,170	
<p>N.B. Figures are exclusive of VAT except where expressly stated above.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project		17/08/2023		S0-P01	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Junction 7 Option 2			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€50,000
b	Fencing	Various	m	Various	€255,691
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€426,514
d	Drainage and Service Ducts	Various	km	460000	€983,023
e	Earthworks	Various	m3	Various	€1,210,842
f	Pavement	Various	Various	Various	€972,190
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€393,209
h	Traffic Signs & Roadmarkings	Various	Various	Various	€366,995
k	Lighting and Electrical	Various	Various	Various	€104,856
l	Landscaping and Environmental	Various	Various	Various	€157,284
m	Structures	Various	Various	Various	€2,662,500
n	Accommodation Works	Various	Various	Various	€157,284
p	Statutory Authorities & Utilities	Various	Various	Various	€1,048,558
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€1,048,558
s	Preliminaries	Various	Various	Various	€1,967,501
Total Base Cost for Main Construction Contract (Excluding VAT)					€11,805,004
Add Project Specific Risk Contingency					20% €2,361,001
Sub-Total exclusive of VAT					€14,166,005
Add VAT at					13.5% €1,912,411
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€16,078,416
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€4,209,200
Add Project Specific Risk Contingency					10% €420,920
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€4,630,120
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €803,921
Add Project Specific Risk Contingency					10% €80,392
Add VAT at					23% €184,902
Total P&D Base Cost plus Project Specific Risk Contingency					€1,069,215
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€200,000
Add Project Specific Risk Contingency					10% €20,000
Add VAT at					18.3% €36,600
Total Archaeology Base Cost plus Project Specific Risk Contingency					€256,600
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €401,960
Add Project Specific Risk Contingency					10% €40,196
Add VAT at					13.5% €54,265
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€496,421
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €803,921
Add Project Specific Risk Contingency					10% €80,392
Add VAT at					23% €184,902
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€1,069,215
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					7.5% €1,205,881
Add Project Specific Risk Contingency					10% €120,588
Add VAT at					13.5% €162,794
Total Residual Network Base Cost plus Project Specific Risk Contingency					€1,489,263
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€25,089,249
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	17/08/2023
Phase 2 Stage 2: Project Appraisal Matrix (PAM)	Junction 7 Option 2
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€50,000
B	Fencing		€255,691
C	Safety Barriers and Pedestrian Guardrails		€426,514
D	Drainage and Service Ducts		€983,023
E	Earthworks		€1,210,842
F	Pavement		€972,190
G	Kerbs, Footways and Paved Areas		€393,209
H	Traffic Signs		€366,995
J	Roadmarking		€0
K	Lighting and Electrical		€104,856
L	Landscaping and Environmental		€157,284
M	Structures (Including Tunnels to be separately identified)		€2,662,500
N	Accommodation Works		€157,284
P	Statutory Authorities & Utilities		€1,048,558
Q	Any Other Obligations and Liabilities of the Contractor		€1,048,558
	Sub-Total		€9,837,504
S	Preliminaries		€1,967,501
MCC Base Cost Total excluding Project Specific Risk Contingency			€11,805,004
	Add Project Specific Risk Contingency	20 %	€2,361,001
MCC Base Cost Total including Project Specific Risk Contingency			€14,166,005
	Add VAT at	13.5 %	€1,912,411
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€16,078,416
Junction Perimeter		5.2 km	
MCC Cost per km based on Junction Perimeter Only		€3,066,767	

Schedule of Works		Quantity	Unit	Rate/Prices	Totals
A Site Clearance					
A1.1	General Site Clearance (Greenfield)	1.00	Ha	€4,094	€50,000
Site Clearance Total to Summary					€50,000
B Fencing					
B.1	Permanent Boundary Fencing	5,243	m	€49	€255,691
Fencing Total to Summary					€255,691
C Safety Barrier and Pedestrian Guardrails					
C.1	Safety Barrier (Specify Type)	3,932	m	€108	€426,514
C.2	Median Barrier (Specify Type e.g. Concrete or Wire)		m	€247	€0
Safety Barrier and Pedestrian Guardrails Total to Summary					€426,514

Maynooth to Leixlip Project		17/08/2023			
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Junction 7 Option 2			
Arup		Gerard Hall			
D Drainage and Service Ducts					
D.1	Drainage and Service Ducts per km (Mainline)	3.9	km	€250,000	€983,023
Drainage and Service Ducts Total to Summary					€983,023
E Earthworks					
Junction 7 Option 2					
E.1	Disposal - U1 - Cut	51,506	m3	€18.21	€937,921
E.2	Excavation - Acceptable - Fill	43,184	m3	€6.32	€272,921
Earthworks Sub-Total					€1,210,842
F Pavement					
New Pavement					
F.1	Sub-base, Granular Type B to Clause 804 150mm Depth	1,358	m3	€38.03	€51,640
F.2	Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	18,105	m2	€25.66	€464,575
F.3	Binder Course (AC 20 Dense bin 55mm)	9,053	m2	€25.66	€232,287
F.4	Surface Course (SMA 40mm)	9,053	m2	€16.81	€152,173
F.5	Milling Existing Pavement (100mm including disposal)	9,053	m2	€7.90	€71,515
Pavement Total to Summary					€972,190
G Kerbs Footways and Paved Areas					
Allowance based on project scope and historical costs (Active Travel)		5.2	km	€75,000	€393,209
					€393,209
H Traffic Signs & Roadmarkings					
Allowance based on project scope and historical costs		5.2	km	€70,000	€366,995
					€533,215
J Roadmarkings					
Allowance based on project scope and historical costs		5.2	sum		€0
					€0
K Lighting and Electrical					
Allowance based on project scope and historical costs		5.2	sum	€20,000	€104,856
					€104,856
L Landscaping and Environmental					
Allowance based on project scope and historical costs		5.2	sum	€30,000	€157,284
					€157,284
M Structures (Including Tunnels to be separately identified)					
New Bridge Structure & Associated Works		888	m2	€3,000	€2,662,500
Structures Total to Summary					€2,662,500
N Accommodation Works					
Allowance based on project scope and historical costs		5.2	sum	€30,000	€157,284
					€157,284
P Statutory Authorities & Utilities					
Allowance based on project scope and historical costs		5.2	sum	€200,000	€1,048,558
					€1,048,558
Q Any Other Obligations and Liabilities of the Contractor					
Allowance based on project scope and historical costs		5.2	sum	€200,000	€1,048,558
					€1,048,558
S Preliminaries					
R.2	All Preliminary Items inc. TTM	20%	sum	€1,967,501	€1,967,501
Preliminaries Total to Summary					€1,967,501
N.B. Figures are exclusive of VAT except where expressly stated above.					
Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.					
Total base costs to include for ALL qualifying costs under each cost heading.					
Refer to the NRA Cost Management Manual for information on coverage and format of back-up.					
See attached Budget Assumptions Sheet for Further Scheme Information.					

Maynooth to Leixlip Project		17/08/2023		S0-P01	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		MOOR Option 1			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€50,000
b	Fencing	Various	m	Various	€261,300
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€435,870
d	Drainage and Service Ducts	Various	km	460000	€1,004,586
e	Earthworks	Various	m3	Various	€385,773
f	Pavement	Various	Various	Various	€2,628,188
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€401,835
h	Traffic Signs & Roadmarkings	Various	Various	Various	€375,046
k	Lighting and Electrical	Various	Various	Various	€107,156
l	Landscaping and Environmental	Various	Various	Various	€160,734
m	Structures	Various	Various	Various	€0
n	Accommodation Works	Various	Various	Various	€160,734
p	Statutory Authorities & Utilities	Various	Various	Various	€535,779
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€535,779
s	Preliminaries	Various	Various	Various	€1,408,556
Total Base Cost for Main Construction Contract (Excluding VAT)					€8,451,334
Add Project Specific Risk Contingency					20% €1,690,267
Sub-Total exclusive of VAT					€10,141,601
Add VAT at					13.5% €1,369,116
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€11,510,718
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€2,598,203
Add Project Specific Risk Contingency					10% €259,820
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€2,858,023
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €575,536
Add Project Specific Risk Contingency					10% €57,554
Add VAT at					23% €132,373
Total P&D Base Cost plus Project Specific Risk Contingency					€765,463
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€2,000,000
Add Project Specific Risk Contingency					10% €200,000
Add VAT at					18.3% €366,000
Total Archaeology Base Cost plus Project Specific Risk Contingency					€2,566,000
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €287,768
Add Project Specific Risk Contingency					10% €28,777
Add VAT at					13.5% €38,849
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€355,393
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €575,536
Add Project Specific Risk Contingency					10% €57,554
Add VAT at					23% €132,373
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€765,463
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					7.5% €863,304
Add Project Specific Risk Contingency					10% €86,330
Add VAT at					13.5% €116,546
Total Residual Network Base Cost plus Project Specific Risk Contingency					€1,066,180
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€19,887,240
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	17/08/2023
Phase 2 Stage 2: Project Appraisal Matrix (PAM)	MOOR Option 1
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€50,000
B	Fencing		€261,300
C	Safety Barriers and Pedestrian Guardrails		€435,870
D	Drainage and Service Ducts		€1,004,586
E	Earthworks		€385,773
F	Pavement		€2,628,188
G	Kerbs, Footways and Paved Areas		€401,835
H	Traffic Signs		€375,046
J	Roadmarking		€0
K	Lighting and Electrical		€107,156
L	Landscaping and Environmental		€160,734
M	Structures (Including Tunnels to be separately identified)		€0
N	Accommodation Works		€160,734
P	Statutory Authorities & Utilities		€535,779
Q	Any Other Obligations and Liabilities of the Contractor		€535,779
	Sub-Total		€7,042,779
S	Preliminaries		€1,408,556
MCC Base Cost Total excluding Project Specific Risk Contingency			€8,451,334
	Add Project Specific Risk Contingency	20 %	€1,690,267
MCC Base Cost Total including Project Specific Risk Contingency			€10,141,601
	Add VAT at	13.5 %	€1,369,116
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€11,510,718
	MOOR Perimeter	5.4 km	
	MCC Cost per km based on Junction Perimeter Only	€2,148,406	

Schedule of Works		Quantity	Unit	Rate/Prices	Totals
A Site Clearance					
A1.1	General Site Clearance (Greenfield)	1.00	Ha	€4,094	€50,000
Site Clearance Total to Summary					€50,000
B Fencing					
B.1	Permanent Boundary Fencing	5,358	m	€49	€261,300
Fencing Total to Summary					€261,300
C Safety Barrier and Pedestrian Guardrails					
C.1	Safety Barrier (Specify Type)	4,018	m	€108	€435,870
C.2	Median Barrier (Specify Type e.g. Concrete or Wire)		m	€247	€0
Safety Barrier and Pedestrian Guardrails Total to Summary					€435,870

Maynooth to Leixlip Project		17/08/2023			
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		MOOR Option 1			
Arup		Gerard Hall			
D Drainage and Service Ducts					
D.1	Drainage and Service Ducts per km (Mainline)	4.0	km	€250,000	€1,004,586
Drainage and Service Ducts Total to Summary					€1,004,586
E Earthworks					
MOOR Option 1					
E.1	Disposal - U1 - Cut	12,646	m3	€18.21	€230,276
E.2	Excavation - Acceptable - Fill	24,604	m3	€6.32	€155,497
Earthworks Sub-Total					€385,773
F Pavement					
New Pavement					
F.1	Sub-base, Granular Type B to Clause 804 150mm Depth	3,671	m3	€38.03	€139,602
F.2	Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	48,945	m2	€25.66	€1,255,917
F.3	Binder Course (AC 20 Dense bin 55mm)	24,472	m2	€25.66	€627,959
F.4	Surface Course (SMA 40mm)	24,472	m2	€16.81	€411,379
F.5	Milling Existing Pavement (100mm including disposal)	24,472	m2	€7.90	€193,331
Pavement Total to Summary					€2,628,188
G Kerbs Footways and Paved Areas					
Allowance based on project scope and historical costs (Active Travel)		5.4	km	€75,000	€401,835
					€401,835
H Traffic Signs & Roadmarkings					
Allowance based on project scope and historical costs		5.4	km	€70,000	€375,046
					€375,046
J Roadmarkings					
Allowance based on project scope and historical costs		5.4	sum		€0
					€0
K Lighting and Electrical					
Allowance based on project scope and historical costs		5.4	sum	€20,000	€107,156
					€107,156
L Landscaping and Environmental					
Allowance based on project scope and historical costs		5.4	sum	€30,000	€160,734
					€160,734
M Structures (Including Tunnels to be separately identified)					
New Bridge Structure & Associated Works		-	m2	€4,000	€0
Structures Total to Summary					€0
N Accommodation Works					
Allowance based on project scope and historical costs		5.4	sum	€30,000	€160,734
					€160,734
P Statutory Authorities & Utilities					
Allowance based on project scope and historical costs		5.4	sum	€100,000	€535,779
					€535,779
Q Any Other Obligations and Liabilities of the Contractor					
Allowance based on project scope and historical costs		5.4	sum	€100,000	€535,779
					€535,779
S Preliminaries					
R.2	All Preliminary Items inc. TTM	20%	sum	€1,408,556	€1,408,556
Preliminaries Total to Summary					€1,408,556
N.B. Figures are exclusive of VAT except where expressly stated above.					
Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.					
Total base costs to include for ALL qualifying costs under each cost heading.					
Refer to the NRA Cost Management Manual for information on coverage and format of back-up.					
See attached Budget Assumptions Sheet for Further Scheme Information.					

Maynooth to Leixlip Project		17/08/2023		S0-P01	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		MOOR Option 2			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€50,000
b	Fencing	Various	m	Various	€262,343
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€437,611
d	Drainage and Service Ducts	Various	km	460000	€1,008,599
e	Earthworks	Various	m3	Various	€386,137
f	Pavement	Various	Various	Various	€2,242,290
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€403,440
h	Traffic Signs & Roadmarkings	Various	Various	Various	€376,544
k	Lighting and Electrical	Various	Various	Various	€107,584
l	Landscaping and Environmental	Various	Various	Various	€161,376
m	Structures	Various	Various	Various	€0
n	Accommodation Works	Various	Various	Various	€161,376
p	Statutory Authorities & Utilities	Various	Various	Various	€537,919
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€537,919
s	Preliminaries	Various	Various	Various	€1,334,627
Total Base Cost for Main Construction Contract (Excluding VAT)					€8,007,764
Add Project Specific Risk Contingency					20%
Sub-Total exclusive of VAT					€9,609,317
Add VAT at					13.5%
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€10,906,575
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€2,689,715
Add Project Specific Risk Contingency					10%
Add VAT at					0%
Total L&P Base Cost plus Project Specific Risk Contingency					€2,958,687
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5%
Add Project Specific Risk Contingency					10%
Add VAT at					23%
Total P&D Base Cost plus Project Specific Risk Contingency					€725,287
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€200,000
Add Project Specific Risk Contingency					10%
Add VAT at					18.3%
Total Archaeology Base Cost plus Project Specific Risk Contingency					€256,600
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5%
Add Project Specific Risk Contingency					10%
Add VAT at					13.5%
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€336,741
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5%
Add Project Specific Risk Contingency					10%
Add VAT at					23%
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€725,287
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					7.5%
Add Project Specific Risk Contingency					10%
Add VAT at					13.5%
Total Residual Network Base Cost plus Project Specific Risk Contingency					€1,010,222
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€16,919,398
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	17/08/2023
Phase 2 Stage 2: Project Appraisal Matrix (PAM)	MOOR Option 2
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€50,000
B	Fencing		€262,343
C	Safety Barriers and Pedestrian Guardrails		€437,611
D	Drainage and Service Ducts		€1,008,599
E	Earthworks		€386,137
F	Pavement		€2,242,290
G	Kerbs, Footways and Paved Areas		€403,440
H	Traffic Signs		€376,544
J	Roadmarking		€0
K	Lighting and Electrical		€107,584
L	Landscaping and Environmental		€161,376
M	Structures (Including Tunnels to be separately identified)		€0
N	Accommodation Works		€161,376
P	Statutory Authorities & Utilities		€537,919
Q	Any Other Obligations and Liabilities of the Contractor		€537,919
	Sub-Total		€6,673,137
S	Preliminaries		€1,334,627
MCC Base Cost Total excluding Project Specific Risk Contingency			€8,007,764
	Add Project Specific Risk Contingency	20 %	€1,601,553
MCC Base Cost Total including Project Specific Risk Contingency			€9,609,317
	Add VAT at	13.5 %	€1,297,258
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€10,906,575
	MOOR Perimeter	5.4 km	
	MCC Cost per km based on Junction Perimeter Only	€2,027,548	

Schedule of Works		Quantity	Unit	Rate/Prices	Totals
A Site Clearance					
A1.1	General Site Clearance (Greenfield)	1.00	Ha	€4,094	€50,000
Site Clearance Total to Summary					€50,000
B Fencing					
B.1	Permanent Boundary Fencing	5,379	m	€49	€262,343
Fencing Total to Summary					€262,343
C Safety Barrier and Pedestrian Guardrails					
C.1	Safety Barrier (Specify Type)	4,034	m	€108	€437,611
C.2	Median Barrier (Specify Type e.g. Concrete or Wire)		m	€247	€0
Safety Barrier and Pedestrian Guardrails Total to Summary					€437,611

Maynooth to Leixlip Project		17/08/2023			
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		MOOR Option 2			
Arup		Gerard Hall			
D Drainage and Service Ducts					
D.1	Drainage and Service Ducts per km (Mainline)	4.0	km	€250,000	€1,008,599
Drainage and Service Ducts Total to Summary					€1,008,599
E Earthworks					
MOOR Option 2					
E.1	Disposal - U1 - Cut	10,367	m3	€18.21	€188,783
E.2	Excavation - Acceptable - Fill	31,227	m3	€6.32	€197,353
Earthworks Sub-Total					€386,137
F Pavement					
New Pavement					
F.1	Sub-base, Granular Type B to Clause 804 150mm Depth	3,132	m3	€38.03	€119,104
F.2	Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	41,758	m2	€25.66	€1,071,510
F.3	Binder Course (AC 20 Dense bin 55mm)	20,879	m2	€25.66	€535,755
F.4	Surface Course (SMA 40mm)	20,879	m2	€16.81	€350,976
F.5	Milling Existing Pavement (100mm including disposal)	20,879	m2	€7.90	€164,944
Pavement Total to Summary					€2,242,290
G Kerbs Footways and Paved Areas					
Allowance based on project scope and historical costs (Active Travel)		5.4	km	€75,000	€403,440
					€403,440
H Traffic Signs & Roadmarkings					
Allowance based on project scope and historical costs		5.4	km	€70,000	€376,544
					€376,544
J Roadmarkings					
Allowance based on project scope and historical costs		5.4	sum		€0
					€0
K Lighting and Electrical					
Allowance based on project scope and historical costs		5.4	sum	€20,000	€107,584
					€107,584
L Landscaping and Environmental					
Allowance based on project scope and historical costs		5.4	sum	€30,000	€161,376
					€161,376
M Structures (Including Tunnels to be separately identified)					
New Bridge Structure & Associated Works		-	m2	€4,000	€0
Structures Total to Summary					€0
N Accommodation Works					
Allowance based on project scope and historical costs		5.4	sum	€30,000	€161,376
					€161,376
P Statutory Authorities & Utilities					
Allowance based on project scope and historical costs		5.4	sum	€100,000	€537,919
					€537,919
Q Any Other Obligations and Liabilities of the Contractor					
Allowance based on project scope and historical costs		5.4	sum	€100,000	€537,919
					€537,919
S Preliminaries					
R.2	All Preliminary Items inc. TTM	20%	sum	€1,334,627	€1,334,627
Preliminaries Total to Summary					€1,334,627
N.B. Figures are exclusive of VAT except where expressly stated above.					
Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.					
Total base costs to include for ALL qualifying costs under each cost heading.					
Refer to the NRA Cost Management Manual for information on coverage and format of back-up.					
See attached Budget Assumptions Sheet for Further Scheme Information.					



MAYNOOTH TO LEIXLIP PROJECT

Appendix 6.2C

Stage 2 PAM

Costs (OCE's) - Active Travel

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Project title	Maynooth to Leixlip Project	Job number	272691-00
cc	Stephen Cummins Kevin Tynan Zita Langenbach Stephen Barry	File reference	4-03-03-7-3
Prepared by	Gerard Hall	Date	28 September 2023
Subject	Phase 2 Stage 2 Project Appraisal Matrix (PAM) Cost Estimate – Active Travel Options		

1 Introduction

Arup has been appointed by Kildare County Council to provide multi-disciplinary technical consultancy services for the delivery of the Maynooth to Leixlip Project, on behalf of Kildare County Council and South Dublin County Council.

The Maynooth to Leixlip Project is being progressed in accordance with Transport Infrastructure Ireland's Project Management Guidelines (PMGs). These guidelines provide a framework for the management, development and delivery of national road and public transport capital projects. The PMGs divide the evolution and progression of a project into an eight-phase process (Phase 0 – 7 inclusive). Arup has been appointed to progress the delivery of the project through Phases 1 to 4 of the PMGs.

The purpose of this assessment is to assess the likely costs of the Active Travel options. An order of magnitude estimate has been developed using the feasibility design as a basis, which is deemed appropriate for Phase 2 Stage 2 of the project.

The purpose of this Technical Note is to present the findings of this assessment and to provide a summary of the Phase 2 Stage 2 cost estimate.

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2 Overview

A western and an eastern option have been designed at each of the following locations:

- R408 Newtown Road Overbridge;
- Junction 7 Maynooth;
- R405 Ballygoran Road Overbridge;
- Junction 6 Celbridge;
- R404 Celbridge Road Overbridge; and
- Junction 5 Leixlip.

3 Assumptions and Methodology

This section details the assumptions and methodology applied in developing the Stage 2 Option Comparison Estimates. The Option Comparison Estimates are presented in full in **Appendix A**.

Rates have been sourced and benchmarked against the following:

- Estimate costs for the M7 Naas to Newbridge Upgrade project, using cost information supplied by Kildare National Roads Office (KNRO);
- Professional judgement based on market rates and inflation in 2023;
- Estimate costs prepared for other TII projects, including the N11/M11 and N40; and
- TII Schedule of Rates (2023) - Upper.

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4 Construction Cost Estimate – Active Travel Options

4.1 Overview

The methodology of developing the quantities and rates for each discipline are outlined in the following sections.

4.2 Site Clearance

A rate of €4,094/Ha as per Schedule of Rates (2023) has been noted. However, professional judgement dictated that a lump sum rate of €50,000 be applied to each Active Travel Option for Site Clearance as this value was deemed more appropriate.

4.3 Fencing

It has been assumed that new boundary fencing would be required along the perimeter of the Active Travel Options. A rate of €48/m has been applied for fencing for the Active Travel Options. This rate is consistent with the TII Schedule of Rates 2023.

4.4 Safety Barriers

It has been assumed that new Safety Barriers (N2 single sided) would be required along 75% of the perimeter of the Active Travel Options. A rate of €108/m has been applied for safety barriers for the Active Travel Options. This rate is consistent with the TII Schedule of Rates 2023.

4.5 Drainage and Service Ducts

A rate of €250,000/km has been applied for the Active Travel Options, for the provision of new drainage infrastructure. This is developed taking cognisance of drainage costs for the M7 Naas to Newbridge Upgrade project.

4.6 Earthworks

Cut and fill earthworks quantities have been extracted from the Open Roads Designer (ORD) 3D model. The following rates have been applied for the various earthworks elements:

- Excavation of acceptable material – €6.32/m³
- Disposal of acceptable material – €18.21/m³

These are extracted from the TII Schedule of Rates (2023) - Upper.

4.7 Pavement

The following approximate rates have been applied for the various elements of pavement construction:

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- Sub-base, Granular Type B to Clause 804, 150mm thick – €38.03/m³
- Road Base (AC 32 Dense base 40/60) 2 Layers – €25.66/m² per layer
- Binder Course (AC 20 Dense bin 55mm) – €25.66/m²
- Surface Course (SMA 40mm) – €16.81/m²

These are extracted from the TII Schedule of Rates (2023).

4.8 Kerbs, Footways and Paved Areas

An allowance of €75,000/km has been applied for the provision of kerbs, footways, and paved areas for the Active Travel Options. This is a per km rate taking cognisance of the costs of the M7 Naas to Newbridge Upgrade project.

4.9 Traffic Signs & Road Markings

An allowance of €70,000/km has been applied for the provision of general traffic signs and road markings for the Active Travel Options.

This is a per km rate which has been derived from the costs for the M7 Naas to Newbridge Upgrade project and is expected to cover the relocation of impacted signage, and re-application of line markings to suit the revised alignment for the project.

4.10 Lighting and Electrical

An allowance of €20,000/km for lighting and electrical has been applied for the Active Travel Options. This is a per km rate taking cognisance of the costs of the M7 Naas to Newbridge Upgrade project and is expected to cover the relocation of any impacted lighting columns.

4.11 Landscaping and Environmental

An allowance of €30,000/km has been applied for landscaping and environmental works for the Active Travel Options. This is a per km rate which has been derived from the costs for the M7 Naas to Newbridge Upgrade project.

4.12 Structures

Following consultation with the Arup Bridges and Civil Structures team, a rate of €4,000/m² has been applied for each Active Travel Option structure.

4.13 Accommodation Works

Accommodation works are not envisaged to impact greatly on the Active Travel Options. A rate of €30,000/km has been applied for the Active Travel Options.

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4.14 Statutory Authorities & Utilities

The high-level cost estimate has been developed prior to the undertaking of site investigation works, therefore the impacts on utilities and utility diversions may need to be amended during future design development. Considering the above, the following approach has been taken:

- A general allowance of €200,000/km for the Active Travel Options has been made for costs associated with statutory authorities and utilities. This allowance has been made based on an estimated proportion of total contract cost only, and these costs are subject to change during future design development.

4.15 Preliminaries

A 20% rate has been applied for Preliminaries for the Active Travel Options including traffic management.

4.16 Risk Contingency

A 20% risk contingency has been allowed for the corridor options which is considered appropriate for this stage of the design development.

4.17 Main Construction Contract Estimate – Active Travel Options

The Main Construction Contract (MCC) estimate and breakdown for the Active Travel Options by discipline is presented in Table 1. These have been developed based on information currently available and are subject to change during future design development. An estimate is provided in further detail in **Appendix A**.

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Table 1: Total Main Construction Contract (MCC) Cost Estimate – Active Travel Options

Item Description	R408 Option 1 – West	R408 Option 2 - East	Junction 7 Option 1 - West	Junction 7 Option 2 - East	R405 Option 1 - West	R405 Option 2 - East
Site Clearance	€50,000	€50,000	€50,000	€50,000	€50,000	€50,000
Fencing	€20,000	€20,000	€20,000	€20,000	€10,000	€20,000
Safety Barriers	€40,000	€30,000	€30,000	€40,000	€10,000	€40,000
Drainage and Service Ducts	€80,000	€70,000	€60,000	€90,000	€30,000	€90,000
Earthworks	€20,000	€20,000	€10,000	€10,000	€10,000	€10,000
Pavement	-	-	-	-	-	-
Kerbs, Footways and Paved Areas	€30,000	€30,000	€20,000	€40,000	€10,000	€40,000
Traffic Signs & Markings	€30,000	€30,000	€20,000	€30,000	€10,000	€30,000
Lighting and Electrical	€10,000	€10,000	€10,000	€10,000	€5,000	€10,000
Landscaping	€10,000	€10,000	€10,000	€10,000	€5,000	€10,000
Structures	€870,000	€1,100,000	€710,000	€800,000	€930,000	€1,020,000
Accommodation Works	€10,000	€10,000	€10,000	€10,000	€5,000	€10,000
Statutory Authorities and Utilities	€90,000	€80,000	€60,000	€100,000	€30,000	€100,000
Any Other Obligations and Liabilities of the Contractor	€90,000	€80,000	€60,000	€100,000	€30,000	€100,000
Preliminaries @ 20% incl. TTM	€270,000	€310,000	€210,000	€270,000	€230,000	€310,000
Project Specific Risk Contingency @ 20%	€330,000	€370,000	€250,000	€320,000	€270,000	€370,000
MCC Base Cost Total (excl. VAT)	€1,950,000	€2,220,000	€1,530,000	€1,900,000	€1,635,000	€2,210,000
Add VAT @ 13.5%	€263,250	€299,700	€206,550	€256,500	€220,725	€298,350
MCC Base Cost Total	€2,213,250	€2,519,700	€1,736,550	€2,156,500	€1,855,725	€2,508,350

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Item Description	Junction 6 Option 1 – West	Junction 6 Option 2 - East	R404 Option 1 - West	R404 Option 2 - East	Junction 5 Option 1 - West	Junction 5 Option 2 - East
Site Clearance	€50,000	€50,000	€50,000	€50,000	€50,000	€50,000
Fencing	€50,000	€70,000	€10,000	€10,000	€10,000	€10,000
Safety Barriers	€90,000	€110,000	€20,000	€10,000	€20,000	€10,000
Drainage and Service Ducts	€210,000	€260,000	€40,000	€20,000	€40,000	€20,000
Earthworks	€100,000	€80,000	€10,000	€10,000	€5,000	€5,000
Pavement	-	-	-	-	-	-
Kerbs, Footways and Paved Areas	€80,000	€100,000	€10,000	€10,000	€10,000	€10,000
Signs & Markings	€80,000	€100,000	€10,000	€10,000	€10,000	€10,000
Lighting and Electrical	€20,000	€30,000	€5,000	€5,000	€5,000	€5,000
Landscaping	€30,000	€40,000	€10,000	€5,000	€10,000	€5,000
Structures	€860,000	€670,000	€810,000	€870,000	€1,000,000	€840,000
Accommodation Works	€30,000	€40,000	€10,000	€5,000	€10,000	€5,000
Statutory Authorities and Utilities	€220,000	€270,000	€40,000	€20,000	€40,000	€20,000
Any Other Obligations and Liabilities of the Contractor	€220,000	€270,000	€40,000	€20,000	€40,000	€20,000
Preliminaries @ 20% incl. TTM	€410,000	€420,000	€210,000	€210,000	€250,000	€200,000
Project Specific Risk Contingency @ 20%	€490,000	€500,000	€250,000	€250,000	€300,000	€240,000
MCC Base Cost Total (excl. VAT)	€2,940,000	€3,680,000	€1,535,000	€1,505,000	€1,800,000	€1,450,000
Add VAT @ 13.5%	€396,900	€496,800	€207,225	€203,175	€243,000	€195,750
MCC Base Cost Total	€3,336,900	€4,176,800	€1,742,225	€1,708,175	€2,043,000	€1,645,750

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5 Total Level 2 Estimate

5.1 Overview

The methodology for developing the Level 2 Estimate is outlined in the following sections. All rates assumed hereunder are deemed appropriate for Phase 2 Stage 2 of the project.

5.2 Main Construction Contract

Refer to Section 4.

5.3 Land and Property

A rate of €500,000 has been applied for each Active Travel Option with respect to Land and Property.

5.4 Planning and Design

The cost of the Local Authority's fees and the Consultant's fees are included in this item based on a percentage of Main Construction Contract base cost.

A 5% rate of the Main Construction Contract base cost has been applied for the Active Travel Options.

5.5 Archaeology

A rate of €100,000 has been applied for each Active Travel Option with respect to Archaeology.

5.6 Enabling Works and Other Contracts

A rate of 2.5% of the Main Construction Contract base cost has been applied for the Active Travel Options.

5.7 Main Contract Supervision (Employer's Costs)

A rate of 5% of the Main Construction Contract base cost has been applied for the Active Travel Options.

5.8 Walking/Cycling/Asset Renewal

A rate of 10% of the Main Construction Contract base cost has been applied for the Active Travel Options.

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5.9 Summary

The Total Level 2 Estimate and breakdown for the Active Travel Options is presented in Table 2. These have been developed based on information currently available and are subject to change during future design development. The estimate is provided in further detail in **Appendix A**. Please note the following:

- Figures are inclusive of VAT;
- Figures are inclusive of Project Specific Risk Contingency;
- Figures are inclusive of provision for Inflation; and
- Total base costs include for all qualifying costs under each cost heading.

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Table 2: Total Level 2 Estimate – Active Travel Options

Item Description	R408 Option 1 – West	R408 Option 2 - East	Junction 7 Option 1 - West	Junction 7 Option 2 - East	R405 Option 1 - West	R405 Option 2 - East
Main Construction Contract	€2,220,000	€2,500,000	€1,730,000	€2,170,000	€1,850,000	€2,510,000
Land and Property	€550,000	€550,000	€550,000	€550,000	€550,000	€550,000
Planning and Design	€150,000	€170,000	€120,000	€140,000	€120,000	€170,000
Archaeology	€130,000	€130,000	€130,000	€130,000	€130,000	€130,000
Advance Works and Other Contracts	€70,000	€80,000	€50,000	€70,000	€60,000	€80,000
Main Contract Supervision (Employer's Costs)	€150,000	€170,000	€120,000	€140,000	€120,000	€170,000
Walking/ Cycling/ Asset Renewal	€270,000	€310,000	€210,000	€270,000	€230,000	€310,000
Total Level 2 Estimate	€3,540,000	€3,910,000	€2,910,000	€3,470,000	€3,060,000	€3,920,000

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Item Description	Junction 6 Option 1 – West	Junction 6 Option 2 - East	R404 Option 1 - West	R404 Option 2 - East	Junction 5 Option 1 - West	Junction 5 Option 2 - East
Main Construction Contract	€3,340,000	€3,420,000	€1,720,000	€1,690,000	€2,040,000	€1,640,000
Land and Property	€550,000	€550,000	€550,000	€550,000	€550,000	€550,000
Planning and Design	€220,000	€230,000	€110,000	€110,000	€140,000	€110,000
Archaeology	€130,000	€130,000	€130,000	€130,000	€130,000	€130,000
Advance Works and Other Contracts	€100,000	€110,000	€50,000	€50,000	€60,000	€50,000
Main Contract Supervision (Employer's Costs)	€220,000	€230,000	€110,000	€110,000	€140,000	€110,000
Walking/ Cycling/ Asset Renewal	€410,000	€420,000	€210,000	€210,000	€250,000	€200,000
Total Level 2 Estimate	€4,970,000	€5,090,000	€2,880,000	€2,850,000	€3,310,000	€2,790,000

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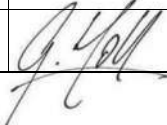
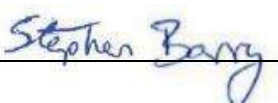
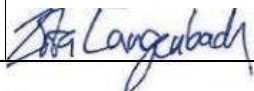
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6 Conclusions

The Phase 2 Stage 2 Total Level 2 Estimates have been determined as follows:

- **R408 Newtown Road Overbridge**
 - Option 1 - West: ~ €3.5m including VAT
 - Option 2 - East: ~ €3.9m including VAT
- **Junction 7 Maynooth**
 - Option 1 - West: €2.9m including VAT
 - Option 2 - East: €3.5m including VAT
- **R405 Ballygoran Road Overbridge**
 - Option 1 - West: €3.1m including VAT
 - Option 2 - East: €3.9m including VAT
- **Junction 6 Celbridge**
 - Option 1 - West: €5.0m including VAT
 - Option 2 - East: €5.1m including VAT
- **R404 Celbridge Road Overbridge**
 - Option 1 - West: €2.9m including VAT
 - Option 2 - East: €2.9m including VAT
- **Junction 5 Leixlip**
 - Option 1 - West: €3.3m including VAT
 - Option 2 - East: €2.8m including VAT

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	Gerard Hall	Stephen Barry	Zita Langenbach
Signature			

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Appendix A Estimate Breakdown

Maynooth to Leixlip Project		10/08/2023		S0-P01	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		R408 Option 1			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€50,000
b	Fencing	Various	m	Various	€21,809
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€36,379
d	Drainage and Service Ducts	Various	km	460000	€83,846
e	Earthworks	Various	m3	Various	€21,737
f	Pavement	Various	Various	Various	€0
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€33,538
h	Traffic Signs & Roadmarkings	Various	Various	Various	€31,302
k	Lighting and Electrical	Various	Various	Various	€8,944
l	Landscaping and Environmental	Various	Various	Various	€13,415
m	Structures	Various	Various	Various	€868,048
n	Accommodation Works	Various	Various	Various	€13,415
p	Statutory Authorities & Utilities	Various	Various	Various	€89,436
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€89,436
s	Preliminaries	Various	Various	Various	€272,261
Total Base Cost for Main Construction Contract (Excluding VAT)					€1,633,567
Add Project Specific Risk Contingency					20% €326,713
Sub-Total exclusive of VAT					€1,960,280
Add VAT at					13.5% €264,638
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€2,224,918
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€500,000
Add Project Specific Risk Contingency					10% €50,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€550,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €111,246
Add Project Specific Risk Contingency					10% €11,125
Add VAT at					23% €25,587
Total P&D Base Cost plus Project Specific Risk Contingency					€147,957
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€100,000
Add Project Specific Risk Contingency					10% €10,000
Add VAT at					18.3% €18,300
Total Archaeology Base Cost plus Project Specific Risk Contingency					€128,300
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €55,623
Add Project Specific Risk Contingency					10% €5,562
Add VAT at					13.5% €7,509
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€68,694
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €111,246
Add Project Specific Risk Contingency					10% €11,125
Add VAT at					23% €25,587
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€147,957
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					10% €222,492
Add Project Specific Risk Contingency					10% €22,249
Add VAT at					13.5% €30,036
Total Residual Network Base Cost plus Project Specific Risk Contingency					€274,777
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€3,542,603
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	10/08/2023
Phase 2 Stage 2: Project Appraisal Matrix (PAM)	R408 Option 1
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€50,000
B	Fencing		€21,809
C	Safety Barriers and Pedestrian Guardrails		€36,379
D	Drainage and Service Ducts		€83,846
E	Earthworks		€21,737
F	Pavement		€0
G	Kerbs, Footways and Paved Areas		€33,538
H	Traffic Signs		€31,302
J	Roadmarking		€0
K	Lighting and Electrical		€8,944
L	Landscaping and Environmental		€13,415
M	Structures (Including Tunnels to be separately identified)		€868,048
N	Accommodation Works		€13,415
P	Statutory Authorities & Utilities		€89,436
Q	Any Other Obligations and Liabilities of the Contractor		€89,436
	Sub-Total		€1,361,305
S	Preliminaries		€272,261
MCC Base Cost Total excluding Project Specific Risk Contingency			€1,633,567
	Add Project Specific Risk Contingency	20 %	€326,713
MCC Base Cost Total including Project Specific Risk Contingency			€1,960,280
	Add VAT at	13.5 %	€264,638
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€2,224,918
	Junction Perimeter	0.4 km	
	MCC Cost per km based on Junction Perimeter Only	€4,975,463	

Schedule of Works		Quantity	Unit	Rate/Prices	Totals
A Site Clearance					
A1.1	General Site Clearance (Greenfield)	1.00	Ha	€4,094	€50,000
Site Clearance Total to Summary					€50,000
B Fencing					
B.1	Permanent Boundary Fencing	447	m	€49	€21,809
Fencing Total to Summary					€21,809
C Safety Barrier and Pedestrian Guardrails					
C.1	Safety Barrier (Specify Type)	335	m	€108	€36,379
C.2	Median Barrier (Specify Type e.g. Concrete or Wire)		m	€247	€0
Safety Barrier and Pedestrian Guardrails Total to Summary					€36,379

Maynooth to Leixlip Project		10/08/2023	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		R408 Option 1	
Arup		Gerard Hall	
D Drainage and Service Ducts			
D.1 Drainage and Service Ducts per km (Mainline)	0.3	km	€250,000
Drainage and Service Ducts Total to Summary			€83,846
E Earthworks			
R408 Option 1			
E.1 Disposal - U1 - Cut	48	m3	€18.21
E.2 Excavation - Acceptable - Fill	3,301	m3	€6.32
Earthworks Sub-Total			€21,737
F Pavement			
New Pavement			
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	-	m3	€38.03
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	-	m2	€25.66
F.3 Binder Course (AC 20 Dense bin 55mm)	-	m2	€25.66
F.4 Surface Course (SMA 40mm)	-	m2	€16.81
F.5 Milling Existing Pavement (100mm including disposal)	-	m2	€7.90
Pavement Total to Summary			€0
G Kerbs Footways and Paved Areas			
Allowance based on project scope and historical costs (Active Travel)	0.4	km	€75,000
			€33,538
H Traffic Signs & Roadmarkings			
Allowance based on project scope and historical costs	0.4	km	€70,000
			€31,302
J Roadmarkings			
Allowance based on project scope and historical costs	0.4	sum	
			€0
K Lighting and Electrical			
Allowance based on project scope and historical costs	0.4	sum	€20,000
			€8,944
L Landscaping and Environmental			
Allowance based on project scope and historical costs	0.4	sum	€30,000
			€13,415
M Structures (Including Tunnels to be separately identified)			
New Bridge Structure & Associated Works	217	m2	€4,000
Structures Total to Summary			€868,048
N Accommodation Works			
Allowance based on project scope and historical costs	0.4	sum	€30,000
			€13,415
P Statutory Authorities & Utilities			
Allowance based on project scope and historical costs	0.4	sum	€200,000
			€89,436
Q Any Other Obligations and Liabilities of the Contractor			
Allowance based on project scope and historical costs	0.4	sum	€200,000
			€89,436
S Preliminaries			
R.2 All Preliminary Items inc. TTM	20%	sum	€272,261
Preliminaries Total to Summary			€272,261
<p>N.B. Figures are exclusive of VAT except where expressly stated above. Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate. Total base costs to include for ALL qualifying costs under each cost heading. Refer to the NRA Cost Management Manual for information on coverage and format of back-up. See attached Budget Assumptions Sheet for Further Scheme Information.</p>			

Maynooth to Leixlip Project		10/08/2023		S0-P01	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		R408 Option 2			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€50,000
b	Fencing	Various	m	Various	€18,813
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€31,381
d	Drainage and Service Ducts	Various	km	460000	€72,327
e	Earthworks	Various	m3	Various	€16,746
f	Pavement	Various	Various	Various	€0
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€28,931
h	Traffic Signs & Roadmarkings	Various	Various	Various	€27,002
k	Lighting and Electrical	Various	Various	Various	€7,715
l	Landscaping and Environmental	Various	Various	Various	€11,572
m	Structures	Various	Various	Various	€1,095,404
n	Accommodation Works	Various	Various	Various	€11,572
p	Statutory Authorities & Utilities	Various	Various	Various	€77,149
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€77,149
s	Preliminaries	Various	Various	Various	€305,152
Total Base Cost for Main Construction Contract (Excluding VAT)					€1,830,914
Add Project Specific Risk Contingency					20% €366,183
Sub-Total exclusive of VAT					€2,197,096
Add VAT at					13.5% €296,608
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€2,493,704
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€500,000
Add Project Specific Risk Contingency					10% €50,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€550,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €124,685
Add Project Specific Risk Contingency					10% €12,469
Add VAT at					23% €28,678
Total P&D Base Cost plus Project Specific Risk Contingency					€165,831
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€100,000
Add Project Specific Risk Contingency					10% €10,000
Add VAT at					18.3% €18,300
Total Archaeology Base Cost plus Project Specific Risk Contingency					€128,300
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €62,343
Add Project Specific Risk Contingency					10% €6,234
Add VAT at					13.5% €8,416
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€76,993
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €124,685
Add Project Specific Risk Contingency					10% €12,469
Add VAT at					23% €28,678
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€165,831
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					10% €249,370
Add Project Specific Risk Contingency					10% €24,937
Add VAT at					13.5% €33,665
Total Residual Network Base Cost plus Project Specific Risk Contingency					€307,973
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€3,888,633
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	10/08/2023
Phase 2 Stage 2: Project Appraisal Matrix (PAM)	R408 Option 2
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€50,000
B	Fencing		€18,813
C	Safety Barriers and Pedestrian Guardrails		€31,381
D	Drainage and Service Ducts		€72,327
E	Earthworks		€16,746
F	Pavement		€0
G	Kerbs, Footways and Paved Areas		€28,931
H	Traffic Signs		€27,002
J	Roadmarking		€0
K	Lighting and Electrical		€7,715
L	Landscaping and Environmental		€11,572
M	Structures (Including Tunnels to be separately identified)		€1,095,404
N	Accommodation Works		€11,572
P	Statutory Authorities & Utilities		€77,149
Q	Any Other Obligations and Liabilities of the Contractor		€77,149
	Sub-Total		€1,525,761
S	Preliminaries		€305,152
MCC Base Cost Total excluding Project Specific Risk Contingency			€1,830,914
	Add Project Specific Risk Contingency	20 %	€366,183
MCC Base Cost Total including Project Specific Risk Contingency			€2,197,096
	Add VAT at	13.5 %	€296,608
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€2,493,704
	Junction Perimeter	0.4 km	
	MCC Cost per km based on Junction Perimeter Only	€6,464,662	

Schedule of Works		Quantity	Unit	Rate/Prices	Totals
A Site Clearance					
A1.1	General Site Clearance (Greenfield)	0.07	Ha	€4,094	€50,000
Site Clearance Total to Summary					€50,000
B Fencing					
B.1	Permanent Boundary Fencing	386	m	€49	€18,813
Fencing Total to Summary					€18,813
C Safety Barrier and Pedestrian Guardrails					
C.1	Safety Barrier (Specify Type)	289	m	€108	€31,381
C.2	Median Barrier (Specify Type e.g. Concrete or Wire)		m	€247	€0
Safety Barrier and Pedestrian Guardrails Total to Summary					€31,381

Maynooth to Leixlip Project		10/08/2023			
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		R408 Option 2			
Arup		Gerard Hall			
D Drainage and Service Ducts					
D.1	Drainage and Service Ducts per km (Mainline)	0.3	km	€250,000	€72,327
Drainage and Service Ducts Total to Summary					€72,327
E Earthworks					
R408 Option 2					
E.1	Disposal - U1 - Cut	75	m3	€18.21	€1,372
E.2	Excavation - Acceptable - Fill	2,433	m3	€6.32	€15,375
Earthworks Sub-Total					€16,746
F Pavement					
New Pavement					
F.1	Sub-base, Granular Type B to Clause 804 150mm Depth	-	m3	€38.03	€0
F.2	Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	-	m2	€25.66	€0
F.3	Binder Course (AC 20 Dense bin 55mm)	-	m2	€25.66	€0
F.4	Surface Course (SMA 40mm)	-	m2	€16.81	€0
F.5	Milling Existing Pavement (100mm including disposal)	-	m2	€7.90	€0
Pavement Total to Summary					€0
G Kerbs Footways and Paved Areas					
Allowance based on project scope and historical costs (Active Travel)		0.4	km	€75,000	€28,931
					€28,931
H Traffic Signs & Roadmarkings					
Allowance based on project scope and historical costs		0.4	km	€70,000	€27,002
					€193,222
J Roadmarkings					
Allowance based on project scope and historical costs		0.4	sum		€0
					€0
K Lighting and Electrical					
Allowance based on project scope and historical costs		0.4	sum	€20,000	€7,715
					€7,715
L Landscaping and Environmental					
Allowance based on project scope and historical costs		0.4	sum	€30,000	€11,572
					€11,572
M Structures (Including Tunnels to be separately identified)					
New Bridge Structure & Associated Works		274	m2	€4,000	€1,095,404
Structures Total to Summary					€1,095,404
N Accommodation Works					
Allowance based on project scope and historical costs		0.4	sum	€30,000	€11,572
					€11,572
P Statutory Authorities & Utilities					
Allowance based on project scope and historical costs		0.4	sum	€200,000	€77,149
					€77,149
Q Any Other Obligations and Liabilities of the Contractor					
Allowance based on project scope and historical costs		0.4	sum	€200,000	€77,149
					€77,149
S Preliminaries					
R.2	All Preliminary Items inc. TTM	20%	sum	€305,152	€305,152
Preliminaries Total to Summary					€305,152
<p>N.B. Figures are exclusive of VAT except where expressly stated above.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project		10/08/2023		S0-P01		
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Junction 7 Option 1				
Arup		The information presented is Private and Confidential				
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €	
a	Site Clearance	Various	Ha	Various	€50,000	
b	Fencing	Various	m	Various	€15,385	
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€25,664	
d	Drainage and Service Ducts	Various	km	460000	€59,151	
e	Earthworks	Various	m3	Various	€7,396	
f	Pavement	Various	Various	Various	€0	
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€23,660	
h	Traffic Signs & Roadmarkings	Various	Various	Various	€22,083	
k	Lighting and Electrical	Various	Various	Various	€6,309	
l	Landscaping and Environmental	Various	Various	Various	€9,464	
m	Structures	Various	Various	Various	€706,224	
n	Accommodation Works	Various	Various	Various	€9,464	
p	Statutory Authorities & Utilities	Various	Various	Various	€63,094	
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€63,094	
s	Preliminaries	Various	Various	Various	€212,198	
Total Base Cost for Main Construction Contract (Excluding VAT)					€1,273,186	
Add Project Specific Risk Contingency					20%	€254,637
Sub-Total exclusive of VAT					€1,527,824	
Add VAT at					13.5%	€206,256
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€1,734,080	
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €	
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various		
Total Base Cost for Land and Property					€500,000	
Add Project Specific Risk Contingency					10%	€50,000
Add VAT at					0%	€0
Total L&P Base Cost plus Project Specific Risk Contingency					€550,000	
3	Planning and Design					
Provision based on % of MCC Base Cost & Actual Costs where known					5%	€86,704
Add Project Specific Risk Contingency					10%	€8,670
Add VAT at					23%	€19,942
Total P&D Base Cost plus Project Specific Risk Contingency					€115,316	
4	Archaeology					
Provision based on per hectare rate applied to total greenfield area					€100,000	
Add Project Specific Risk Contingency					10%	€10,000
Add VAT at					18.3%	€18,300
Total Archaeology Base Cost plus Project Specific Risk Contingency					€128,300	
5	Advance Works and Other Contracts					
Provision based on % of MCC Base Cost & Actual Costs where known					2.5%	€43,352
Add Project Specific Risk Contingency					10%	€4,335
Add VAT at					13.5%	€5,853
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€53,540	
6	Main Contract Supervision (Employer's Costs)					
Provision based on % of MCC Base Cost & Actual Costs where known					5%	€86,704
Add Project Specific Risk Contingency					10%	€8,670
Add VAT at					23%	€19,942
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€115,316	
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)					
Provision based on percentage of Main Construction Contract Base Cost					10%	€173,408
Add Project Specific Risk Contingency					10%	€17,341
Add VAT at					13.5%	€23,410
Total Residual Network Base Cost plus Project Specific Risk Contingency					€214,159	
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€2,910,711	
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>						

Maynooth to Leixlip Project	10/08/2023
Phase 2 Stage 2: Project Appraisal Matrix (PAM)	Junction 7 Option 1
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€50,000
B	Fencing		€15,385
C	Safety Barriers and Pedestrian Guardrails		€25,664
D	Drainage and Service Ducts		€59,151
E	Earthworks		€7,396
F	Pavement		€0
G	Kerbs, Footways and Paved Areas		€23,660
H	Traffic Signs		€22,083
J	Roadmarking		€0
K	Lighting and Electrical		€6,309
L	Landscaping and Environmental		€9,464
M	Structures (Including Tunnels to be separately identified)		€706,224
N	Accommodation Works		€9,464
P	Statutory Authorities & Utilities		€63,094
Q	Any Other Obligations and Liabilities of the Contractor		€63,094
	Sub-Total		€1,060,989
S	Preliminaries		€212,198
MCC Base Cost Total excluding Project Specific Risk Contingency			€1,273,186
	Add Project Specific Risk Contingency	20 %	€254,637
MCC Base Cost Total including Project Specific Risk Contingency			€1,527,824
	Add VAT at	13.5 %	€206,256
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€1,734,080
Junction Perimeter		0.3 km	
MCC Cost per km based on Junction Perimeter Only		€5,496,814	

Schedule of Works	Quantity	Unit	Rate/Prices	Totals
A Site Clearance				
A1.1 General Site Clearance (Greenfield)	0.06	Ha	€4,094	€50,000
Site Clearance Total to Summary				€50,000
B Fencing				
B.1 Permanent Boundary Fencing	315	m	€49	€15,385
Fencing Total to Summary				€15,385
C Safety Barrier and Pedestrian Guardrails				
C.1 Safety Barrier (Specify Type)	237	m	€108	€25,664
C.2 Median Barrier (Specify Type e.g. Concrete or Wire)		m	€247	€0
Safety Barrier and Pedestrian Guardrails Total to Summary				€25,664

Maynooth to Leixlip Project		10/08/2023			
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Junction 7 Option 1			
Arup		Gerard Hall			
D Drainage and Service Ducts					
D.1	Drainage and Service Ducts per km (Mainline)	0.2	km	€250,000	€59,151
Drainage and Service Ducts Total to Summary					€59,151
E Earthworks					
Junction 7 Option 1					
E.1	Disposal - U1 - Cut	112	m3	€18.21	€2,032
E.2	Excavation - Acceptable - Fill	849	m3	€6.32	€5,364
Earthworks Sub-Total					€7,396
F Pavement					
New Pavement					
F.1	Sub-base, Granular Type B to Clause 804 150mm Depth	-	m3	€38.03	€0
F.2	Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	-	m2	€25.66	€0
F.3	Binder Course (AC 20 Dense bin 55mm)	-	m2	€25.66	€0
F.4	Surface Course (SMA 40mm)	-	m2	€16.81	€0
F.5	Milling Existing Pavement (100mm including disposal)	-	m2	€7.90	€0
Pavement Total to Summary					€0
G Kerbs Footways and Paved Areas					
Allowance based on project scope and historical costs (Active Travel)		0.3	km	€75,000	€23,660
					€23,660
H Traffic Signs & Roadmarkings					
Allowance based on project scope and historical costs		0.3	km	€70,000	€22,083
					€22,083
J Roadmarkings					
Allowance based on project scope and historical costs		0.3	sum		
					€0
K Lighting and Electrical					
Allowance based on project scope and historical costs		0.3	sum	€20,000	€6,309
					€6,309
L Landscaping and Environmental					
Allowance based on project scope and historical costs		0.3	sum	€30,000	€9,464
					€9,464
M Structures (Including Tunnels to be separately identified)					
New Bridge Structure & Associated Works		177	m2	€4,000	€706,224
Structures Total to Summary					€706,224
N Accommodation Works					
Allowance based on project scope and historical costs		0.3	sum	€30,000	€9,464
					€9,464
P Statutory Authorities & Utilities					
Allowance based on project scope and historical costs		0.3	sum	€200,000	€63,094
					€63,094
Q Any Other Obligations and Liabilities of the Contractor					
Allowance based on project scope and historical costs		0.3	sum	€200,000	€63,094
					€63,094
S Preliminaries					
R.2	All Preliminary Items inc. TTM	20%	sum	€212,198	€212,198
Preliminaries Total to Summary					€212,198
<p>N.B. Figures are exclusive of VAT except where expressly stated above.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project		10/08/2023		S0-P01	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Junction 7 Option 2			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€50,000
b	Fencing	Various	m	Various	€24,384
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€40,674
d	Drainage and Service Ducts	Various	km	460000	€93,745
e	Earthworks	Various	m3	Various	€6,269
f	Pavement	Various	Various	Various	€0
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€37,498
h	Traffic Signs & Roadmarkings	Various	Various	Various	€34,998
k	Lighting and Electrical	Various	Various	Various	€9,999
l	Landscaping and Environmental	Various	Various	Various	€14,999
m	Structures	Various	Various	Various	€797,884
n	Accommodation Works	Various	Various	Various	€14,999
p	Statutory Authorities & Utilities	Various	Various	Various	€99,994
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€99,994
s	Preliminaries	Various	Various	Various	€265,088
Total Base Cost for Main Construction Contract (Excluding VAT)					€1,590,526
Add Project Specific Risk Contingency					20%
Sub-Total exclusive of VAT					€1,908,631
Add VAT at					13.5%
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€2,166,296
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€500,000
Add Project Specific Risk Contingency					10%
Add VAT at					0%
Total L&P Base Cost plus Project Specific Risk Contingency					€550,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5%
Add Project Specific Risk Contingency					10%
Add VAT at					23%
Total P&D Base Cost plus Project Specific Risk Contingency					€144,059
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€100,000
Add Project Specific Risk Contingency					10%
Add VAT at					18.3%
Total Archaeology Base Cost plus Project Specific Risk Contingency					€128,300
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5%
Add Project Specific Risk Contingency					10%
Add VAT at					13.5%
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€66,884
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5%
Add Project Specific Risk Contingency					10%
Add VAT at					23%
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€144,059
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					10%
Add Project Specific Risk Contingency					10%
Add VAT at					13.5%
Total Residual Network Base Cost plus Project Specific Risk Contingency					€267,538
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€3,467,136
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	10/08/2023
Phase 2 Stage 2: Project Appraisal Matrix (PAM)	Junction 7 Option 2
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€50,000
B	Fencing		€24,384
C	Safety Barriers and Pedestrian Guardrails		€40,674
D	Drainage and Service Ducts		€93,745
E	Earthworks		€6,269
F	Pavement		€0
G	Kerbs, Footways and Paved Areas		€37,498
H	Traffic Signs		€34,998
J	Roadmarking		€0
K	Lighting and Electrical		€9,999
L	Landscaping and Environmental		€14,999
M	Structures (Including Tunnels to be separately identified)		€797,884
N	Accommodation Works		€14,999
P	Statutory Authorities & Utilities		€99,994
Q	Any Other Obligations and Liabilities of the Contractor		€99,994
	Sub-Total		€1,325,438
S	Preliminaries		€265,088
MCC Base Cost Total excluding Project Specific Risk Contingency			€1,590,526
	Add Project Specific Risk Contingency	20 %	€318,105
MCC Base Cost Total including Project Specific Risk Contingency			€1,908,631
	Add VAT at	13.5 %	€257,665
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€2,166,296
	Junction Perimeter	0.5 km	
	MCC Cost per km based on Junction Perimeter Only	€4,332,835	

Schedule of Works	Quantity	Unit	Rate/Prices	Totals
A Site Clearance				
A1.1 General Site Clearance (Greenfield)	0.10	Ha	€4,094	€50,000
Site Clearance Total to Summary				€50,000
B Fencing				
B.1 Permanent Boundary Fencing	500	m	€49	€24,384
Fencing Total to Summary				€24,384
C Safety Barrier and Pedestrian Guardrails				
C.1 Safety Barrier (Specify Type)	375	m	€108	€40,674
C.2 Median Barrier (Specify Type e.g. Concrete or Wire)		m	€247	€0
Safety Barrier and Pedestrian Guardrails Total to Summary				€40,674

Maynooth to Leixlip Project		10/08/2023	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Junction 7 Option 2	
Arup		Gerard Hall	
D Drainage and Service Ducts			
D.1 Drainage and Service Ducts per km (Mainline)	0.4	km	€250,000
Drainage and Service Ducts Total to Summary			€93,745
E Earthworks			
Junction 7 Option 2			
E.1 Disposal - U1 - Cut	138	m3	€18.21
E.2 Excavation - Acceptable - Fill	595	m3	€6.32
Earthworks Sub-Total			€6,269
F Pavement			
New Pavement			
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	-	m3	€38.03
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	-	m2	€25.66
F.3 Binder Course (AC 20 Dense bin 55mm)	-	m2	€25.66
F.4 Surface Course (SMA 40mm)	-	m2	€16.81
F.5 Milling Existing Pavement (100mm including disposal)	-	m2	€7.90
Pavement Total to Summary			€0
G Kerbs Footways and Paved Areas			
Allowance based on project scope and historical costs (Active Travel)	0.5	km	€75,000
			€37,498
H Traffic Signs & Roadmarkings			
Allowance based on project scope and historical costs	0.5	km	€70,000
			€34,998
J Roadmarkings			
Allowance based on project scope and historical costs	0.5	sum	
			€0
K Lighting and Electrical			
Allowance based on project scope and historical costs	0.5	sum	€20,000
			€9,999
L Landscaping and Environmental			
Allowance based on project scope and historical costs	0.5	sum	€30,000
			€14,999
M Structures (Including Tunnels to be separately identified)			
New Bridge Structure & Associated Works	199	m2	€4,000
Structures Total to Summary			€797,884
N Accommodation Works			
Allowance based on project scope and historical costs	0.5	sum	€30,000
			€14,999
P Statutory Authorities & Utilities			
Allowance based on project scope and historical costs	0.5	sum	€200,000
			€99,994
Q Any Other Obligations and Liabilities of the Contractor			
Allowance based on project scope and historical costs	0.5	sum	€200,000
			€99,994
S Preliminaries			
R.2 All Preliminary Items inc. TTM	20%	sum	€265,088
Preliminaries Total to Summary			€265,088
<p>N.B. Figures are exclusive of VAT except where expressly stated above.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>			

Maynooth to Leixlip Project		10/08/2023		S0-P01	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		R405 Option 1			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€50,000
b	Fencing	Various	m	Various	€7,858
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€13,108
d	Drainage and Service Ducts	Various	km	460000	€30,211
e	Earthworks	Various	m3	Various	€5,464
f	Pavement	Various	Various	Various	€0
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€12,084
h	Traffic Signs & Roadmarkings	Various	Various	Various	€11,279
k	Lighting and Electrical	Various	Various	Various	€3,222
l	Landscaping and Environmental	Various	Various	Various	€4,834
m	Structures	Various	Various	Various	€925,316
n	Accommodation Works	Various	Various	Various	€4,834
p	Statutory Authorities & Utilities	Various	Various	Various	€32,225
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€32,225
s	Preliminaries	Various	Various	Various	€226,532
Total Base Cost for Main Construction Contract (Excluding VAT)					€1,359,191
Add Project Specific Risk Contingency					20% €271,838
Sub-Total exclusive of VAT					€1,631,029
Add VAT at					13.5% €220,189
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€1,851,218
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€500,000
Add Project Specific Risk Contingency					10% €50,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€550,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €92,561
Add Project Specific Risk Contingency					10% €9,256
Add VAT at					23% €21,289
Total P&D Base Cost plus Project Specific Risk Contingency					€123,106
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€100,000
Add Project Specific Risk Contingency					10% €10,000
Add VAT at					18.3% €18,300
Total Archaeology Base Cost plus Project Specific Risk Contingency					€128,300
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €46,280
Add Project Specific Risk Contingency					10% €4,628
Add VAT at					13.5% €6,248
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€57,156
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €92,561
Add Project Specific Risk Contingency					10% €9,256
Add VAT at					23% €21,289
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€123,106
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					10% €185,122
Add Project Specific Risk Contingency					10% €18,512
Add VAT at					13.5% €24,991
Total Residual Network Base Cost plus Project Specific Risk Contingency					€228,625
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€3,061,511

N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.
 Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.
 Total base costs to include for ALL qualifying costs under each cost heading.
 Refer to the NRA Cost Management Manual for information on coverage and format of back-up.
 See attached Budget Assumptions Sheet for Further Scheme Information.

Maynooth to Leixlip Project	10/08/2023
Phase 2 Stage 2: Project Appraisal Matrix (PAM)	R405 Option 1
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€50,000
B	Fencing		€7,858
C	Safety Barriers and Pedestrian Guardrails		€13,108
D	Drainage and Service Ducts		€30,211
E	Earthworks		€5,464
F	Pavement		€0
G	Kerbs, Footways and Paved Areas		€12,084
H	Traffic Signs		€11,279
J	Roadmarking		€0
K	Lighting and Electrical		€3,222
L	Landscaping and Environmental		€4,834
M	Structures (Including Tunnels to be separately identified)		€925,316
N	Accommodation Works		€4,834
P	Statutory Authorities & Utilities		€32,225
Q	Any Other Obligations and Liabilities of the Contractor		€32,225
	Sub-Total		€1,132,659
S	Preliminaries		€226,532
MCC Base Cost Total excluding Project Specific Risk Contingency			€1,359,191
	Add Project Specific Risk Contingency	20 %	€271,838
MCC Base Cost Total including Project Specific Risk Contingency			€1,631,029
	Add VAT at	13.5 %	€220,189
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€1,851,218
	Junction Perimeter	0.2 km	
	MCC Cost per km based on Junction Perimeter Only		€11,489,398

Schedule of Works	Quantity	Unit	Rate/Prices	Totals
A Site Clearance				
A1.1 General Site Clearance (Greenfield)	0.03	Ha	€4,094	€50,000
Site Clearance Total to Summary				€50,000
B Fencing				
B.1 Permanent Boundary Fencing	161	m	€49	€7,858
Fencing Total to Summary				€7,858
C Safety Barrier and Pedestrian Guardrails				
C.1 Safety Barrier (Specify Type)	121	m	€108	€13,108
C.2 Median Barrier (Specify Type e.g. Concrete or Wire)		m	€247	€0
Safety Barrier and Pedestrian Guardrails Total to Summary				€13,108

Maynooth to Leixlip Project		10/08/2023	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		R405 Option 1	
Arup		Gerard Hall	
D Drainage and Service Ducts			
D.1 Drainage and Service Ducts per km (Mainline)	0.1	km	€250,000
Drainage and Service Ducts Total to Summary			€30,211
E Earthworks			
R405 Option 1			
E.1 Disposal - U1 - Cut	12	m3	€18.21
E.2 Excavation - Acceptable - Fill	830	m3	€6.32
Earthworks Sub-Total			€5,464
F Pavement			
New Pavement			
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	-	m3	€38.03
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	-	m2	€25.66
F.3 Binder Course (AC 20 Dense bin 55mm)	-	m2	€25.66
F.4 Surface Course (SMA 40mm)	-	m2	€16.81
F.5 Milling Existing Pavement (100mm including disposal)	-	m2	€7.90
Pavement Total to Summary			€0
G Kerbs Footways and Paved Areas			
Allowance based on project scope and historical costs (Active Travel)	0.2	km	€75,000
			€12,084
H Traffic Signs & Roadmarkings			
Allowance based on project scope and historical costs	0.2	km	€70,000
			€11,279
J Roadmarkings			
Allowance based on project scope and historical costs	0.2	sum	
			€0
K Lighting and Electrical			
Allowance based on project scope and historical costs	0.2	sum	€20,000
			€3,222
L Landscaping and Environmental			
Allowance based on project scope and historical costs	0.2	sum	€30,000
			€4,834
M Structures (Including Tunnels to be separately identified)			
Bridge Structure Update & Associated Works	231	m2	€4,000
Structures Total to Summary			€925,316
N Accommodation Works			
Allowance based on project scope and historical costs	0.2	sum	€30,000
			€4,834
P Statutory Authorities & Utilities			
Allowance based on project scope and historical costs	0.2	sum	€200,000
			€32,225
Q Any Other Obligations and Liabilities of the Contractor			
Allowance based on project scope and historical costs	0.2	sum	€200,000
			€32,225
S Preliminaries			
R.2 All Preliminary Items inc. TTM	20%	sum	€226,532
Preliminaries Total to Summary			€226,532
N.B. Figures are exclusive of VAT except where expressly stated above.			
Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.			
Total base costs to include for ALL qualifying costs under each cost heading.			
Refer to the NRA Cost Management Manual for information on coverage and format of back-up.			
See attached Budget Assumptions Sheet for Further Scheme Information.			

Maynooth to Leixlip Project		10/08/2023		S0-P01	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		R405 Option 2			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€50,000
b	Fencing	Various	m	Various	€23,735
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€39,591
d	Drainage and Service Ducts	Various	km	460000	€91,249
e	Earthworks	Various	m3	Various	€5,471
f	Pavement	Various	Various	Various	€0
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€36,500
h	Traffic Signs & Roadmarkings	Various	Various	Various	€34,066
k	Lighting and Electrical	Various	Various	Various	€9,733
l	Landscaping and Environmental	Various	Various	Various	€14,600
m	Structures	Various	Various	Various	€1,022,380
n	Accommodation Works	Various	Various	Various	€14,600
p	Statutory Authorities & Utilities	Various	Various	Various	€97,332
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€97,332
s	Preliminaries	Various	Various	Various	€307,318
Total Base Cost for Main Construction Contract (Excluding VAT)					€1,843,908
Add Project Specific Risk Contingency					20% €368,782
Sub-Total exclusive of VAT					€2,212,689
Add VAT at					13.5% €298,713
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€2,511,402
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€500,000
Add Project Specific Risk Contingency					10% €50,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€550,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €125,570
Add Project Specific Risk Contingency					10% €12,557
Add VAT at					23% €28,881
Total P&D Base Cost plus Project Specific Risk Contingency					€167,008
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€100,000
Add Project Specific Risk Contingency					10% €10,000
Add VAT at					18.3% €18,300
Total Archaeology Base Cost plus Project Specific Risk Contingency					€128,300
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €62,785
Add Project Specific Risk Contingency					10% €6,279
Add VAT at					13.5% €8,476
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€77,540
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €125,570
Add Project Specific Risk Contingency					10% €12,557
Add VAT at					23% €28,881
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€167,008
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					10% €251,140
Add Project Specific Risk Contingency					10% €25,114
Add VAT at					13.5% €33,904
Total Residual Network Base Cost plus Project Specific Risk Contingency					€310,158
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€3,911,416
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	10/08/2023
Phase 2 Stage 2: Project Appraisal Matrix (PAM)	R405 Option 2
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€50,000
B	Fencing		€23,735
C	Safety Barriers and Pedestrian Guardrails		€39,591
D	Drainage and Service Ducts		€91,249
E	Earthworks		€5,471
F	Pavement		€0
G	Kerbs, Footways and Paved Areas		€36,500
H	Traffic Signs		€34,066
J	Roadmarking		€0
K	Lighting and Electrical		€9,733
L	Landscaping and Environmental		€14,600
M	Structures (Including Tunnels to be separately identified)		€1,022,380
N	Accommodation Works		€14,600
P	Statutory Authorities & Utilities		€97,332
Q	Any Other Obligations and Liabilities of the Contractor		€97,332
	Sub-Total		€1,536,590
S	Preliminaries		€307,318
MCC Base Cost Total excluding Project Specific Risk Contingency			€1,843,908
	Add Project Specific Risk Contingency	20 %	€368,782
MCC Base Cost Total including Project Specific Risk Contingency			€2,212,689
	Add VAT at	13.5 %	€298,713
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€2,511,402
	Junction Perimeter	0.5 km	
	MCC Cost per km based on Junction Perimeter Only	€5,160,465	

Schedule of Works		Quantity	Unit	Rate/Prices	Totals
A Site Clearance					
A1.1	General Site Clearance (Greenfield)	0.04	Ha	€4,094	€50,000
Site Clearance Total to Summary					€50,000
B Fencing					
B.1	Permanent Boundary Fencing	487	m	€49	€23,735
Fencing Total to Summary					€23,735
C Safety Barrier and Pedestrian Guardrails					
C.1	Safety Barrier (Specify Type)	365	m	€108	€39,591
C.2	Median Barrier (Specify Type e.g. Concrete or Wire)		m	€247	€0
Safety Barrier and Pedestrian Guardrails Total to Summary					€39,591

Maynooth to Leixlip Project		10/08/2023			
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		R405 Option 2			
Arup		Gerard Hall			
D Drainage and Service Ducts					
D.1	Drainage and Service Ducts per km (Mainline)	0.4	km	€250,000	€91,249
Drainage and Service Ducts Total to Summary					€91,249
E Earthworks					
R405 Option 2					
E.1	Disposal - U1 - Cut	48	m3	€18.21	€867
E.2	Excavation - Acceptable - Fill	728	m3	€6.32	€4,604
Earthworks Sub-Total					€5,471
F Pavement					
New Pavement					
F.1	Sub-base, Granular Type B to Clause 804 150mm Depth	-	m3	€38.03	€0
F.2	Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	-	m2	€25.66	€0
F.3	Binder Course (AC 20 Dense bin 55mm)	-	m2	€25.66	€0
F.4	Surface Course (SMA 40mm)	-	m2	€16.81	€0
F.5	Milling Existing Pavement (100mm including disposal)	-	m2	€7.90	€0
Pavement Total to Summary					€0
G Kerbs Footways and Paved Areas					
Allowance based on project scope and historical costs (Active Travel)		0.5	km	€75,000	€36,500
					€36,500
H Traffic Signs & Roadmarkings					
Allowance based on project scope and historical costs		0.5	km	€70,000	€34,066
					€200,286
J Roadmarkings					
Allowance based on project scope and historical costs		0.5	sum		€0
					€0
K Lighting and Electrical					
Allowance based on project scope and historical costs		0.5	sum	€20,000	€9,733
					€9,733
L Landscaping and Environmental					
Allowance based on project scope and historical costs		0.5	sum	€30,000	€14,600
					€14,600
M Structures (Including Tunnels to be separately identified)					
New Bridge Structure & Associated Works		256	m2	€4,000	€1,022,380
Structures Total to Summary					€1,022,380
N Accommodation Works					
Allowance based on project scope and historical costs		0.5	sum	€30,000	€14,600
					€14,600
P Statutory Authorities & Utilities					
Allowance based on project scope and historical costs		0.5	sum	€200,000	€97,332
					€97,332
Q Any Other Obligations and Liabilities of the Contractor					
Allowance based on project scope and historical costs		0.5	sum	€200,000	€97,332
					€97,332
S Preliminaries					
R.2	All Preliminary Items inc. TTM	20%	sum	€307,318	€307,318
Preliminaries Total to Summary					€307,318
N.B. Figures are exclusive of VAT except where expressly stated above.					
Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.					
Total base costs to include for ALL qualifying costs under each cost heading.					
Refer to the NRA Cost Management Manual for information on coverage and format of back-up.					
See attached Budget Assumptions Sheet for Further Scheme Information.					

Maynooth to Leixlip Project		10/08/2023		S0-P01	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Junction 6 Option 1			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€50,000
b	Fencing	Various	m	Various	€53,583
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€89,380
d	Drainage and Service Ducts	Various	km	460000	€206,003
e	Earthworks	Various	m3	Various	€98,677
f	Pavement	Various	Various	Various	€0
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€82,401
h	Traffic Signs & Roadmarkings	Various	Various	Various	€76,908
k	Lighting and Electrical	Various	Various	Various	€21,974
l	Landscaping and Environmental	Various	Various	Various	€32,960
m	Structures	Various	Various	Various	€861,976
n	Accommodation Works	Various	Various	Various	€32,960
p	Statutory Authorities & Utilities	Various	Various	Various	€219,736
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€219,736
s	Preliminaries	Various	Various	Various	€409,259
Total Base Cost for Main Construction Contract (Excluding VAT)					€2,455,552
Add Project Specific Risk Contingency					20% €491,110
Sub-Total exclusive of VAT					€2,946,662
Add VAT at					13.5% €397,799
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€3,344,462
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€500,000
Add Project Specific Risk Contingency					10% €50,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€550,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €167,223
Add Project Specific Risk Contingency					10% €16,722
Add VAT at					23% €38,461
Total P&D Base Cost plus Project Specific Risk Contingency					€222,407
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€100,000
Add Project Specific Risk Contingency					10% €10,000
Add VAT at					18.3% €18,300
Total Archaeology Base Cost plus Project Specific Risk Contingency					€128,300
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €83,612
Add Project Specific Risk Contingency					10% €8,361
Add VAT at					13.5% €11,288
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€103,260
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €167,223
Add Project Specific Risk Contingency					10% €16,722
Add VAT at					23% €38,461
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€222,407
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					10% €334,446
Add Project Specific Risk Contingency					10% €33,445
Add VAT at					13.5% €45,150
Total Residual Network Base Cost plus Project Specific Risk Contingency					€413,041
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€4,983,877
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	10/08/2023
Phase 2 Stage 2: Project Appraisal Matrix (PAM)	Junction 6 Option 1
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€50,000
B	Fencing		€53,583
C	Safety Barriers and Pedestrian Guardrails		€89,380
D	Drainage and Service Ducts		€206,003
E	Earthworks		€98,677
F	Pavement		€0
G	Kerbs, Footways and Paved Areas		€82,401
H	Traffic Signs		€76,908
J	Roadmarking		€0
K	Lighting and Electrical		€21,974
L	Landscaping and Environmental		€32,960
M	Structures (Including Tunnels to be separately identified)		€861,976
N	Accommodation Works		€32,960
P	Statutory Authorities & Utilities		€219,736
Q	Any Other Obligations and Liabilities of the Contractor		€219,736
	Sub-Total		€2,046,293
S	Preliminaries		€409,259
MCC Base Cost Total excluding Project Specific Risk Contingency			€2,455,552
	Add Project Specific Risk Contingency	20 %	€491,110
MCC Base Cost Total including Project Specific Risk Contingency			€2,946,662
	Add VAT at	13.5 %	€397,799
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€3,344,462
	Junction Perimeter	1.1 km	
	MCC Cost per km based on Junction Perimeter Only	€3,044,073	

Schedule of Works		Quantity	Unit	Rate/Prices	Totals
A Site Clearance					
A1.1	General Site Clearance (Greenfield)	0.22	Ha	€4,094	€50,000
Site Clearance Total to Summary					€50,000
B Fencing					
B.1	Permanent Boundary Fencing	1,099	m	€49	€53,583
Fencing Total to Summary					€53,583
C Safety Barrier and Pedestrian Guardrails					
C.1	Safety Barrier (Specify Type)	824	m	€108	€89,380
C.2	Median Barrier (Specify Type e.g. Concrete or Wire)		m	€247	€0
Safety Barrier and Pedestrian Guardrails Total to Summary					€89,380

Maynooth to Leixlip Project		10/08/2023		
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Junction 6 Option 1		
Arup		Gerard Hall		
D Drainage and Service Ducts				
D.1 Drainage and Service Ducts per km (Mainline)	0.8	km	€250,000	€206,003
Drainage and Service Ducts Total to Summary				€206,003
E Earthworks				
Junction 6 Option 1				
E.1 Disposal - U1 - Cut	671	m3	€18.21	€12,210
E.2 Excavation - Acceptable - Fill	13,681	m3	€6.32	€86,467
Earthworks Sub-Total				€98,677
F Pavement				
New Pavement				
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	-	m3	€38.03	€0
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	-	m2	€25.66	€0
F.3 Binder Course (AC 20 Dense bin 55mm)	-	m2	€25.66	€0
F.4 Surface Course (SMA 40mm)	-	m2	€16.81	€0
F.5 Milling Existing Pavement (100mm including disposal)	-	m2	€7.90	€0
Pavement Total to Summary				€0
G Kerbs Footways and Paved Areas				
Allowance based on project scope and historical costs (Active Travel)	1.1	km	€75,000	€82,401
				€82,401
H Traffic Signs & Roadmarkings				
Allowance based on project scope and historical costs	1.1	km	€70,000	€76,908
				€243,128
J Roadmarkings				
Allowance based on project scope and historical costs	1.1	sum		€0
				€0
K Lighting and Electrical				
Allowance based on project scope and historical costs	1.1	sum	€20,000	€21,974
				€21,974
L Landscaping and Environmental				
Allowance based on project scope and historical costs	1.1	sum	€30,000	€32,960
				€32,960
M Structures (Including Tunnels to be separately identified)				
New Bridge Structure & Associated Works	215	m2	€4,000	€861,976
Structures Total to Summary				€861,976
N Accommodation Works				
Allowance based on project scope and historical costs	1.1	sum	€30,000	€32,960
				€32,960
P Statutory Authorities & Utilities				
Allowance based on project scope and historical costs	1.1	sum	€200,000	€219,736
				€219,736
Q Any Other Obligations and Liabilities of the Contractor				
Allowance based on project scope and historical costs	1.1	sum	€200,000	€219,736
				€219,736
S Preliminaries				
R.2 All Preliminary Items inc. TTM	20%	sum	€409,259	€409,259
Preliminaries Total to Summary				€409,259
N.B. Figures are exclusive of VAT except where expressly stated above.				
Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.				
Total base costs to include for ALL qualifying costs under each cost heading.				
Refer to the NRA Cost Management Manual for information on coverage and format of back-up.				
See attached Budget Assumptions Sheet for Further Scheme Information.				

Maynooth to Leixlip Project		10/08/2023		S0-P01	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Junction 6 Option 2			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€50,000
b	Fencing	Various	m	Various	€66,804
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€111,435
d	Drainage and Service Ducts	Various	km	460000	€256,833
e	Earthworks	Various	m3	Various	€82,969
f	Pavement	Various	Various	Various	€0
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€102,733
h	Traffic Signs & Roadmarkings	Various	Various	Various	€95,884
k	Lighting and Electrical	Various	Various	Various	€27,395
l	Landscaping and Environmental	Various	Various	Various	€41,093
m	Structures	Various	Various	Various	€665,888
n	Accommodation Works	Various	Various	Various	€41,093
p	Statutory Authorities & Utilities	Various	Various	Various	€273,955
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€273,955
s	Preliminaries	Various	Various	Various	€418,007
Total Base Cost for Main Construction Contract (Excluding VAT)					€2,508,044
Add Project Specific Risk Contingency					20% €501,609
Sub-Total exclusive of VAT					€3,009,653
Add VAT at					13.5% €406,303
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€3,415,956
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€500,000
Add Project Specific Risk Contingency					10% €50,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€550,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €170,798
Add Project Specific Risk Contingency					10% €17,080
Add VAT at					23% €39,283
Total P&D Base Cost plus Project Specific Risk Contingency					€227,161
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€100,000
Add Project Specific Risk Contingency					10% €10,000
Add VAT at					18.3% €18,300
Total Archaeology Base Cost plus Project Specific Risk Contingency					€128,300
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €85,399
Add Project Specific Risk Contingency					10% €8,540
Add VAT at					13.5% €11,529
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€105,468
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €170,798
Add Project Specific Risk Contingency					10% €17,080
Add VAT at					23% €39,283
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€227,161
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					10% €341,596
Add Project Specific Risk Contingency					10% €34,160
Add VAT at					13.5% €46,115
Total Residual Network Base Cost plus Project Specific Risk Contingency					€421,871
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€5,075,916
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	10/08/2023
Phase 2 Stage 2: Project Appraisal Matrix (PAM)	Junction 6 Option 2
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€50,000
B	Fencing		€66,804
C	Safety Barriers and Pedestrian Guardrails		€111,435
D	Drainage and Service Ducts		€256,833
E	Earthworks		€82,969
F	Pavement		€0
G	Kerbs, Footways and Paved Areas		€102,733
H	Traffic Signs		€95,884
J	Roadmarking		€0
K	Lighting and Electrical		€27,395
L	Landscaping and Environmental		€41,093
M	Structures (Including Tunnels to be separately identified)		€665,888
N	Accommodation Works		€41,093
P	Statutory Authorities & Utilities		€273,955
Q	Any Other Obligations and Liabilities of the Contractor		€273,955
	Sub-Total		€2,090,037
S	Preliminaries		€418,007
MCC Base Cost Total excluding Project Specific Risk Contingency			€2,508,044
	Add Project Specific Risk Contingency	20 %	€501,609
MCC Base Cost Total including Project Specific Risk Contingency			€3,009,653
	Add VAT at	13.5 %	€406,303
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€3,415,956
Junction Perimeter		1.4 km	
MCC Cost per km based on Junction Perimeter Only		€2,493,810	

Schedule of Works	Quantity	Unit	Rate/Prices	Totals
A Site Clearance				
A1.1 General Site Clearance (Greenfield)	0.27	Ha	€4,094	€50,000
Site Clearance Total to Summary				€50,000
B Fencing				
B.1 Permanent Boundary Fencing	1,370	m	€49	€66,804
Fencing Total to Summary				€66,804
C Safety Barrier and Pedestrian Guardrails				
C.1 Safety Barrier (Specify Type)	1,027	m	€108	€111,435
C.2 Median Barrier (Specify Type e.g. Concrete or Wire)		m	€247	€0
Safety Barrier and Pedestrian Guardrails Total to Summary				€111,435

Maynooth to Leixlip Project		10/08/2023			
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Junction 6 Option 2			
Arup		Gerard Hall			
D Drainage and Service Ducts					
D.1	Drainage and Service Ducts per km (Mainline)	1.0	km	€250,000	€256,833
Drainage and Service Ducts Total to Summary					€256,833
E Earthworks					
Junction 6 Option 2					
E.1	Disposal - U1 - Cut	361	m3	€18.21	€6,567
E.2	Excavation - Acceptable - Fill	12,089	m3	€6.32	€76,402
Earthworks Sub-Total					€82,969
F Pavement					
New Pavement					
F.1	Sub-base, Granular Type B to Clause 804 150mm Depth	-	m3	€38.03	€0
F.2	Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	-	m2	€25.66	€0
F.3	Binder Course (AC 20 Dense bin 55mm)	-	m2	€25.66	€0
F.4	Surface Course (SMA 40mm)	-	m2	€16.81	€0
F.5	Milling Existing Pavement (100mm including disposal)	-	m2	€7.90	€0
Pavement Total to Summary					€0
G Kerbs Footways and Paved Areas					
Allowance based on project scope and historical costs (Active Travel)		1.4	km	€75,000	€102,733
					€102,733
H Traffic Signs & Roadmarkings					
Allowance based on project scope and historical costs		1.4	km	€70,000	€95,884
					€262,104
J Roadmarkings					
Allowance based on project scope and historical costs		1.4	sum		
					€0
K Lighting and Electrical					
Allowance based on project scope and historical costs		1.4	sum	€20,000	€27,395
					€27,395
L Landscaping and Environmental					
Allowance based on project scope and historical costs		1.4	sum	€30,000	€41,093
					€41,093
M Structures (Including Tunnels to be separately identified)					
New Bridge Structure & Associated Works		166	m2	€4,000	€665,888
Structures Total to Summary					€665,888
N Accommodation Works					
Allowance based on project scope and historical costs		1.4	sum	€30,000	€41,093
					€41,093
P Statutory Authorities & Utilities					
Allowance based on project scope and historical costs		1.4	sum	€200,000	€273,955
					€273,955
Q Any Other Obligations and Liabilities of the Contractor					
Allowance based on project scope and historical costs		1.4	sum	€200,000	€273,955
					€273,955
S Preliminaries					
R.2	All Preliminary Items inc. TTM	20%	sum	€418,007	€418,007
Preliminaries Total to Summary					€418,007
N.B. Figures are exclusive of VAT except where expressly stated above.					
Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.					
Total base costs to include for ALL qualifying costs under each cost heading.					
Refer to the NRA Cost Management Manual for information on coverage and format of back-up.					
See attached Budget Assumptions Sheet for Further Scheme Information.					

Maynooth to Leixlip Project		10/08/2023		S0-P01	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		R404 Option 1			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€50,000
b	Fencing	Various	m	Various	€9,130
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€15,229
d	Drainage and Service Ducts	Various	km	460000	€35,100
e	Earthworks	Various	m3	Various	€13,982
f	Pavement	Various	Various	Various	€0
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€14,040
h	Traffic Signs & Roadmarkings	Various	Various	Various	€13,104
k	Lighting and Electrical	Various	Various	Various	€3,744
l	Landscaping and Environmental	Various	Various	Various	€5,616
m	Structures	Various	Various	Various	€809,524
n	Accommodation Works	Various	Various	Various	€5,616
p	Statutory Authorities & Utilities	Various	Various	Various	€37,440
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€37,440
s	Preliminaries	Various	Various	Various	€209,993
Total Base Cost for Main Construction Contract (Excluding VAT)					€1,259,958
Add Project Specific Risk Contingency					20% €251,992
Sub-Total exclusive of VAT					€1,511,950
Add VAT at					13.5% €204,113
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€1,716,063
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€500,000
Add Project Specific Risk Contingency					10% €50,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€550,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €85,803
Add Project Specific Risk Contingency					10% €8,580
Add VAT at					23% €19,735
Total P&D Base Cost plus Project Specific Risk Contingency					€114,118
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€100,000
Add Project Specific Risk Contingency					10% €10,000
Add VAT at					18.3% €18,300
Total Archaeology Base Cost plus Project Specific Risk Contingency					€128,300
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €42,902
Add Project Specific Risk Contingency					10% €4,290
Add VAT at					13.5% €5,792
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€52,983
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €85,803
Add Project Specific Risk Contingency					10% €8,580
Add VAT at					23% €19,735
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€114,118
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					10% €171,606
Add Project Specific Risk Contingency					10% €17,161
Add VAT at					13.5% €23,167
Total Residual Network Base Cost plus Project Specific Risk Contingency					€211,934
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€2,887,516
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	10/08/2023
Phase 2 Stage 2: Project Appraisal Matrix (PAM)	R404 Option 1
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€50,000
B	Fencing		€9,130
C	Safety Barriers and Pedestrian Guardrails		€15,229
D	Drainage and Service Ducts		€35,100
E	Earthworks		€13,982
F	Pavement		€0
G	Kerbs, Footways and Paved Areas		€14,040
H	Traffic Signs		€13,104
J	Roadmarking		€0
K	Lighting and Electrical		€3,744
L	Landscaping and Environmental		€5,616
M	Structures (Including Tunnels to be separately identified)		€809,524
N	Accommodation Works		€5,616
P	Statutory Authorities & Utilities		€37,440
Q	Any Other Obligations and Liabilities of the Contractor		€37,440
	Sub-Total		€1,049,965
S	Preliminaries		€209,993
MCC Base Cost Total excluding Project Specific Risk Contingency			€1,259,958
	Add Project Specific Risk Contingency	20 %	€251,992
MCC Base Cost Total including Project Specific Risk Contingency			€1,511,950
	Add VAT at	13.5 %	€204,113
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€1,716,063
	Junction Perimeter	0.2 km	
	MCC Cost per km based on Junction Perimeter Only	€9,167,003	

Schedule of Works	Quantity	Unit	Rate/Prices	Totals
A Site Clearance				
A1.1 General Site Clearance (Greenfield)	0.03	Ha	€4,094	€50,000
Site Clearance Total to Summary				€50,000
B Fencing				
B.1 Permanent Boundary Fencing	187	m	€49	€9,130
Fencing Total to Summary				€9,130
C Safety Barrier and Pedestrian Guardrails				
C.1 Safety Barrier (Specify Type)	140	m	€108	€15,229
C.2 Median Barrier (Specify Type e.g. Concrete or Wire)		m	€247	€0
Safety Barrier and Pedestrian Guardrails Total to Summary				€15,229

Maynooth to Leixlip Project		10/08/2023	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		R404 Option 1	
Arup		Gerard Hall	
D Drainage and Service Ducts			
D.1 Drainage and Service Ducts per km (Mainline)	0.1	km	€250,000
Drainage and Service Ducts Total to Summary			€35,100
E Earthworks			
R404 Option 1			
E.1 Disposal - U1 - Cut	22	m3	€18.21
E.2 Excavation - Acceptable - Fill	2,149	m3	€6.32
Earthworks Sub-Total			€13,982
F Pavement			
New Pavement			
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	-	m3	€38.03
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	-	m2	€25.66
F.3 Binder Course (AC 20 Dense bin 55mm)	-	m2	€25.66
F.4 Surface Course (SMA 40mm)	-	m2	€16.81
F.5 Milling Existing Pavement (100mm including disposal)	-	m2	€7.90
Pavement Total to Summary			€0
G Kerbs Footways and Paved Areas			
Allowance based on project scope and historical costs (Active Travel)	0.2	km	€75,000
			€14,040
H Traffic Signs & Roadmarkings			
Allowance based on project scope and historical costs	0.2	km	€70,000
			€13,104
J Roadmarkings			
Allowance based on project scope and historical costs	0.2	sum	
			€0
K Lighting and Electrical			
Allowance based on project scope and historical costs	0.2	sum	€20,000
			€3,744
L Landscaping and Environmental			
Allowance based on project scope and historical costs	0.2	sum	€30,000
			€5,616
M Structures (Including Tunnels to be separately identified)			
New Bridge Structure & Associated Works	202	m2	€4,000
Structures Total to Summary			€809,524
N Accommodation Works			
Allowance based on project scope and historical costs	0.2	sum	€30,000
			€5,616
P Statutory Authorities & Utilities			
Allowance based on project scope and historical costs	0.2	sum	€200,000
			€37,440
Q Any Other Obligations and Liabilities of the Contractor			
Allowance based on project scope and historical costs	0.2	sum	€200,000
			€37,440
S Preliminaries			
R.2 All Preliminary Items inc. TTM	20%	sum	€209,993
Preliminaries Total to Summary			€209,993
<p>N.B. Figures are exclusive of VAT except where expressly stated above. Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate. Total base costs to include for ALL qualifying costs under each cost heading. Refer to the NRA Cost Management Manual for information on coverage and format of back-up. See attached Budget Assumptions Sheet for Further Scheme Information.</p>			

Maynooth to Leixlip Project		10/08/2023		S0-P01		
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		R404 Option 2				
Arup		The information presented is Private and Confidential				
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €	
a	Site Clearance	Various	Ha	Various	€50,000	
b	Fencing	Various	m	Various	€5,467	
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€9,119	
d	Drainage and Service Ducts	Various	km	460000	€21,017	
e	Earthworks	Various	m3	Various	€8,113	
f	Pavement	Various	Various	Various	€0	
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€8,407	
h	Traffic Signs & Roadmarkings	Various	Various	Various	€7,846	
k	Lighting and Electrical	Various	Various	Various	€2,242	
l	Landscaping and Environmental	Various	Various	Various	€3,363	
m	Structures	Various	Various	Various	€872,064	
n	Accommodation Works	Various	Various	Various	€3,363	
p	Statutory Authorities & Utilities	Various	Various	Various	€22,418	
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€22,418	
s	Preliminaries	Various	Various	Various	€207,167	
Total Base Cost for Main Construction Contract (Excluding VAT)					€1,243,003	
Add Project Specific Risk Contingency					20%	€248,601
Sub-Total exclusive of VAT					€1,491,603	
Add VAT at					13.5%	€201,366
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€1,692,970	
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €	
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various		
Total Base Cost for Land and Property					€500,000	
Add Project Specific Risk Contingency					10%	€50,000
Add VAT at					0%	€0
Total L&P Base Cost plus Project Specific Risk Contingency					€550,000	
3	Planning and Design					
Provision based on % of MCC Base Cost & Actual Costs where known					5%	€84,648
Add Project Specific Risk Contingency					10%	€8,465
Add VAT at					23%	€19,469
Total P&D Base Cost plus Project Specific Risk Contingency					€112,582	
4	Archaeology					
Provision based on per hectare rate applied to total greenfield area						€100,000
Add Project Specific Risk Contingency					10%	€10,000
Add VAT at					18.3%	€18,300
Total Archaeology Base Cost plus Project Specific Risk Contingency					€128,300	
5	Advance Works and Other Contracts					
Provision based on % of MCC Base Cost & Actual Costs where known					2.5%	€42,324
Add Project Specific Risk Contingency					10%	€4,232
Add VAT at					13.5%	€5,714
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€52,270	
6	Main Contract Supervision (Employer's Costs)					
Provision based on % of MCC Base Cost & Actual Costs where known					5%	€84,648
Add Project Specific Risk Contingency					10%	€8,465
Add VAT at					23%	€19,469
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€112,582	
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)					
Provision based on percentage of Main Construction Contract Base Cost					10%	€169,297
Add Project Specific Risk Contingency					10%	€16,930
Add VAT at					13.5%	€22,855
Total Residual Network Base Cost plus Project Specific Risk Contingency					€209,082	
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€2,857,787	
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>						

Maynooth to Leixlip Project	10/08/2023
Phase 2 Stage 2: Project Appraisal Matrix (PAM)	R404 Option 2
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€50,000
B	Fencing		€5,467
C	Safety Barriers and Pedestrian Guardrails		€9,119
D	Drainage and Service Ducts		€21,017
E	Earthworks		€8,113
F	Pavement		€0
G	Kerbs, Footways and Paved Areas		€8,407
H	Traffic Signs		€7,846
J	Roadmarking		€0
K	Lighting and Electrical		€2,242
L	Landscaping and Environmental		€3,363
M	Structures (Including Tunnels to be separately identified)		€872,064
N	Accommodation Works		€3,363
P	Statutory Authorities & Utilities		€22,418
Q	Any Other Obligations and Liabilities of the Contractor		€22,418
	Sub-Total		€1,035,836
S	Preliminaries		€207,167
MCC Base Cost Total excluding Project Specific Risk Contingency			€1,243,003
	Add Project Specific Risk Contingency	20 %	€248,601
MCC Base Cost Total including Project Specific Risk Contingency			€1,491,603
	Add VAT at	13.5 %	€201,366
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€1,692,970
	Junction Perimeter	0.1 km	
	MCC Cost per km based on Junction Perimeter Only	€15,103,666	

Schedule of Works	Quantity	Unit	Rate/Prices	Totals
A Site Clearance				
A1.1 General Site Clearance (Greenfield)	0.02	Ha	€4,094	€50,000
Site Clearance Total to Summary				€50,000
B Fencing				
B.1 Permanent Boundary Fencing	112	m	€49	€5,467
Fencing Total to Summary				€5,467
C Safety Barrier and Pedestrian Guardrails				
C.1 Safety Barrier (Specify Type)	84	m	€108	€9,119
C.2 Median Barrier (Specify Type e.g. Concrete or Wire)		m	€247	€0
Safety Barrier and Pedestrian Guardrails Total to Summary				€9,119

Maynooth to Leixlip Project		10/08/2023			
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		R404 Option 2			
Arup		Gerard Hall			
D Drainage and Service Ducts					
D.1	Drainage and Service Ducts per km (Mainline)	0.1	km	€250,000	€21,017
Drainage and Service Ducts Total to Summary					€21,017
E Earthworks					
R404 Option 2					
E.1	Disposal - U1 - Cut	8	m3	€18.21	€153
E.2	Excavation - Acceptable - Fill	1,259	m3	€6.32	€7,960
Earthworks Sub-Total					€8,113
F Pavement					
New Pavement					
F.1	Sub-base, Granular Type B to Clause 804 150mm Depth	-	m3	€38.03	€0
F.2	Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	-	m2	€25.66	€0
F.3	Binder Course (AC 20 Dense bin 55mm)	-	m2	€25.66	€0
F.4	Surface Course (SMA 40mm)	-	m2	€16.81	€0
F.5	Milling Existing Pavement (100mm including disposal)	-	m2	€7.90	€0
Pavement Total to Summary					€0
G Kerbs Footways and Paved Areas					
Allowance based on project scope and historical costs (Active Travel)		0.1	km	€75,000	€8,407
					€8,407
H Traffic Signs & Roadmarkings					
Allowance based on project scope and historical costs		0.1	km	€70,000	€7,846
					€7,846
J Roadmarkings					
Allowance based on project scope and historical costs		0.1	sum		€0
					€0
K Lighting and Electrical					
Allowance based on project scope and historical costs		0.1	sum	€20,000	€2,242
					€2,242
L Landscaping and Environmental					
Allowance based on project scope and historical costs		0.1	sum	€30,000	€3,363
					€3,363
M Structures (Including Tunnels to be separately identified)					
New Bridge Structure & Associated Works		218	m2	€4,000	€872,064
Structures Total to Summary					€872,064
N Accommodation Works					
Allowance based on project scope and historical costs		0.1	sum	€30,000	€3,363
					€3,363
P Statutory Authorities & Utilities					
Allowance based on project scope and historical costs		0.1	sum	€200,000	€22,418
					€22,418
Q Any Other Obligations and Liabilities of the Contractor					
Allowance based on project scope and historical costs		0.1	sum	€200,000	€22,418
					€22,418
S Preliminaries					
R.2	All Preliminary Items inc. TTM	20%	sum	€207,167	€207,167
Preliminaries Total to Summary					€207,167
<p>N.B. Figures are exclusive of VAT except where expressly stated above.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project		10/08/2023		S0-P01	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Junction 5 Option 1			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€50,000
b	Fencing	Various	m	Various	€9,694
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€16,170
d	Drainage and Service Ducts	Various	km	460000	€37,268
e	Earthworks	Various	m3	Various	€1,132
f	Pavement	Various	Various	Various	€0
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€14,907
h	Traffic Signs & Roadmarkings	Various	Various	Various	€13,913
k	Lighting and Electrical	Various	Various	Various	€3,975
l	Landscaping and Environmental	Various	Various	Various	€5,963
m	Structures	Various	Various	Various	€1,001,768
n	Accommodation Works	Various	Various	Various	€14,907
p	Statutory Authorities & Utilities	Various	Various	Various	€39,752
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€39,752
s	Preliminaries	Various	Various	Various	€249,840
Total Base Cost for Main Construction Contract (Excluding VAT)					€1,499,043
Add Project Specific Risk Contingency					20% €299,809
Sub-Total exclusive of VAT					€1,798,851
Add VAT at					13.5% €242,845
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€2,041,696
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€500,000
Add Project Specific Risk Contingency					10% €50,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€550,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €102,085
Add Project Specific Risk Contingency					10% €10,208
Add VAT at					23% €23,480
Total P&D Base Cost plus Project Specific Risk Contingency					€135,773
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€100,000
Add Project Specific Risk Contingency					10% €10,000
Add VAT at					18.3% €18,300
Total Archaeology Base Cost plus Project Specific Risk Contingency					€128,300
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €51,042
Add Project Specific Risk Contingency					10% €5,104
Add VAT at					13.5% €6,891
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€63,037
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €102,085
Add Project Specific Risk Contingency					10% €10,208
Add VAT at					23% €23,480
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€135,773
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					10% €204,170
Add Project Specific Risk Contingency					10% €20,417
Add VAT at					13.5% €27,563
Total Residual Network Base Cost plus Project Specific Risk Contingency					€252,149
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€3,306,729

N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.
 Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.
 Total base costs to include for ALL qualifying costs under each cost heading.
 Refer to the NRA Cost Management Manual for information on coverage and format of back-up.
 See attached Budget Assumptions Sheet for Further Scheme Information.

Maynooth to Leixlip Project	10/08/2023
Phase 2 Stage 2: Project Appraisal Matrix (PAM)	Junction 5 Option 1
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€50,000
B	Fencing		€9,694
C	Safety Barriers and Pedestrian Guardrails		€16,170
D	Drainage and Service Ducts		€37,268
E	Earthworks		€1,132
F	Pavement		€0
G	Kerbs, Footways and Paved Areas		€14,907
H	Traffic Signs		€13,913
J	Roadmarking		€0
K	Lighting and Electrical		€3,975
L	Landscaping and Environmental		€5,963
M	Structures (Including Tunnels to be separately identified)		€1,001,768
N	Accommodation Works		€14,907
P	Statutory Authorities & Utilities		€39,752
Q	Any Other Obligations and Liabilities of the Contractor		€39,752
	Sub-Total		€1,249,202
S	Preliminaries		€249,840
MCC Base Cost Total excluding Project Specific Risk Contingency			€1,499,043
	Add Project Specific Risk Contingency	20 %	€299,809
MCC Base Cost Total including Project Specific Risk Contingency			€1,798,851
	Add VAT at	13.5 %	€242,845
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€2,041,696
	Junction Perimeter	0.2 km	
	MCC Cost per km based on Junction Perimeter Only	€10,272,065	

Schedule of Works

	Quantity	Unit	Rate/Prices	Totals
A Site Clearance				
A1.1 General Site Clearance (Greenfield)	0.04	Ha	€4,094	€50,000
Site Clearance Total to Summary				€50,000
B Fencing				
B.1 Permanent Boundary Fencing	199	m	€49	€9,694
Fencing Total to Summary				€9,694
C Safety Barrier and Pedestrian Guardrails				
C.1 Safety Barrier (Specify Type)	149	m	€108	€16,170
C.2 Median Barrier (Specify Type e.g. Concrete or Wire)		m	€247	€0
Safety Barrier and Pedestrian Guardrails Total to Summary				€16,170
D Drainage and Service Ducts				
D.1 Drainage and Service Ducts per km (Mainline)	0.1	km	€250,000	€37,268
Drainage and Service Ducts Total to Summary				€37,268

Maynooth to Leixlip Project		10/08/2023		
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Junction 5 Option 1		
Arup		Gerard Hall		
E Earthworks				
Junction 5 Option 1				
E.1 Disposal - U1 - Cut	53	m3	€18.21	€959
E.2 Excavation - Acceptable - Fill	28	m3	€6.32	€174
Earthworks Sub-Total				€1,132
F Pavement				
New Pavement				
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	-	m3	€38.03	€0
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	-	m2	€25.66	€0
F.3 Binder Course (AC 20 Dense bin 55mm)	-	m2	€25.66	€0
F.4 Surface Course (SMA 40mm)	-	m2	€16.81	€0
F.5 Milling Existing Pavement (100mm including disposal)	-	m2	€7.90	€0
Pavement Total to Summary				€0
G Kerbs Footways and Paved Areas				
Allowance based on project scope and historical costs (Active Travel)	0.2	km	€75,000	€14,907
				€14,907
H Traffic Signs & Roadmarkings				
Allowance based on project scope and historical costs	0.2	km	€70,000	€13,913
				€13,913
J Roadmarkings				
Allowance based on project scope and historical costs	0.2	sum		€0
				€0
K Lighting and Electrical				
Allowance based on project scope and historical costs	0.2	sum	€20,000	€3,975
				€3,975
L Landscaping and Environmental				
Allowance based on project scope and historical costs	0.2	sum	€30,000	€5,963
				€5,963
M Structures (Including Tunnels to be separately identified)				
New Bridge Structure & Associated Works	250	m2	€4,000	€1,001,768
Structures Total to Summary				€1,001,768
N Accommodation Works				
Allowance based on project scope and historical costs	0.2	sum	€75,000	€14,907
				€14,907
P Statutory Authorities & Utilities				
Allowance based on project scope and historical costs	0.2	sum	€200,000	€39,752
				€39,752
Q Any Other Obligations and Liabilities of the Contractor				
Allowance based on project scope and historical costs	0.2	sum	€200,000	€39,752
				€39,752
S Preliminaries				
R.2 All Preliminary Items inc. TTM	20%	sum	€249,840	€249,840
Preliminaries Total to Summary				€249,840
<p>N.B. Figures are exclusive of VAT except where expressly stated above.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>				

Maynooth to Leixlip Project		10/08/2023		S0-P01	
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Junction 5 Option 2			
Arup		The information presented is Private and Confidential			
1	Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
a	Site Clearance	Various	Ha	Various	€50,000
b	Fencing	Various	m	Various	€5,841
c	Safety Barriers and Pedestrian Guardrails	Various	m	Various	€9,743
d	Drainage and Service Ducts	Various	km	460000	€22,455
e	Earthworks	Various	m3	Various	€1,203
f	Pavement	Various	Various	Various	€0
g	Kerbs, Footways and Paved Areas	Various	Various	Various	€8,982
h	Traffic Signs & Roadmarkings	Various	Various	Various	€8,383
k	Lighting and Electrical	Various	Various	Various	€2,395
l	Landscaping and Environmental	Various	Various	Various	€3,593
m	Structures	Various	Various	Various	€840,968
n	Accommodation Works	Various	Various	Various	€3,593
p	Statutory Authorities & Utilities	Various	Various	Various	€23,952
q	Any Other Obligations and Liabilities of the Contractor	Various	Various	Various	€23,952
s	Preliminaries	Various	Various	Various	€201,012
Total Base Cost for Main Construction Contract (Excluding VAT)					€1,206,074
Add Project Specific Risk Contingency					20% €241,215
Sub-Total exclusive of VAT					€1,447,289
Add VAT at					13.5% €195,384
Total MCC Base Cost plus Project Specific Risk Contingency and VAT					€1,642,673
2	Land and Property - All-In Costs	Quantity	Unit	Rate €	Total €
a	Land & Property (refer individual breakdown sheets for corridor)	Various	Various	Various	
Total Base Cost for Land and Property					€500,000
Add Project Specific Risk Contingency					10% €50,000
Add VAT at					0% €0
Total L&P Base Cost plus Project Specific Risk Contingency					€550,000
3	Planning and Design				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €82,134
Add Project Specific Risk Contingency					10% €8,213
Add VAT at					23% €18,891
Total P&D Base Cost plus Project Specific Risk Contingency					€109,238
4	Archaeology				
Provision based on per hectare rate applied to total greenfield area					€100,000
Add Project Specific Risk Contingency					10% €10,000
Add VAT at					18.3% €18,300
Total Archaeology Base Cost plus Project Specific Risk Contingency					€128,300
5	Advance Works and Other Contracts				
Provision based on % of MCC Base Cost & Actual Costs where known					2.5% €41,067
Add Project Specific Risk Contingency					10% €4,107
Add VAT at					13.5% €5,544
Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency					€50,718
6	Main Contract Supervision (Employer's Costs)				
Provision based on % of MCC Base Cost & Actual Costs where known					5% €82,134
Add Project Specific Risk Contingency					10% €8,213
Add VAT at					23% €18,891
Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency					€109,238
7	Walking/Cycling/Asset Renewal (Provision to be subject to the approval of the TII Regional Manager)				
Provision based on percentage of Main Construction Contract Base Cost					10% €164,267
Add Project Specific Risk Contingency					10% €16,427
Add VAT at					13.5% €22,176
Total Residual Network Base Cost plus Project Specific Risk Contingency					€202,870
TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT					€2,793,036
<p>N.B. Figures above are INCLUSIVE of VAT unless otherwise specified.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>					

Maynooth to Leixlip Project	10/08/2023
Phase 2 Stage 2: Project Appraisal Matrix (PAM)	Junction 5 Option 2
Arup	Gerard Hall

Main Construction Cost - Base Cost Estimate

Summary

A	Site Clearance		€50,000
B	Fencing		€5,841
C	Safety Barriers and Pedestrian Guardrails		€9,743
D	Drainage and Service Ducts		€22,455
E	Earthworks		€1,203
F	Pavement		€0
G	Kerbs, Footways and Paved Areas		€8,982
H	Traffic Signs		€8,383
J	Roadmarking		€0
K	Lighting and Electrical		€2,395
L	Landscaping and Environmental		€3,593
M	Structures (Including Tunnels to be separately identified)		€840,968
N	Accommodation Works		€3,593
P	Statutory Authorities & Utilities		€23,952
Q	Any Other Obligations and Liabilities of the Contractor		€23,952
	Sub-Total		€1,005,062
S	Preliminaries		€201,012
MCC Base Cost Total excluding Project Specific Risk Contingency			€1,206,074
	Add Project Specific Risk Contingency	20 %	€241,215
MCC Base Cost Total including Project Specific Risk Contingency			€1,447,289
	Add VAT at	13.5 %	€195,384
MCC Base Cost Total including Project Specific Risk Contingency and VAT			€1,642,673
	Junction Perimeter	0.1 km	
	MCC Cost per km based on Junction Perimeter Only	€13,716,143	

Schedule of Works		Quantity	Unit	Rate/Prices	Totals
A Site Clearance					
A1.1	General Site Clearance (Greenfield)	0.02	Ha	€4,094	€50,000
Site Clearance Total to Summary					€50,000
B Fencing					
B.1	Permanent Boundary Fencing	120	m	€49	€5,841
Fencing Total to Summary					€5,841
C Safety Barrier and Pedestrian Guardrails					
C.1	Safety Barrier (Specify Type)	90	m	€108	€9,743
C.2	Median Barrier (Specify Type e.g. Concrete or Wire)		m	€247	€0
Safety Barrier and Pedestrian Guardrails Total to Summary					€9,743
D Drainage and Service Ducts					
D.1	Drainage and Service Ducts per km (Mainline)	0.1	km	€250,000	€22,455
Drainage and Service Ducts Total to Summary					€22,455

Maynooth to Leixlip Project		10/08/2023		
Phase 2 Stage 2: Project Appraisal Matrix (PAM)		Junction 5 Option 2		
Arup		Gerard Hall		
E Earthworks				
Junction 5 Option 2				
E.1 Disposal - U1 - Cut	18	m3	€18.21	€320
E.2 Excavation - Acceptable - Fill	140	m3	€6.32	€884
Earthworks Sub-Total				€1,203
F Pavement				
New Pavement				
F.1 Sub-base, Granular Type B to Clause 804 150mm Depth	-	m3	€38.03	€0
F.2 Road Base (AC 32 Dense base 40/60) 2 x 100mm (200mm)	-	m2	€25.66	€0
F.3 Binder Course (AC 20 Dense bin 55mm)	-	m2	€25.66	€0
F.4 Surface Course (SMA 40mm)	-	m2	€16.81	€0
F.5 Milling Existing Pavement (100mm including disposal)	-	m2	€7.90	€0
Pavement Total to Summary				€0
G Kerbs Footways and Paved Areas				
Allowance based on project scope and historical costs (Active Travel)	0.1	km	€75,000	€8,982
				€8,982
H Traffic Signs & Roadmarkings				
Allowance based on project scope and historical costs	0.1	km	€70,000	€8,383
				€8,383
J Roadmarkings				
Allowance based on project scope and historical costs	0.1	sum		€0
				€0
K Lighting and Electrical				
Allowance based on project scope and historical costs	0.1	sum	€20,000	€2,395
				€2,395
L Landscaping and Environmental				
Allowance based on project scope and historical costs	0.1	sum	€30,000	€3,593
				€3,593
M Structures (Including Tunnels to be separately identified)				
New Bridge Structure & Associated Works	210	m2	€4,000	€840,968
Structures Total to Summary				€840,968
N Accommodation Works				
Allowance based on project scope and historical costs	0.1	sum	€30,000	€3,593
				€3,593
P Statutory Authorities & Utilities				
Allowance based on project scope and historical costs	0.1	sum	€200,000	€23,952
				€23,952
Q Any Other Obligations and Liabilities of the Contractor				
Allowance based on project scope and historical costs	0.1	sum	€200,000	€23,952
				€23,952
S Preliminaries				
R.2 All Preliminary Items inc. TTM	20%	sum	€201,012	€201,012
Preliminaries Total to Summary				€201,012
<p>N.B. Figures are exclusive of VAT except where expressly stated above.</p> <p>Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.</p> <p>Total base costs to include for ALL qualifying costs under each cost heading.</p> <p>Refer to the NRA Cost Management Manual for information on coverage and format of back-up.</p> <p>See attached Budget Assumptions Sheet for Further Scheme Information.</p>				



MAYNOOTH TO LEIXLIP PROJECT

Appendix 6.3A
Stage 2 PAM
Environmental Assessments
(Corridors)

Kildare County Council

Maynooth to Leixlip Project

Options Report - Stage 2 Material
Assets – Non-Agriculture Corridor
Options Assessment

Draft 1 | 31 August 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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ARUP

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Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Corridor Options Pavement Width

Table 1.3: Criteria for Assessing the Significance of Impact on Properties and Land Use

Table 1.4: Criteria for Assessing the Significance of Impact on Utilities and Services

Table 1.5: Properties and Land Use Assessment

Table 1.6: Utilities and Services Assessment

Table 1.7: Material Assets Summary Assessment Matrix

1 Stage 2 Material Assets – Non-Agriculture - Corridor Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Corridor Options for the Maynooth to Leixlip Project with respect to the Material Assets Non-Agricultural constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4.

1.2 Methodology

The following guidelines and legislation were referred to when undertaking this assessment:

- European Union (2018) (Planning and Development) (Environmental Impact Assessment) Regulations. (SI 296 of 2018);
- Environmental Protection Agency (EPA) (May 2022) Guidelines on the Information to be contained in Environmental Impact Assessment Reports¹; and
- Transport Infrastructure Ireland (TII) (2016) Project Appraisal Guidelines Unit 7.0 - Multi Criteria Analysis, PE-PAG-02031².

This assessment is a desktop assessment of available data sources. The desktop study considered the following sources of information i.e., aerial mapping / photography³, Property Registration Authority of Ireland (PRAI)⁴ database and data regarding agriculture in County Kildare and County Dublin from the Central Statistics Office (CSO) as referred to in the Constraints Report.

1.2.1 Scoring Procedure

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG scoring procedure. The PAG seven-point scale scoring procedure is shown in Table 1.1.

¹ Environmental Protection Agency (EPA) (May 2022) Guidelines on the Information to be contained in Environmental Impact Assessment Report. Available from: https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf [Accessed 12th December 2022]

² Transport Infrastructure Ireland (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf> [Accessed: 3rd March 2022]

³ Google Aerial Mapping (2022). Available from: <https://www.google.com/maps> [Accessed: November 2020 to March 2022]

⁴ Property Registration Authority (2021). Available from <https://www.landdirect.ie/index> [Accessed in 2021 and 2022]

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

In the first instance, individual assessments were carried out on each criterion followed by an overall assessment. A score was assigned to both Corridor Options based on the TII PAG seven-point scale, and the overall preference for each Corridor Option of Preferred, Intermediate, or Least Preferred was assigned using a combination of the assessment criteria results and professional judgement.

1.2.2 Assessment Criteria Overview

Overall pavement width is the primary differentiator between the Corridor Options. These pavement widths are summarised in Table 1.2. This criterion is used to carry out the assessment on Properties and Land Use and Utilities and Services, and also to determine a preferred Corridor Option.

Table 1.2: Corridor Options Pavement Width

Corridor Option	Overall Pavement Width
Corridor Option 1	29m
Corridor Option 2	30.5m

1.2.3 Assessment Criteria for Properties and Land Use

For the purposes of assessing direct impacts on properties, the extent of both Corridor Options is considered to include all lands required for the construction and operation of new infrastructure. Both Corridor Options are online options and share the same centreline and therefore it can be deemed appropriate to examine both Corridor Options together.

Both Corridor Options are considered to have a similarly minor impact from a properties and utilities perspective primarily because they are all within the existing M4/N4 corridor. However, given that Corridor Option 1 has the narrowest footprint it is considered to be Preferred. Corridor Option 2 has a footprint wider than Corridor Option 1, therefore is considered to be Least Preferred.

The potential impact of the Corridor Options on properties is assessed according to the significance criteria detailed in Table 1.3.

Table 1.3: Criteria for Assessing the Significance of Impact on Properties and Land Use

Significance Level/ Degree of Impact	Definition
Major or Highly Negative Profound	A non-agricultural property of national or regional importance is fully within the option extent and will be removed by the proposed option
Moderately Negative	A non-agricultural property or other material asset is fully within the option extent and may result in the demolition or acquisition of a dwelling or, or where acquisition of a property results in loss of employment and total or partial loss of the business
Minor or Slightly Negative	Part of a non-agricultural property or other material asset is within the option extent
Not Significant or Neutral	An impact on a property which is currently occupied by a public right-of-way, e.g., a road or the non-agricultural property or other material asset is in the vicinity of the option but outside the option extent

1.2.4 Assessment Criteria for Utilities and Services

The locations of existing utilities were requested from relevant utility service providers. Key utilities and services have been identified and used to inform this assessment.

Low voltage ESB lines which service homes and businesses within the vicinity of the Corridor Options were evident, however these are considered to be a minor constraint and may be readily diverted where necessary. In addition, it would not be a differentiating factor when comparing options. The ESB services that have been assessed (see bulleted list below) are considered to be the major utilities for this service provider and pose more significant constraints for the project. This is because they are high voltage.

Small diameter foul combined and surface water sewers and watermains throughout the study area have are not considered significant constraints for the project. Moreover, they are considered to be a minor constraint and could be readily diverted where necessary. The assessment has been carried out based on the larger diameter, more critical services, as detailed in the bulleted list below, as these pose more significant constraints for the Project.

In summary, at Stage 2 in the assessment and comparison of the Corridor Options, impacts on larger utilities and services were considered as high impact and differentiating factors. The following utilities and services were considered:

- ESB High Voltage (i.e., 38kV, 110kV and 220kV) Overhead Lines;
- ESB High Voltage Underground Lines;
- ESB Medium Voltage (i.e., 10kV, 20kV) Overhead Lines;
- ESB Substations;
- Gas Networks Ireland Infrastructure;
- Irish Water watermains;

- Irish Water foul and combined sewers;
- Water/wastewater treatment plants;
- Telecoms Antennas;
- Eir underground services; and
- E-Net services.

The potential impact of both Corridor Options on services and utilities is assessed according to the significance criteria detailed in Table 1.4.

Table 1.4: Criteria for Assessing the Significance of Impact on Utilities and Services

Significance Level/ Degree of Impact	Definition
Major or Highly Negative Profound	Removal of a service or utility that is of national or regional importance
Moderately Negative	Major diversion of High Voltage ESB lines (38kV, 110kV or 220kV) or fibre optic telecoms
Minor or Slightly Negative	Minor diversion of High Voltage ESB lines (38kV, 110kV or 220kV) or fibre optic telecoms
Not Significant or Neutral	The diversion of low and medium voltage ESB network, telecommunications or water supply or foul sewer services

1.3 Corridor Options Assessment

1.3.1 Properties and Land Use

There are no amenities located within the extent of the Corridor Options.

Adjacent to the Corridor Options there are a number of business parks including the M4 Business Park, the Maynooth Business Campus, and the Liffey Business Campus (former HP site). The Properties and Land Use assessment is summarised in Table 1.5.

Table 1.5: Properties and Land Use Assessment

Assessment Criteria	Corridor Option 1	Corridor Option 2
Residential	There are no impacted residential properties within Corridor Option 1 or Corridor Option 2	
Commercial/Industrial	There are three business parks adjacent to the Corridor Options, none of which will be directly affected	
Amenity	There are no impacted amenities within Corridor Option 1 or Corridor Option 2	
Other	N/A	
Qualitative Assessment	Not Significant or Neutral	Not Significant or Neutral
Score/Impact Level	4	4
Preference	Preferred	Least Preferred

1.3.2 Utilities and Services

Storm watermains are located in much of the existing M4/N4 mainline, from Junction 7 Maynooth to Junction 5 Leixlip.

Numerous watermains are evident throughout the extent of the Corridor Options, running adjacent to the M4/N4 mainline. Watermains cross the M4/N4 at various locations, usually utilising an existing overbridge although also traversing under the M4/N4 mainline at times. There is a reservoir located east of Junction 7 Maynooth with various watermain inlets and outlets.

Leixlip Hydro Station and Leixlip Drinking Water Treatment Plant are situated west of Junction 5 Leixlip.

Gravity fed foul wastewater network mainline crossings are evident at Junction 7 Maynooth, the R404 and west of the River Liffey Bridge. There is a combined sewer crossing at Junction 5 Leixlip.

There is one overhead HV ESB line within the extent of the Corridor Options. This is located east of Junction 7 Maynooth. Underground HV lines are located adjacent to the Ballygoran Road and end at a sub-station also located on the Ballygoran Road.

There is a LV/MV overhead crossing located between Junction 6 Celbridge and Junction 5 Leixlip.

Decommissioned gas infrastructure is evident west of Junction 6 Celbridge. Low pressure gas infrastructure is evident east of Junction 6 Celbridge. Medium pressure gas infrastructure is evident throughout the extent of the Corridor Options with an underground mainline crossing east of the R405 Ballygoran Road Overbridge and a mainline crossing on the R404 Celbridge Road Overbridge.

Numerous EIR infrastructure is evident within the extent of the Corridor Options with at-grade crossings at Junction 7 Maynooth and Junction 5 Leixlip.

Mainline crossings are also evident at the M4 Business Park, the R404 Celbridge Road Overbridge and east of Junction 5 Leixlip.

There is a small quantity of BT infrastructure located at Junction 6 Celbridge and adjacent to Barnhall Road. Further BT infrastructure crosses the mainline on the R404 Celbridge Road Overbridge.

UPC infrastructure is evident throughout the extent of the Corridor Options with mainline crossings located at Junction 6 Celbridge, the R405 Ballygoran Road Overbridge, the R404 Celbridge Road Overbridge, Junction 5 Leixlip and east of Junction 5 Leixlip.

The assessment is summarised in Table 1.6.

Table 1.6: Utilities and Services Assessment

Assessment Criteria	Corridor Option 1	Corridor Option 2
ESB High Voltage (i.e., 38kV, 110kV and 220kV) Overhead Lines (HV OH)	East of Junction 7	
ESB High Voltage Underground Lines (HV UG)	East of Ballygoran Road	
ESB Medium Voltage (i.e., 10kV, 20kV) Overhead Lines (MV OH)	Junction 6 and Junction 5	
ESB Substations	Ballygoran Road	
Gas Networks Ireland MP gas mains	Located Throughout Corridor Option 1 with Crossings R405 Ballygoran Road Overbridge and Mainline Crossing at R404 Celbridge Road	
Gas Networks Ireland LP gas mains	East of Junction 6	
Irish Water watermains	Located Throughout Corridor Option 1 and Corridor Option 2	
Irish Water foul or combined sewers	Combined Sewer Crossing at Junction 5. 3x no. Mainline Crossings	
Water/wastewater treatment plants	Leixlip Drinking Water Treatment Plant	
Eir underground services	At Grade Crossings at Junction 5 and Junction 7. Mainline EIR Crossings at M4 Business Park, R404 Celbridge Road Overbridge and East of Junction 5	
Other	BT Infrastructure at Junction 6 and Adjacent to Barnhall Road. R404 Overbridge Crossing. UPC Infrastructure Mainline Crossings at Junction 6, R405, R404, Junction 5 and east of Junction 5	
Qualitative Assessment	Minor or Slightly Negative	Minor or Slightly Negative
Score/Impact Level	3	3
Preference	Preferred	Least Preferred

The overall ranking preferences for the Corridor Options in terms of material assets are shown in Table 1.7.

Table 1.7: Material Assets Summary Assessment Matrix

Assessment Criteria	Corridor Option 1	Corridor Option 2
Properties	There are three business parks that are not significant near both Corridor Option 1 and Corridor Option 2	
Utilities	There are numerous utilities crossing the mainline, both overhead and underground in Corridor Option 1 and Corridor Option 2	
Qualitative Assessment	Minor or Slightly Negative	Minor or Slightly Negative
Score/Impact Level	3	3
Preference	Preferred	Least Preferred

1.4 Summary

Both Corridor Options have a similarly minor impact from a properties and utilities perspective primarily because they are both within the existing M4/N4 corridor. However, given that Corridor Option 1 has a narrower footprint than Corridor Option 2, it is considered to be Preferred. Corridor Option 2 has a wider footprint than Corridor Option 1, and therefore is Least Preferred.

Kildare County Council

Maynooth to Leixlip Project

Options Report – Stage 2 Air Quality
Corridor Options Assessment

Draft 1 | 31 August 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Table 1.1: Baseline Concentration of Pollutants – Zone C

Table 1.2: Baseline Concentrations of Pollutants – Zone D

Table 1.3: PAG Scoring System used in Ranking

Table 1.4: Air Quality Assessment Matrix of Corridor Options

1 Stage 2 Air Quality - Corridor Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Corridor Options for the Maynooth to Leixlip Project with respect to the Air Quality constraints identified in the Constraints Report.

Section 1.2 outlines the methodology that was used to carry out the assessment. The assessment is presented in Section 1.3 with Section 1.4 outlining the summary of the Stage 2 Air Quality assessment of the options.

Sensitive receptors are defined in TII guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes as residential housing, schools, hospitals, places of worship, sports centres and shopping areas, i.e., locations where members of the public are likely to be regularly present. Ecological receptors are considered in the Biodiversity assessment in terms of their proximity to the two corridor options.

1.2 Methodology

The methodology for the assessment of the Stage 2 Corridor Options is set out hereunder.

The steps outlined in the Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes (TII 2011) were followed for the calculation of the Index of Overall Change in Exposure which allows a comparison of the overall impact on people from each of the Route Options.

“The index is based on identifying the number of sensitive receptor locations (e.g. residential properties) within 50m of the carriageway for all road links with a significant change in traffic for each of the Route Options. Fifty metres represents the distance within which detectable impacts of road traffic might be found, while a significant change can be considered to be an increase or decrease in traffic flow (AADT) of 5% or more. The number of properties is then multiplied by the predicted change in the emission rate along that link, and then summed across all links for that Route Option”.

The scope of this Corridor Options assessment focuses on the section of the M4/N4 mainline carriageway from Maynooth to Leixlip. The existing environment of this area is as described in the Stage 1 Environmental Assessment.

1.2.1 Existing Environment

The existing local air quality conditions within the Study Area are discussed in this section. The existing air quality is determined from air quality data recorded by the EPA. The Air Quality Standards divides Ireland into four zones, with air quality data recorded by the EPA for each zone.

- Zone A includes Dublin City and its environs;
- Zone B includes Cork City and its environs;
- Zone C is defined by the EPA as other cities and large towns comprising Limerick, Galway, Waterford, Drogheda, Dundalk, Bray, Navan, Ennis, Tralee, Kilkenny, Carlow, Naas, Sligo, Newbridge, Mullingar, Wexford, Letterkenny, Athlone, Celbridge, Clonmel, Balbriggan, Greystones, Leixlip and Portlaoise; and
- Zone D includes Rural Ireland, i.e., the remainder of the State excluding Zones A, B and C.

Pollutants that are of concern in relation to road project developments are identified as NO₂, NO_x, CO, and PM. Table 1.1 and Table 1.2 present baseline data for the most recent available years, 2021, 2020, and 2019 for each of these pollutants as published by the Environmental Protection Agency (EPA)¹. The study area incorporates both Zone C and Zone D. Baseline values are compared to Air Quality Standards.

Table 1.1: Baseline Concentration of Pollutants – Zone C

Year	Pollutant	Time Period	Concentration µg/m ³	Air Quality Standard µg/m ³	% of Air Quality Standard Limit
2021	NO ₂	Annual Average	11.6	40	29
	NO _x	Annual Average	22.7	30	75.6
	CO	8-hour Annual Average	300	10,000	0.003
	PM _{2.5}	Annual Average	8.8	25	35.2
	PM ₁₀	Annual Average	13.1	40	32.75
2020	NO ₂	Annual Average	11.1	40	27.75
	NO _x	Annual Average	21.6	30	72
	CO	8-hour Annual Average	200	10,000	0.002
	PM _{2.5}	Annual Average	9.5	25	38
	PM ₁₀	Annual Average	14.4	40	36

¹ EPA (2022) Monitoring & Assessment: Air Publications | Environmental Protection Agency (epa.ie)

Year	Pollutant	Time Period	Concentration $\mu\text{g}/\text{m}^3$	Air Quality Standard $\mu\text{g}/\text{m}^3$	% of Air Quality Standard Limit
2019	NO ₂	Annual Average	17	40	42.5
	NO _x	Annual Average	13.65	30	45.5
	CO	8-hour Annual Average	100	10,000	1
	PM _{2.5}	Annual Average	9	25	36
	PM ₁₀	Annual Average	15	40	37.5

Table 1.2: Baseline Concentrations of Pollutants – Zone D

Year	Pollutant	Time Period	Concentration $\mu\text{g}/\text{m}^3$	Air Quality Standard $\mu\text{g}/\text{m}^3$	% of Air Quality Standard Limit
2021	NO ₂	Annual Average	7.5	40	18.75
	NO _x	Annual Average	14.2	30	47.3
	CO	8-hour Annual Average	300	10,000	0.003
	PM _{2.5}	Annual Average	8.7	25	34.8
	PM ₁₀	Annual Average	11.8	40	29.5
2020	NO ₂	Annual Average	7.6	40	19
	NO _x	Annual Average	15.8	30	52.6
	CO	8-hour Annual Average	400	10,000	0.004
	PM _{2.5}	Annual Average	7.8	25	31.2
	PM ₁₀	Annual Average	11.2	40	28
2019	NO ₂	Annual Average	5.7	40	14.3
	NO _x	Annual Average	7.8	30	26.0
	CO	8-hour Annual Average	-	10,000	-
	PM _{2.5}	Annual Average	10.3	25	41.2
	PM ₁₀	Annual Average	12.8	40	32.0

1.2.2 Scoring Procedure

The multi-criteria air assessment was undertaken with reference to the Transport Infrastructure Ireland (TII) Air Quality Assessment of Proposed National Roads - Standard² and in accordance with the requirements of the TII Project Management Guidelines³, the TII Project Manager’s Manual⁴ and the TII Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis PE-PAG02031⁵.

An air quality specialist is required to define their assessment methodology and assessment sub-criteria based on their expert opinion and best practice. Guidance on what to include as sub-criteria is given in Chapter 3 of PAG Unit 7.0⁵. Following this, the potential impacts and their magnitude are to be identified for each of the options. The summary assessment matrix for air quality includes both quantitative and qualitative assessments, as shown in Table 1.4. Each impact is scored qualitatively based on the PAG seven-point Likert scale and an integer is assigned according to the impact level as shown in Table 1.3.

Table 1.3: PAG Scoring System used in Ranking

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Using a combination of the impact scores and professional judgement, a determination on the level of the impact of each Corridor Option was provided. The Environmental Protection Agency (EPA) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports⁶ were also referred to when undertaking this assessment.

² TII (2022) Air Quality Assessment of Proposed National Roads - Standard. Available at: <https://www.tiipublications.ie/library/PE-ENV-01107-01.pdf>

³ TII (2022) Project Management Guidelines. Available at: <https://www.tiipublications.ie/library/PE-PMG-02041-04.pdf>

⁴ TII (2019) Project Manger’s Manual for Major National Road Projects PE-PMG-02042. Available from <https://www.tiipublications.ie/library/PE-PMG-02042-01.pdf>

⁵ TII (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis. Available at: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

⁶ EPA (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR). Available at: <https://www.epa.ie/publications/monitoring--assessment/assessment/guidelines-on-the-information-to-be-contained-in-environmental-impact-assessment-reports-eiar.php>

Using the impact scores and the professional judgement of the specialist, a determination is made as to whether each corridor option is either:

- Preferred; or
- Least Preferred.

The corridor options are then weighted against each other in the assessment matrix (Table 1.4).

1.3 Corridor Options Assessment

The number of existing and potential sensitive receptors in proximity to both corridor options determines local air quality impacts. The zone of interest for the assessment is 0-50m from each corridor option potential road footprint. This is an offset from the edge of the potential road footprint of each corridor option and assumes that properties within the potential footprint would be acquired and would therefore not be counted as receptors.

The two corridor options are located within the existing M4/N4 corridor and include both bus and road elements, therefore the sensitive receptors in proximity are the same for both Corridor Option 1 and Corridor Option 2.

1.3.1 Corridor Option 1

Corridor Option 1 would consist of hard shoulder bus priority measures in both the eastbound and westbound directions. Construction works will also be necessary in terms of site clearance, pavement works, drainage, earthworks, vehicle restraint systems, utility infrastructure, traffic signs, road markings and road lighting.

The number of sensitive receptors in proximity to each corridor option and the air quality assessment determinations are outlined in Table 1.4. The average traffic volume for Corridor Option 1 between Junction 7 and Junction 6 were used for the assessment. Corridor Option 1 is located within the existing M4/N4 corridor and include both bus and road elements. The online improvements of Corridor Option 1 are predicted to have minor or slightly negative air quality impacts to the 104 sensitive receptors in close proximity to the M4.

During the operational stage of Corridor Option 1, the implementation of bus priority measures will result in no change to traffic volumes or NOx exposure.

Air quality impacts associated with Corridor Option 1 are predicted to have the least negative impacts compared to other options and therefore, Corridor Option 1 has been ranked as Preferred both in relation to construction and operational phases.

1.3.2 Corridor Option 2

The online improvements provided in Corridor Option 2 will include bus priority measure works, previously listed for Corridor Option 1, as well as the construction of a third lane of traffic to the existing M4 westbound. The addition of a new lane has the potential to result in minor or slightly negative impacts on surrounding sensitive receptors, during the construction and operational phases.

During the operational phase, the implementation of bus priority measures and the addition of one extra traffic lane in the westbound direction will result in a slight increase in traffic volumes. Both the construction and the operational stages are predicted to result in minor or slightly negative impacts to air quality. The operational phase is predicted to generate a higher NO_x exposure than Corridor Option 1. This option is therefore ranked as Least Preferred.

1.3.3 Corridor Options Assessment Matrix

The numbers of sensitive receptors in proximity to each corridor option and the air quality assessment are outlined in Table 1.4 below. The predicted change in AADT volumes listed below are taken from the same section of the M4/N4 between Junction 7 and Junction 6 for each corridor option. The NO_x exposure index is calculated for each corridor option and is included in Table 1.4.

Both corridor options cross the River Liffey between Junction 5 and Junction 6 and there is also a minor watercourse between Junction 6 and the R404 Overbridge. These two outfall areas belong to the designated sites: the Rye Water Valley/ Carton SAC and the Royal Canal pNHA. As a result, two outfall locations have been included as sensitive receptors in Table 1.4.

Table 1.4: Air Quality Assessment Matrix of Corridor Options

Assessment Criteria - Distance from Footprint	Do-Minimum	Corridor Option 1	Corridor Option 2
Property counts – existing sensitive receptors - 0 - 50m	45	45	45
Designated Sites – Outfalls crossing existing M4	2	2	2
Property counts – granted planning applications for sensitive receptor developments 0 – 50m	57	57	57
Total No. of Receptors within 0-50m	104	104	104
Change in AADT 2031 across routes	0	0	1,285
NO _x Exposure Index	0	0	38,051
Qualitative Assessment	N/A	Not significant or neutral	Minor or slightly negative
Score / Impact Level	N/A	4	3
Preference	N/A	Preferred	Least Preferred

The minimal predicted changes in traffic volumes accessing this section of the M4/N4 is unlikely to generate noticeable changes in air quality. No significant adverse impacts are likely to arise at the nearest residential receptors or ecological receptors.

The potential for air quality impacts during the construction phase can be minimised through the implementation of standard dust mitigation measures.

1.4 Summary

Corridor Option 1 is Preferred, as no change is predicted in the AADT and there is no predicted increase in NO_x exposure.

Corridor Option 2 is Least Preferred, as there is a predicted increase in both AADT values and NO_x exposure. However, these increases are marginal.

The provision of the hard shoulder bus priority measures offers a more sustainable option to private cars, potentially reducing emissions into the future.

No significant adverse impacts on air quality are likely to arise during the operational phase. Construction phase impacts can be mitigated through the provision of standard mitigation measures.

1.5 References

EPA (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR). Available at: <https://www.epa.ie/publications/monitoring--assessment/assessment/guidelines-on-the-information-to-be-contained-in-environmental-impact-assessment-reports-eiar.php>

EPA (2022) Monitoring & Assessment: Air Publications | Environmental Protection Agency (epa.ie)

TII (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis. Available at: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

TII (2019) Project Manger's Manual for Major National Road Projects PE-PMG-02042. Available from <https://www.tiipublications.ie/library/PE-PMG-02042-01.pdf>

TII (2022) Air Quality Assessment of Proposed National Roads - Standard. Available at: <https://www.tiipublications.ie/library/PE-ENV-01107-01.pdf>

TII (2022) Project Management Guidelines. Available at: <https://www.tiipublications.ie/library/PE-PMG-02041-04.pdf>

Kildare County Council

Maynooth to Leixlip Project

Options Report - Stage 2

Archaeological, Architectural and
Cultural Heritage Corridor Options
Assessment

Draft 1 | 31 August 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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1 Stage 2 Archaeological, Architectural and Cultural Heritage Corridor Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Corridor Options for the Maynooth to Leixlip Project with respect to the Archaeological, Architectural and Cultural Heritage constraints identified in Constraints Report. The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4.

1.2 Methodology

As per the Stage 1 assessment, the Stage 2 assessment of options has been carried out with reference to the NRA Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes (2005) and Assessment of Architectural Heritage Impacts of National Road Schemes (2005), although it should be noted that the guidelines themselves predate the establishment of an options assessment process.

In order to produce a meaningful assessment (in relation to the Archaeological, Architectural and Cultural Heritage resource), a study area of 200m from the edge of where interventions may be required has been used for the assessment of same. A preliminary design has been used to assess for potential direct and indirect impacts on the archaeological, architectural and cultural heritage constraints within a 200m study area within each option corridor.

Measurements are made from the edge of the intervention (where applicable) or indicative fenceline to the upstanding remains of the archaeological, architectural or cultural heritage constraint. If no remains are upstanding, the measurement is made to the centre of the site.

Each constraint included in and within 200m of each option is tabulated with measurements from the option included. The impact type is then defined (direct, indirect, no impact, positive, negative, neutral) based on whether the constraint would be physically affected or not by the option. Dependant on how the constraint would be affected defines the potential impact on the constraint (significant, very significant, profound).

Based on the above therefore, the assessment comprises the calculation and definition of the potential direct and indirect impacts upon the Archaeological, Architectural and Cultural Heritage resource associated with each option and the potential significance of those impacts. This results in the overall assessment of the options in terms of potential impacts and an overall ranking of the options in terms of potential impacts and order of preference.

The assessment included key Archaeological, Architectural and Cultural Heritage constraints, identified during the overall constraints study for the project, along with a desktop assessment carried out in order to identify previously unrecorded sites or structures of Archaeological, Architectural or Cultural Heritage significance.

The resources consulted consist of the following:

- Record of Monuments and Places (RMP) for Counties Kildare and Dublin;
- Sites and Monuments Record (SMR) for Counties Kildare and Dublin;
- Monuments in State Care Database Counties Kildare and Dublin;
- Preservation Orders Counties Kildare and Dublin;
- Topographical Files of the National Museum of Ireland- Counties Kildare and Dublin;
- Historic cartographic study area;
- National Inventory of Architectural Heritage Counties Kildare and Dublin (Architectural & Garden Survey);
- Excavations Bulletin (1970-2023);
- Kildare County Development Plan 2023-2029;
- South Dublin County Development Plan 2022-2028; and
- Aerial photographic coverage.

Record of Monuments and Places (RMP) Section 12 (1) of the National Monuments Act (1994 amendment) provides that the Minister for Arts, Heritage, Gaeltacht and the Islands (now the Minister for Housing, Local Government and Heritage) shall establish and maintain a record of monuments and places (RMP) where it is known that such monuments exist. The record comprises of a list of monuments and relevant places and mapping showing each monument and relevant place in respect of each county in the state. Sites recorded on the Record of Monuments and Places all receive statutory protection under the National Monuments Act. All recorded monuments are referred to as Archaeological Heritage (AH sites) within this assessment.

Sites and Monuments Record (SMR) holds documentary evidence and field inspections of all known archaeological sites and monuments. Some information is also held about archaeological sites and monuments whose precise location is not known e.g. only a site type and townland are recorded. These are known to the National Monuments Service as ‘un-located sites’ and cannot be afforded legal protection. As a result, these are omitted from the Record of Monuments and Places. SMR sites are also listed on a website maintained by the Housing, Local Government and Heritage (DoHLGH) – www.archaeology.ie. All SMR sites are referred to as Archaeological Heritage (AH sites) within this assessment.

National Monuments in the State Care Database is a list of all the National Monuments in the state guardianship or ownership. Each is assigned a National Monument number whether in guardianship or ownership and has a brief description of the remains of each Monument.

A national monument receives statutory protection and is described as ‘a monument or the remains of a monument the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto’ (National Monuments Act, 1930, Section 2).

The Minister for the Department of Housing, Local Government and Heritage may acquire national monuments by agreement or by compulsory order. The state or local authority may assume guardianship of any national monument (other than dwellings). The owners of national monuments (other than dwellings) may also appoint the Minister or the local authority as guardian of that monument if the state or local authority agrees. Once the site is in ownership or guardianship of the state, it may not be interfered with without the written consent of the Minister.

Preservation Orders List and/or Temporary Preservation Orders, can be assigned to a site or sites that are deemed to be in danger of injury or destruction. These are allocated under the 1930 Act.

Preservation Orders make any interference with the site illegal. Temporary Preservation Orders can be attached under the 1954 Act. These perform the same function as a Preservation Order but have a time limit of six months, after which the situation must be reviewed. Work may only be undertaken on or in the vicinity of sites under Preservation Orders with the written consent, and at the discretion, of the Minister (DoHLGH).

Topographical files of the National Museum of Ireland are the national archive of all known finds recorded by the National Museum. This archive relates primarily to artefacts but also includes references to monuments and unique records of previous excavations. The find spots of artefacts are important sources of information on the discovery of sites of archaeological significance.

Historic cartographic sources are important in tracing land use development within the development area as well as providing important topographical information on areas of archaeological potential and the development of buildings. Cartographic analysis of the historic Ordnance Survey Maps has been made to identify any topographical anomalies or structures that no longer remain within the landscape. All sites of potential archaeological or architectural heritage merit identified during the map analysis are listed as Cultural Heritage (CH) sites within this assessment.

Aerial photographic coverage is an important source of information regarding the precise location of sites and their extent. It also provides initial information on the terrain and its likely potential for archaeology. Ordnance Survey aerial photographs (1995-2013), Google Earth coverage (2020) and Bing Maps were examined for this assessment. Any sites identified during cartographic or aerial photographic assessment as identified as Cultural Heritage (CH) sites within this assessment.

Development Plans contain a catalogue of all the Protected Structures, archaeological sites and Architectural Conservation Areas within each county.

The development plans for Counties Kildare and South Dublin were examined as part of this assessment, along with relevant local or town plans. All protected structures are referred to as Built Heritage sites (BH) as part of this assessment. Any designated Architectural Conservation Areas (ACAs) are also included, where applicable.

The National Inventory of Architectural Heritage (NIAH) is a government-based organisation tasked with making a nationwide record of significant local, regional, national and international structures, which in turn provides county councils with a guide as to what structures to list within the Record of Protected Structures. The NIAH have also conducted a nationwide desk-based survey of historic gardens, including demesnes that surround large houses. All NIAH structures are referred to as Built Heritage sites (BH) as part of this assessment.

Whilst the NIAH Garden Survey was utilised as part of this assessment, this was carried out in conjunction with detailed analysis of the historic Ordnance Survey maps in order to identify all designed landscapes (DL) within the corridor options.

Excavations Bulletin is a summary publication that has been produced every year since 1970. The hard copy publication summarises every archaeological excavation that has taken place in Ireland during that year up until 2010 and since 1987 has been edited by Isabel Bennett. This information is vital when examining the archaeological content of any area which may not have been recorded under the SMR and RMP files. This information is also available online (www.excavations.ie) from 1970-2023. It should be noted that in some instances, summaries are not lodged for excavations and as such the record cannot be considered to be entirely complete.

1.2.1 Scoring Procedure

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG scoring procedure. The PAG seven-point scale scoring procedure is shown in Table 1.1.

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Using a combination of the impact scores and professional judgement, a determination as to the level of the impact of each Corridor Option was provided. Using the impact scores and the professional judgement of the specialist, a determination is made as to whether each Corridor Option that is assessed is either:

- Preferred; or
- Least Preferred.

1.3 Corridor Options Assessment

1.3.1 Corridor Option 1

Option 1 passes through the following townlands, parishes and baronies within the Counties of Dublin and Kildare. Refer to Table 1.2.

Table 1.2: Baronies, Parishes and Townlands - Option 1

Townland	Parish	Barony	County
Rinawade Upper	Donaghcumper	North Salt	Kildare
Castletown	Kildrought		
Moortown			
Kilmacredock Upper	Kilmacredock		
Barrogstown	Laraghbryan		

Townland	Parish	Barony	County
Ballygoran	Leixlip		
Moneycooly			
Leixlip Demesne			
Barnhall			
Lucan Demesne	Lucan	Newcastle	Dublin
Backwestonpark	Aderrig/ Lucan		
Cooldrinagh			

A review of the National Museum of Ireland (NMI) topographical files has shown the items as detailed in Table 1.3 have been recorded within the study area.

Table 1.3: Stray Finds - Option 1

Townland	NMI Reg No.	Description	Material	Find Place (if recorded)
Moneycooley	IA/153/87	Spindle Whorl; Flint; Pottery; Glass; Metal	Various	-
Barnhall	-	Viking Burial	Human remains	-
Lucan Demesne	1960:575	Bronze Latchet Brooch	Bronze	-

A review of the Excavations Bulletin has shown that multiple archaeological excavations have been carried out within study area of Option 1. These are detailed below in Table 1.4.

Table 1.4: Previous Archaeological Investigations - Option 1

Site Ref.	Licence	Reference	Description	Townland
EX 4	04E0644	Bennett 2004:0851	Archaeological testing and subsequent excavation a number of archaeological areas. in Area 1, a minimum of 55 individuals were identified in the remains of a cemetery, likely of early medieval date. Additional features were excavated in the vicinity of the cemetery, One of the pits contained a sickle and a piece of glass and was deemed to be of post-medieval date. Area 2 contained four undated pits, two of which contained charcoal-rich material and occasional burnt bone. Area 3 contained two adjacent bowl furnaces, containing metallurgical waste and a hearth. Area 4 comprised three pits, containing small amounts of burnt bone. Further small-scale and undated features were identified in Areas 6-8.	Moneycooly

Site Ref.	Licence	Reference	Description	Townland
EX 5	00E0888	Bennett 2000:0503, 2001:667	Monitoring in advance of construction failed to identify any features of archaeological significance.	Moneycooly
EX 7	13E0249	Bennett 2013:210	Archaeological monitoring as part of a water pipeline scheme failed to identify any features of deposits of archaeological potential.	Ballygoran & Donaghmore
EX 8	13E0016	Bennett 2013:185	Archaeological monitoring was carried out as part of the Ballygoran to Castlewarden pipeline scheme. The scheme passed through 22 townlands, including Ballygoran, Moneycooly and Griffenrath within the constraints area. Nothing of archaeological significance was identified within the current constraints study area.	Ballygoran, Moneycooly, Griffenrath
EX 9	01E0306	Bennett 2001:610	Archaeological monitoring of groundworks associated with the Celbridge Interchange identified 17 archaeological sites and one site which was later proven to be of natural origin.	Kilmacredock Upper, Castletown
EX 10	01E0306	Bennett 2001:610	Site 1 identified during monitoring of topsoil-stripping on the Celbridge Interchange. A possible fire-pit and posthole were excavated.	Kilmacredock Upper
EX 11	01E0669	Bennett 2001:609	Archaeological monitoring of topsoil-stripping on the Celbridge Interchange and subsequent excavation of Site 4 uncovered a stone-built kiln feature (KD011-042001-) set into one of the ditches of an enclosure (KD011-042002) which also contained a ring ditch (KD011-042).	Castletown
EX 12	01E0306	Bennett 2001:651	Site 5 of the Celbridge Interchange comprised three bowl furnaces and two associated burnt deposits. The area was truncated by one of the townland boundaries between Castletown and Kilmacredock Upper.	Kilmacredock Upper
EX 13	01E0547	Bennett 2001:652	Site 7 of the Celbridge Interchange consisted of a corn-drying kiln incorporated into an earlier ditch.	Kilmacredock Upper
EX 14	01E0306	Bennett 2001:651	Site 3 of the Celbridge Interchange Scheme comprised two pits and a shallow spread of material.	Kilmacredock Upper
	01E0596	Bennett 2001:651	Investigation of Site 6 of the Celbridge Interchange Scheme revealed seven possible post-holes and a linear feature with charcoal and burnt stone fills.	Kilmacredock Upper
	01E0596 ext.	Bennett 2001:651	Site 8 of the Celbridge Interchange Scheme comprised three pits and one trench or oval pit. Some charcoal and burnt bone were visible in the fills. Two small fragments of prehistoric pottery and a piece of flint were recovered from the site.	Kilmacredock Upper

Site Ref.	Licence	Reference	Description	Townland
EX 15	01E0998	Bennett 2001:653	Site 9 of the Celbridge Interchange represents a burnt mound. The burnt mound material was not associated with a trough or hearth; however, the archaeological material extends north out of the excavated area. Two large postholes may have formed part of a structure. A quern stone was also present on site, and it has been suggested that the site had some industrial purpose.	Kilmacredock Upper
EX 19	01E0960	Bennett 2001:651	Site 13 of the Celbridge Interchange Scheme consisted of fourteen areas of burnt stone or ash with charcoal in pits, later interpreted as a burnt mound.	Kilmacredock Upper
EX 25	97E0167	Bennett 1997:275	Archaeological monitoring of a drainage scheme failed to identify anything of archaeological significance.	Leixlip Demesne
EX 26	07E0265	Bennett 2007:526	A riverbank survey and underwater archaeological investigation and metal-detector survey of the riverbed sediments and adjacent riverbank features was carried out and identified a stone-built quayside to the east and west of the project area. A single fragment of late medieval pottery was recovered in the collapsed wall.	River Liffey, Leixlip
EX 27	E2034; C0135	Bennett 2007:449	Five test-trenches were excavated but nothing of archaeological significance was identified.	Cooldrinagh
EX 28	07E0983	Bennett 2007:448	Monitoring of the groundworks associated with installation of new ESB poles revealed the ground excavated consisted of made ground. No archaeological features, deposits or artefacts were exposed.	Cooldrinagh
EX 31	E4414, C014	Bennett 2012:189	Archaeological monitoring and metal detection of spoil was carried out but failed to identify anything of archaeological significance.	Cooldrinagh
EX 33	CO14	Bennett 2005:410	A programme of combined ploughsoil survey and test-trenching produced an assemblage of 330 knapped flint pieces. A significant proportion of these have been identified as early Mesolithic in date, although Neolithic and Bronze Age lithics were also present. A cairn constructed of angular stones was also identified. Additional trenches were opened along the line of the periphery of the cairn and a number of possible kerbstones were also revealed. A polished stone ball, a type of artefact often associated with the passage tomb tradition, was found in the ploughsoil at another location within the proposed development area. Cremated bone and worn human teeth were recovered from the cairn. A number of additional small-scale archaeological features were also recorded.	Cooldrinagh

Site Ref.	Licence	Reference	Description	Townland
EX 35	22E0737	Murtagh and Organ 2022	Archaeological testing following geophysical survey, discovered four areas of archaeological potential. AA1- a sub-circular possible posthole. AA2- Two spreads of heat-affected stone and a possible trough within the footprint one of these spreads of heat-affected material. AA3- A linear feature. AA4- A sub-circular pit and shallow linear feature.	Leixlip Demesne

The archaeological sites detailed in Table 1.5 are recorded within the study area of Option 1.

Table 1.5: Archaeological Heritage - Option 1

Site Ref	SMR Ref.	Category	Dist. from Option 1	RMP Status	Impact Type	Significance of Effect
AH 6	KD010-008	Field system	127m south	Proposed SMR	Neutral	N/A
AH 7	KD011-061	Furnace	120m north	SMR	Neutral	N/A
AH 8	KD010-040	Burial ground	167m north	SMR	Neutral	N/A
AH 11	KD011-057	Habitation site	70m south	SMR	Neutral	N/A
AH 13	KD011-032	Field system	178m north	RMP	Neutral	N/A
AH 18	KD011-058	Habitation site	13m north	SMR	Neutral	N/A
AH 19	KD011-045	Burnt mound	60m north	Proposed RMP	Neutral	N/A
AH 20	KD011-043	Habitation site	31m north	SMR	Neutral	N/A
	KD011-044	Habitation site	48m north	SMR	Neutral	N/A
AH 21	KD011-050	Kiln - corn-drying	25m south	SMR	Neutral	N/A
	KD011-059	Metalworking site	29m south	SMR	Neutral	N/A
AH 22	KD011-042002	Enclosure	89m south	Proposed RMP	Neutral	N/A
	KD011-042001	Kiln - corn-drying	84m south	SMR	Neutral	N/A
	KD011-042	Ring-ditch	88m south	SMR	Neutral	N/A
AH 26	KD011-017	Bridge	128m south	RMP	Neutral	N/A

Site Ref	SMR Ref.	Category	Dist. from Option 1	RMP Status	Impact Type	Significance of Effect
	DU017-087	Bridge	121m south	Proposed RMP	Neutral	N/A
	DU017-014	Weir - fish	112m south	RMP	Neutral	N/A
	KD011-017001	Weir - fish	128m south	Proposed RMP	Neutral	N/A

The built heritage sites detailed in Table 1.6 are recorded within the study area of Option 1.

Table 1.6: Built Heritage - Option 1

Site Ref	Name	Designation	Dist. from Option 1	Impact Type	Significance of Effect
BH 3	Wonderful Barn	RPS	189m north	Neutral	N/A
BH 9	Beckett Hotel	RPS	110m north	Neutral	N/A
BH 12	Water pump	NIAH	166m south	Neutral	N/A
BH 14	Weir	RPS	124 northeast	Neutral	N/A
BH 15	Round House	RPS	147m southeast	Neutral	N/A

A review of the National Inventory of Architectural Heritage (NIAH) Garden Survey and historic OS maps has shown that a number of demesne landscapes are located within the study area of Option 1, as detailed in Table 1.7 below.

Table 1.7: Demesne Landscapes - Option 1

Site Ref.	Name	Designation	Dist. from Option 1	Impact Type:	Significance of Effect
DL 2	Castletown	NIAH	0m	Neutral	N/A
DL 4	Leixlip Castle	NIAH	0m	Neutral	N/A
DL 5	Westonpark House	NIAH	0m	Neutral	N/A
DL 6	Cooldrinagh Lodge	NIAH	0m	Neutral	N/A
DL 7	Lucan Demesne	NIAH	0m	Neutral	N/A

A review of the historic mapping and aerial photographic coverage resulted of the identification of a number of structures of architectural heritage merit as described in Table 1.8.

While the proposed Option 1 corridor will cross a number of watercourses, it is confined to the existing road carriage way and will not impact any specific Areas of Archaeological Potential.

Table 1.8: Cultural Heritage - Option 1

Site Ref	Type	Designation	Dist. from Option 1	Impact Type	Significance of Effect
CH 1	Barn Hall	None	155m north	Neutral	N/A
CH 2	Flour Mill shown on the first edition OS map	None	126m south	Neutral	N/A
CH 3	Group of vernacular structures shown on the first edition OS map	None	179m north	Neutral	N/A

1.3.2 Corridor Option 2

Option 2 passes through the following townlands, parishes and baronies within the Counties of Dublin and Kildare. Refer to Table 1.9.

Table 1.9: Baronies, Parishes and Townlands - Option 2

Townland	Parish	Barony	County
Rinawade Upper	Donaghcumper	North Salt	Kildare
Castletown	Kildrought		
Moortown			
Kilmacredock Upper	Kilmacredock		
Barrogstown	Laraghbryan		
Ballygoran			
Moneycooly			
Leixlip Demesne	Leixlip		
Barnhall			
Lucan Demesne	Lucan		
Backwestonpark	Aderrig/ Lucan		
Cooldrinagh			

A review of the National Museum of Ireland (NMI) topographical files has shown the find as detailed in Table 1.10 have been recorded within the study area.

Table 1.10: Stray Finds - Option 2

Townland	NMI Reg No	Description	Material	Find Place (if recorded)
Moneycooley	IA/153/87	Spindle Whorl; Flint; Pottery; Glass; Metal	Various	-
Barnhall	-	Viking Burial	Human remains	-
Lucan Demesne	1960:575	Bronze Latchet Brooch	Bronze	-

A review of the Excavations Bulletin has shown that multiple archaeological excavations have been carried out within study area of Option 2. These are detailed below in Table 1.11.

Table 1.11: Previous Archaeological Investigations - Option 2

Site Ref.	Licence	Reference	Description	Townland
EX 4	04E0644	Bennett 2004:0851	Archaeological testing and subsequent excavation a number of archaeological areas. in Area 1, a minimum of 55 individuals were identified in the remains of a cemetery, likely of early medieval date. Additional features were excavated in the vicinity of the cemetery, One of the pits contained a sickle and a piece of glass and was deemed to be of post-medieval date. Area 2 contained four undated pits, two of which contained charcoal-rich material and occasional burnt bone. Area 3 contained two adjacent bowl furnaces, containing metallurgical waste and a hearth. Area 4 comprised three pits, containing small amounts of burnt bone. Further small-scale and undated features were identified in Areas 6-8.	Moneycooley
EX 5	00E0888	Bennett 2000:0503, 2001:667	Monitoring in advance of construction failed to identify any features of archaeological significance.	Moneycooley
EX 7	13E0249	Bennett 2013:210	Archaeological monitoring as part of a water pipeline scheme failed to identify any features of deposits of archaeological potential.	Ballygoran & Donaghmore
EX 8	13E0016	Bennett 2013:185	Archaeological monitoring was carried out as part of the Ballygoran to Castlewarden pipeline scheme. The scheme passed through 22 townlands, including Ballygoran, Moneycooley and Griffenrath within the constraints area. Nothing of archaeological significance was identified within the current constraints study area.	Ballygoran, Moneycooley, Griffenrath
EX 9	01E0306	Bennett 2001:610	Archaeological monitoring of groundworks associated with the Celbridge Interchange identified 17 archaeological sites and one site which was later proven to be of natural origin.	Kilmacredock Upper, Castletown

Site Ref.	Licence	Reference	Description	Townland
EX 10	01E0306	Bennett 2001:610	Site 1 identified during monitoring of topsoil-stripping on the Celbridge Interchange. A possible fire-pit and posthole were excavated.	Kilmacredock Upper
EX 11	01E0669	Bennett 2001:609	Archaeological monitoring of topsoil-stripping on the Celbridge Interchange and subsequent excavation of Site 4 uncovered a stone-built kiln feature (KD011-042001-) set into one of the ditches of an enclosure (KD011-042002) which also contained a ring ditch (KD011-042).	Castletown
EX 12	01E0306	Bennett 2001:651	Site 5 of the Celbridge Interchange comprised three bowl furnaces and two associated burnt deposits. The area was truncated by one of the townland boundaries between Castletown and Kilmacredock Upper.	Kilmacredock Upper
EX 13	01E0547	Bennett 2001:652	Site 7 of the Celbridge Interchange consisted of a corn-drying kiln incorporated into an earlier ditch.	Kilmacredock Upper
EX 14	01E0306	Bennett 2001:651	Site 3 of the Celbridge Interchange Scheme comprised two pits and a shallow spread of material.	Kilmacredock Upper
	01E0596	Bennett 2001:651	Investigation of Site 6 of the Celbridge Interchange Scheme revealed seven possible post-holes and a linear feature with charcoal and burnt stone fills.	Kilmacredock Upper
	01E0596 ext.	Bennett 2001:651	Site 8 of the Celbridge Interchange Scheme comprised three pits and one trench or oval pit. Some charcoal and burnt bone were visible in the fills. Two small fragments of prehistoric pottery and a piece of flint were recovered from the site.	Kilmacredock Upper
EX 15	01E0998	Bennett 2001:653	Site 9 of the Celbridge Interchange represents a burnt mound. The burnt mound material was not associated with a trough or hearth; however, the archaeological material extends north out of the excavated area. Two large postholes may have formed part of a structure. A quern stone was also present on site, and it has been suggested that the site had some industrial purpose.	Kilmacredock Upper
EX 19	01E0960	Bennett 2001:651	Site 13 of the Celbridge Interchange Scheme consisted of fourteen areas of burnt stone or ash with charcoal in pits, later interpreted as a burnt mound.	Kilmacredock Upper
EX 25	97E0167	Bennett 1997:275	Archaeological monitoring of a drainage scheme failed to identify anything of archaeological significance.	Leixlip Demesne

Site Ref.	Licence	Reference	Description	Townland
EX 26	07E0265	Bennett 2007:526	A riverbank survey and underwater archaeological investigation and metal-detector survey of the riverbed sediments and adjacent riverbank features was carried out and identified a stone-built quayside to the east and west of the project area. A single fragment of late medieval pottery was recovered in the collapsed wall.	River Liffey, Leixlip
EX 27	E2034; C0135	Bennett 2007:449	Five test-trenches were excavated but nothing of archaeological significance was identified.	Cooldrinagh
EX 28	07E0983	Bennett 2007:448	Monitoring of the groundworks associated with installation of new ESB poles revealed the ground excavated consisted of made ground. No archaeological features, deposits or artefacts were exposed.	Cooldrinagh
EX 31	E4414, C014	Bennett 2012:189	Archaeological monitoring and metal detection of spoil was carried out but failed to identify anything of archaeological significance.	Cooldrinagh
EX 33	CO14	Bennett 2005:410	A programme of combined ploughsoil survey and test-trenching produced an assemblage of 330 knapped flint pieces. A significant proportion of these have were identified as early Mesolithic in date, although Neolithic and Bronze Age lithics were also present. A cairn constructed of angular stones was also identified. Additional trenches were opened along the line of the periphery of the cairn and a number of possible kerbstones were also revealed. A polished stone ball, a type of artefact often associated with the passage tomb tradition, was found in the ploughsoil at another location within the proposed development area. Cremated bone and worn human teeth were recovered from the cairn. A number of additional small-scale archaeological features were also recorded.	Cooldrinagh
EX 35	22E0737	Murtagh and Organ 2022	Archaeological testing following geophysical survey, discovered four areas of archaeological potential. AA1- a sub-circular possible posthole. AA2- Two spreads of heat-affected stone and a possible trough within the footprint one of these spreads of heat-affected material. AA3- A linear feature. AA4- A sub-circular pit and shallow linear feature.	Leixlip Demesne

The archaeological sites detailed in Table 1.12 are recorded within the study area of Option 2.

Table 1.12: Archaeological Heritage - Option 2

Site Ref.	SMR Ref.	Category	Dist. from Option 2	RMP Status	Impact Type	Significance of Effect
AH 6	KD010-008	Field system	127m south	Proposed SMR	Neutral	N/A
AH 7	KD011-061	Furnace	120m north	SMR	Neutral	N/A
AH 8	KD010-040	Burial ground	167m north	SMR	Neutral	N/A
AH 11	KD011-057	Habitation site	70m south	SMR	Neutral	N/A
AH 13	KD011-032	Field system	178m north	RMP	Neutral	N/A
AH 18	KD011-058	Habitation site	13m north	SMR	Neutral	N/A
AH 19	KD011-045	Burnt mound	60m north	Proposed RMP	Neutral	N/A
AH 20	KD011-043	Habitation site	31m north	SMR	Neutral	N/A
	KD011-044	Habitation site	48m north	SMR	Neutral	N/A
AH 21	KD011-050	Kiln - corn-drying	25m south	SMR	Neutral	N/A
	KD011-059	Metalworking site	29m south	SMR	Neutral	N/A
AH 22	KD011-042002	Enclosure	89m south	Proposed RMP	Neutral	N/A
	KD011-042001	Kiln - corn-drying	84m south	SMR	Neutral	N/A
	KD011-042	Ring-ditch	88m south	SMR	Neutral	N/A
AH 26	KD011-017	Bridge	128m south	RMP	Neutral	N/A
	DU017-087	Bridge	121m south	Proposed RMP	Neutral	N/A
	DU017-014	Weir - fish	112m south	RMP	Neutral	N/A
	KD011-017001	Weir - fish	128m south	Proposed RMP	Neutral	N/A

The built heritage sites detailed in Table 1.13 are recorded within the study area of Option 2.

Table 1.13: Built Heritage - Option 2

Site Ref.	Name	Designation	Dist. from Option 2	Impact Type	Significance of Effect
BH 3	Wonderful Barn	RPS	189m north	Neutral	N/A
BH 9	Beckett Hotel	RPS	110m north	Neutral	N/A
BH 12	Water pump	NIAH	166m south	Neutral	N/A
BH 14	Weir	RPS	124 northeast	Neutral	N/A
BH 15	Round House	RPS	147m southeast	Neutral	N/A

A review of the National Inventory of Architectural Heritage (NIAH) Garden Survey and historic OS maps has shown that a number of demesne landscapes are located within the study area of Option 2, as detailed in Table 1.14 below.

Table 1.14: Demesne Landscapes - Option 2

Site Ref.	Name	Designation	Dist. from Option 2	Impact Type	Significance of Effect
DL 2	Castletown	NIAH	0m	Neutral	N/A
DL 4	Leixlip Castle	NIAH	0m	Neutral	N/A
DL 5	Westonpark House	NIAH	0m	Neutral	N/A
DL 6	Cooldrinagh Lodge	NIAH	0m	Neutral	N/A
DL 7	Lucan Demesne	NIAH	0m	Neutral	N/A

A review of the historic mapping and aerial photographic coverage resulted in the identification of a number of structures of architectural heritage merit as described in Table 1.15.

While Option 2 would cross a number of watercourses, it is confined to the existing road carriageway and would not impact any specific Areas of Archaeological Potential.

Table 1.15: Cultural Heritage - Option 2

Site Ref	Type	Designation	Dist. from Option 2	Impact Type	Significance of Effect
CH 1	Barn Hall	None	155m north	Neutral	N/A
CH 2	Flour Mill shown on the first edition OS map	None	126m south	Neutral	N/A
CH 3	Group of vernacular structures shown on the first edition OS map	None	179m north	Neutral	N/A

1.3.3 Corridor Options Assessment Matrix

Table 1.16: Archaeological, Architectural and Cultural Heritage Assessment Matrix of Corridor Options

Assessment Criteria	Option 1	Option 2
Potential direct or indirect negative impacts (imperceptible to profound)	This option will not result in any negative direct or indirect impacts upon the archaeological, architectural or cultural heritage resource.	This option will not result in any negative direct or indirect impacts upon the archaeological, architectural or cultural heritage resource.
Qualitative Assessment	Not significant or neutral	Not significant or neutral
Score/ Impact Level	4	4
Preference	Preferred	Preferred

1.4 Summary

Each of the two options under assessment are located within the carriageway of the existing M4/N4. Neither option would have either a direct or indirect impact on any of the recorded archaeological, architectural or cultural heritage resource. Both options are Preferred from an archaeological, architectural and cultural heritage perspective.

Kildare County Council

Maynooth to Leixlip Project

Options Report - Stage 2

Biodiversity Corridor Options
Assessment

Draft 1 | 31 August 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Table 1.2: Key Ecological Receptors located within, or partially within, a Corridor Option

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Table 1.4: Biodiversity Assessment Matrix of Corridor Options

1 Stage 2 Biodiversity Corridor Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Corridor Options for the Maynooth to Leixlip Project with respect to the Biodiversity constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains a summary of Stage 2 survey results the options assessment. The Corridor Options Assessment is provided in Section 1.4 and a summary provided in Section 1.5. References are provided in Section 1.6.

1.2 Methodology

There are two Corridor Options which are within the existing M4/N4 corridor between Junction 5 Leixlip and Junction 7 Maynooth.

The Stage 2 biodiversity assessment follows on from the Stage 1 biodiversity assessment previously carried out, which contained three Corridor Options. For this Stage 2 assessment, Corridor Option 3 has been discounted, based on design review. The geometric design of Corridor Option 1 and Corridor Option 2 has not changed from the Stage 1 design; therefore, the Stage 2 design is identical to the Stage 1 design.

The principal objectives of this assessment are to:

- Evaluate the Corridor Options, based on ecological criteria, as per the National Road Authority (NRA) *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009)¹ and Chartered Institute for Ecology and Environmental Management (CIEEM) *Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine* (2018)²

¹ National Roads Authority (2009) Guidelines for Assessment of Ecological Impacts of National Road Schemes. Available from: <https://www.tii.ie/technical-services/environment/planning/Guidelines-for-Assessment-of-Ecological-Impacts-of-National-Road-Schemes.pdf> [Accessed: April 2023]

² Chartered Institute for Ecology and Environmental Management (CIEEM) (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine. Available from: <https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.1.pdf> [Accessed: April 2023]

- Assess the significance of the likely impacts on each of the biodiversity receptors potentially impacted by the Corridor Options. As per the Transport Infrastructure Ireland (TII)¹ guidance, this step discounted biodiversity receptors or ecological sites where the risk of significant impacts is unlikely considering where the application of standard mitigation and best practice during construction is unambiguous and success is highly likely.
- To assess each option in accordance with Transport Infrastructure Ireland's *Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis* (TII, 2016)³.

To fulfil these objectives, an assessment of the likely or potential impacts of each Corridor Option on ecological receptors is carried out so that an informed comparison of the Corridor Options can be made with cognisance of the potential ecological consequences.

Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. Alongside the term “biodiversity”, the terms “ecology” and “ecological” are also used throughout this section of the report as a broader term to refer to the relationships of biodiversity receptors to one another and to their environment.

Biodiversity Stage 1 Assessment Process

The process by which the Corridor Options were assessed is as follows:

- The key ecological receptors within the study area were identified based on a combination of desktop data, consultation (i.e. relevant bodies/organisations) and field surveys;
- The key ecological receptors were assigned an ecological value based on a geographic frame of reference ranging from international to local importance;
- The likely impacts of the Corridor Options on the key ecological receptors were identified and assessed, indicating which, if any, of these are likely to be significant, and at what geographical level;
- The impacts of the Corridor Options on the key ecological receptors were scored in accordance with the TII approach⁴, on a seven-point scale ranging from ‘major or highly negative (1)’ to ‘major or highly positive (7)’;
- The overall cumulative impact of the Corridor Options across all the key ecological receptors affected was also scored on the same seven-point scale; and
- The scores attributed to the Corridor Options were assessed comparatively and assigned a preference ranking.

³ Transport Infrastructure Ireland (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf> [Accessed: April 2023]

⁴ TII (2016). Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis Document PE-PAG-02031

Key Ecological Receptors

Key ecological receptors are those biodiversity receptors confirmed, or likely to occur, within the study area with an ecological value of local importance (higher value) or greater and, therefore, likely to affect the scoring and ranking of the Corridor Options. These include:

- Designated sites for nature conservation (e.g. SACs, SPAs, NHAs, pNHAs and Nature Reserves);
- Sensitive habitats (e.g., non-Annex I semi-natural woodland habitats and watercourses⁵);
- Sensitive species (e.g. otter *Lutra lutra*); and
- Ecological sites (identified from a combination of desktop and field assessment).

The key ecological receptors were initially identified in the constraints study detailed in the Constraints Report, based on collation of available existing information from the desk study and consultations with relevant bodies/organisations and focussed on the known/potential ecological value for the habitats/species present. In the case of the ecological sites, the boundaries were initially defined based on interpretation of orthophotography and collation of available existing habitat information.

Walkover surveys of ecological sites within the wider constraints study area were undertaken in April 2021. This was further supplemented for the Stage 1 assessment with an additional field survey undertaken in December 2021. The purpose of the field surveys was to ground truth and verify the orthophotography interpretation and selection of ecological sites, refine site boundaries, assess the ecological evaluation of each of the identified ecological sites and to detect any additional ecological sites not identified during the desk study. Walkover surveys of ecological sites which were located in proximity to, or overlapped with, one or more of the Corridor Options, were undertaken during the December survey.

Multidisciplinary surveys of the entire corridor between Junction 5 Leixlip and Junction 7 Maynooth were undertaken by Scott Cawley Ltd., in September 2022 to inform this Stage 2 assessment. The purpose of these field surveys was to map all habitats within the proposed Corridor Options boundary, record signs of terrestrial mammals, record trees and structures with potential roost features (PRFs), record any Third Schedule listed invasive plant species and to detect any additional ecological sites not identified during the desk study.

In some cases, certain sections of the ecological sites (especially those lining the existing M4/N4) were viewed from a distance, owing to limited access or safety issues. However, professional assumptions were made on the value of those ecological sites based on local information gathered during previous constraints field surveys and desk study as necessary.

⁵ Watercourses are referred to as per the names presented on the EPA's online Map Viewer. Available from: <https://gis.epa.ie/EPAMaps/> [Accessed April 2023]

Where possible, during the site walkover surveys, habitat types were classified using the *Guide to Habitats in Ireland* (Fossitt, 2000)⁶ and the likelihood/potential for Annex I habitat types was confirmed or inferred based on the professional judgement of the surveyor, with reference to the *Interpretation manual of European Union Habitats EUR 28* (CEC, 2013)⁷. Where it was not possible to confirm the presence of Annex I habitats, a precautionary approach was adopted with regards to the identification of the potential presence of Annex I habitats within an ecological site.

1.2.1 Scoring Procedure

Ecological Valuation

The key ecological receptors identified have been valued with regard to ecological valuation guidance set out in *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009)¹ and *Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine* (CIEEM, 2018)².

The following geographic frame of reference is used when valuing the key ecological receptors:

- International Importance;
- National Importance;
- County Importance; and
- Local Importance (Higher Value).

All Annex I habitats that lie outside of European sites, are valued as being of at least national importance, given that these habitats are of high conservation concern. Priority Annex I habitat types that lie outside of European sites may be valued as being of international importance given that they are of the highest conservation concern at a European level (i.e., natural habitat types in danger of disappearance⁸). No Annex I habitats, priority or otherwise, have been recorded during the walkover surveys.

For individual sites (e.g., designated sites, watercourses or ecological sites identified during the Constraints Study), the overall ecological valuation for each of the key ecological receptors was based upon the highest value receptor known to be present, or potentially present, within the site.

⁶ Fossitt, J.A. (2000) A Guide to Habitats in Ireland. Heritage Council, Kilkenny. Available from: <https://www.npws.ie/sites/default/files/publications/pdf/A%20Guide%20to%20Habitats%20in%20Ireland%20-%20Fossitt.pdf> [Accessed: April 2023]

⁷ CEC. (Commission of the European Communities) (2013) Interpretation manual of European Union Habitats EUR28. European Commission, DG Environment. Available from: https://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf [Accessed: April 2023]

⁸ From the definition of “priority natural habitat types” in Article 1(d) of the Habitats Directive (Council Directive 92/43/EEC).

Assessment Criteria

The assessment of the Corridor Options included both a quantitative and qualitative assessment. Firstly, the impact on each key ecological receptor is assessed.

Although a Corridor Option may impact upon a particular key ecological receptor, the direct impact(s) on the site may not necessarily directly impact on the highest value receptor(s). This is accounted for in the assessment as much as possible, based on the level of ecological information available.

To assess the likely ecological impacts of the Corridor Options on individual key ecological receptors, the following criteria are applied, with the use of professional judgement as to the likelihood of significant effects occurring:

- Potential impacts on an ecological receptor of national / international importance were assessed as being Major or highly negative;
- Potential impacts on an ecological receptor of county importance were assessed as being Moderately negative; and
- Potential impacts on a receptor of local importance (higher value) were assessed as being Minor or slightly negative.

To assess the likely cumulative overall ecological impacts for each Corridor Option, the following criteria were applied, in conjunction with the use of professional judgement as to the likelihood of significant effects occurring:

- Biodiversity impacts are major or highly negative) if:
 - The impact is directly on one or more designated sites valued as international or national importance (i.e. Sac, spa, pnha or nha);or
 - The impacts associated with constructing a road within the Corridor Option would likely result in an adverse effect on the integrity of the SAC/SPA/pnha/NHA site (i.e. For SAC/SPA this could equate to the loss of qualifying interest habitat or undermining the conservation objectives and for pnha/NHA this could relate to the loss of features for which the site is designated).
- Biodiversity impacts are moderately negative if:
 - The impact is directly on one or more non-designated ecological sites valued as national or county importance, or numerous ecological sites valued as local high importance;or
 - The impacts associated with constructing a road within the Corridor Option would likely result in permanent/long-term effects on non-qualifying interest Annex I habitat or on a species population considered to be of national importance.or

- Impacts associated with constructing a road within the Corridor Option would likely have permanent/long-term effects on a habitat(s) or on a species population considered to be of county/local (high) importance;
- Biodiversity impacts are minor or slightly negative if:
 - The impact is directly on a small number of ecological sites valued as local high importance;
- or
- The impacts associated with constructing a road within the Corridor Option would likely have permanent/long-term effects on a habitat(s) or on a species population considered to be of local (high) importance.

Considering these cumulative impacts on the key ecological receptors identified, each Corridor Option was scored, based on the seven-point scale below and an integer was assigned according to the impact significance:

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

As the Corridor Options are likely to have some level of a negative impact on biodiversity, neutral or positive impact scorings do not apply in this assessment, as in the absence of a design and /or mitigation there is no understanding that any option requiring construction could be assessed as neutral or positive.

Both Corridor Options were also comparatively assessed in terms of the overall impact significance, to provide a preference ranking. The preference ranking was as follows:

- Preferred; and
- Least Preferred.

In accordance with the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009)¹, key ecological receptors within the study area were not assessed against the Corridor Options where the risk of significant impacts is unlikely, considering where the delivery of standard mitigation and best practice during construction is unequivocal and success is highly likely. For example, with the application of standard pollution control measures during construction and an operational drainage and pollution control system designed to current standards, sensitive biodiversity receptors downstream of the Corridor Options are not likely to be affected. However, it should be noted that potential watercourse crossings were considered in this assessment, as it cannot be assumed that clear-span crossings would be possible at each crossing point. In addition, potential watercourse crossings will undoubtedly result in indirect impacts on the watercourse in question (e.g. disturbance to QI species, spread of non-native invasive species).

1.3 Summary of Stage 2 Survey Results

Following on from the multi-disciplinary survey undertaken in September 2022 the following habitats (all of which are valued as local importance (higher value) or below were recorded along the proposed Corridor Options;

Local Importance (Higher Value)

- GS2 - Dry meadows and grassy verges;
- WD1 - (Mixed) broadleaved woodland;
- WL1 – Hedgerows;
- WL2 – Treelines;
- WS1 – Scrub; and
- WS2 - Immature woodland.

Local Importance (Lower Value)

- BL3 – Buildings and artificial surfaces;
- WS3 - Ornamental/non-native shrub; and
- GA2 - Amenity grassland (improved).

No Annex II plant species and no records of plant species protected through their inclusion within the Flora (Protection) Order 2022, were recorded during the multi-disciplinary surveys. Additionally, no non-native invasive species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) were recorded along the Corridor Options.

Three PRFs were recorded along the Corridor Options, all Alder *Alnus glutinosa* located within the roadside planting between Junction 5 Leixlip and the River Liffey Bridge.

During the multi-disciplinary survey, 11 bird species were recorded within or adjacent to the proposed Corridor Option boundaries including 10 green listed species; blackbird, blackcap, blue tit, dunnock, great tit, long-tailed tit, pied wagtail, robin, wood pigeon, wren and one amber listed species goldcrest.

1.4 Corridor Options Assessment

This section details the biodiversity Stage 2 Preliminary Assessment of the Corridor Options. Key ecological receptors which are located within, or partially within, a Corridor Option, and on which the Corridor Options were assessed, are presented in Table 1.2.

Only direct impacts were considered. Indirect impacts, such as those resulting from air quality impacts / impacts to hydrogeology were not considered at this stage of the assessment. These indirect impacts are typically dealt with through standard mitigation measures and both the impacts and proposed mitigation will likely be identical across all options considered. It is envisaged that existing structures will not be significantly impacted and that overbridges and the River Liffey Bridge would not be impacted as part of Corridor Option 1. Corridor Option 2 would include proposed widening of the River Liffey Bridge or the construction of an adjacent bridge to accommodate the additional proposed westbound traffic lane.

Table 1.2: Key Ecological Receptors located within, or partially within, a Corridor Option

Site Name	Description	Ecological Value
EC20	Narrow woodland band / treeline lining the existing M4/N4 roadway	Local importance (higher value)
EC21	Narrow woodland band / treeline lining the existing M4/N4 roadway	Local importance (higher value)
EC22	Narrow woodland band / treeline lining the existing M4/N4 roadway	Local importance (higher value)
EC23	Narrow woodland band / treeline lining the existing M4/N4 roadway	Local importance (higher value)
EC29	Narrow woodland band / treeline lining the existing M4/N4 roadway	Local importance (higher value)
EC30	Narrow woodland band / treeline lining the existing M4/N4 roadway	Local importance (higher value)
EC40	Narrow woodland band / treeline lining the existing M4/N4 roadway	Local importance (higher value)
EC41	Narrow woodland band / treeline lining the existing M4/N4 roadway	Local importance (higher value)
EC45	Narrow woodland band / treeline lining the existing M4/N4 roadway	Local importance (higher value)
EC48	Narrow woodland band / treeline lining the existing M4/N4 roadway	Local importance (higher value)
Kilmacredock_Upper	Watercourse joining with the River Liffey within Leixlip reservoir.	County importance

Site Name	Description	Ecological Value
River Liffey	Nationally important watercourse of a large scale which ultimately discharges to a number of downstream European sites i.e., those within Dublin Bay. Based on consultation with IFI, the Liffey supports a regionally significant population of Atlantic salmon (<i>Salmo salar</i>), a species listed under Annex II and V of the EU Habitats Directive in addition to Brown trout, lamprey, eel and many other sensitive species.	National importance

Ecological Receptors

A summary of the number of ecological receptors impacted by the Corridor Options is provided in Table 1.3.

Table 1.3: Number of Biodiversity Impacts for each Corridor Option

Assessment Criteria	Corridor Option 1	Corridor Option 2
Significant impact on sites of International Importance (major or highly negative)	0	0
Significant impact on sites of National Importance (major or highly negative)	0	1
Significant impact on sites of County Importance (moderately negative)	0	0
Significant impact on sites of Local Importance (Higher Value) (minor or slightly negative)	11	11

Both Corridor Options are within the existing M4/N4 corridor between Junction 5 Leixlip and Junction 7 Maynooth. They comprise variations in terms of proposed width and / or number of traffic lanes in the westbound direction.

1.4.1 Corridor Option 1

Corridor Option 1 consists of hard shoulder bus priority measures in both the eastbound and westbound directions, with no additional lanes. The typical width of this option is circa 29m.

Corridor Option 1 commences at Junction 7 Maynooth and moves in an easterly direction where it interacts with the following ecological sites - EC20, EC21, EC22 and EC23 prior to reaching Junction 6 Celbridge. From Junction 6 Celbridge, Corridor Option 1 continues in an easterly direction and interacting with ecological sites EC29, EC30, EC40, EC41 prior to reaching Junction 5 Leixlip.

Between Junction 6 Celbridge and Junction 7 Maynooth, Corridor Option 1 also crosses two watercourses, one of National importance; the River Liffey and one of County importance; the Kilmacredock_upper. The River Liffey is valued as a Nationally important watercourse due to its large scale and the fact that it ultimately discharges to a number of downstream European sites i.e., those within Dublin Bay. Additionally, based on consultation with IFI carried out as part of the earlier constraints phase for the project, the Liffey supports a regionally significant population of Atlantic salmon (*Salmo salar*), a species listed under Annex II and V of the EU Habitats Directive, in addition to Brown trout, lamprey, eel and many other sensitive species. The Kilmacredock_upper is valued as County importance given its direct connectivity to the River Liffey and being part of the overall Liffey system, it is considered Salmonid. Although the River Liffey is valued as National importance and the Kilmacredock_upper is valued as County importance, the proposed works will not significantly impact on either. As per the technical note issued by ARUP (ARUP 2022) it is envisaged that existing structures will not be significantly impacted and that overbridges including the River Liffey Bridge will not be impacted. Additionally, as outlined above, only direct impacts were considered. Indirect impacts, such as those resulting from air quality impacts/impacts to hydrogeology were not considered at this stage of the assessment and thus the impact significance of Corridor Option 1 is valued as local importance (higher value) for both watercourses.

Given that Corridor Option 1 interacts with a lower number of terrestrial ecological sites (all of which are valued as being of Local importance (higher value)) and that no construction impacts are proposed to the River Liffey overbridge it is ranked as the Preferred Corridor Option with respect to biodiversity.

1.4.2 Corridor Option 2

Similar to Corridor Option 1, Corridor Option 2 consists of hard shoulder bus priority measure in both the eastbound and westbound directions. However, it differs, in that it also includes a third traffic lanes in the westbound direction. The typical width of this option is circa 30.5m.

Corridor Option 2 has an almost identical footprint to Corridor Option 1, consisting mostly of roadway and roadside planting along the existing M4/N4 between Junction 5 Leixlip and Junction 7 Maynooth. Corridor Option 2 intersects with the same ecological sites and watercourses as Corridor Option 1 including the River Liffey, the Kilmacredock_upper and nine sites of local importance (higher value). Corridor Option 2 does interact with one additional ecological site, valued as local importance (higher value) i.e., EC48. Based on the mapped boundaries, Corridor Option 2 also interacts with slightly more area of EC23 along the southern border of the M4 in Moortown. Additionally, for Corridor Option 2, it is envisaged that the River Liffey bridge will need to be widened or a separate bridge constructed adjacent to the existing bridge to accommodate the additional westbound traffic lane. Gantries and cantilevers signage may be impacted and be required to be relocated.

In light of the above direct impacts on the River Liffey Bridge, the impact significance of Corridor Option 2 may result in an impact of National importance for the River Liffey, in the absence of a detailed design. With additional information around the design and an impact mitigation strategy, this impact could be reduced to a local level.

Given that Corridor Option 2 interacts with one additional ecological site, includes an additional westbound traffic lane and proposes a direct impact on the River Liffey Bridge (through widening or construction of an adjacent bridge), Corridor Option 2 has been classified as Least Preferred from a biodiversity perspective.

1.4.3 Corridor Options Assessment Matrix

Table 1.4: Biodiversity Assessment Matrix of Corridor Options

Assessment Criteria	Corridor Option 1	Corridor Option 2
Significant impact on sites of International Importance	0 major or highly negative impacts	0 major or highly negative impacts
Significant impact on sites of National Importance	0 major or highly negative impacts	1 major or highly negative impacts
Significant impact on sites of County Importance	0 moderately negative impact	0 moderately negative impact
Significant impact on sites of Local Importance (Higher Value)	11 minor or slightly negative	11 minor or slightly negative
Overall Assessment	11 'minor or slightly negative' impacts	11 'minor or slightly negative' impacts and one 'major or highly negative'
Qualitative Assessment	Impacts on the River Liffey, the Kilmacredock_upper and nine additional ecological sites of local importance (higher value) all of which consist of treelines and narrow woodland bands lining the existing M4/N4 roadway. Minor Negative	Impacts on the River Liffey, the Kilmacredock_upper and 10 additional ecological sites of local importance (higher value) all of which consist of treelines and narrow woodland bands lining the existing M4/N4 roadway. Moderate Negative
Score/ Impact Level	3	2
Preference	Preferred	Least Preferred

1.5 Summary

Key ecological receptors within the study area were identified and assigned an ecological value based on a geographic frame of reference ranging from national to local importance (higher value). The likely impacts of each Corridor Option on the key ecological receptors were identified and assessed, indicating which, if any, of these are likely to be significant, and at what geographical level.

The impacts of each Corridor Option on the key ecological receptors were identified and assigned an impact rating. The overall cumulative impact of the Corridor Options across all the key ecological receptors affected was then scored in accordance with the TII approach³, on a seven-point Likert scale ranging from 'major or highly negative (1)' to 'major or highly positive (7)'. The scores attributed to the Corridor Options were assessed comparatively and assigned a preference ranking.

Corridor Option 1 was ranked Preferred and Corridor Option 2 was ranked as Least Preferred.

1.6 References

CEC. (Commission of the European Communities) (2013) Interpretation Manual of European Union Habitats EUR 28 April 2013 European Commission, DG Environment Available from:

https://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf

Chartered Institute of Ecology and Environmental Management (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine

Fossitt, J. A. (2000). A Guide to Habitats in Ireland. The Heritage Council.

National Roads Authority (2009). Guidelines for Assessment of Ecological Impacts of National Road Schemes

Transport Infrastructure Ireland (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis. Available from:

<https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

Kildare County Council

Maynooth to Leixlip Project

Options Report – Stage 2 Climate
Corridor Options Assessment

Draft 1 | 31 August 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Table 1.1: PAG Scoring System used in Ranking

Table 1.2: Climate Assessment Matrix of Options Corridors

1 Stage 2 Climate Corridor Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Corridor Options for the Maynooth to Leixlip Project with respect to the Climate constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4 and references are provided in Section 0.

1.2 Methodology

The methodology for the assessment of the Stage 2 Corridor Options is set out hereunder.

1.2.1 Scoring Procedure

The multi-criteria climate assessment was undertaken with reference to the Transport Infrastructure Ireland (TII) Climate Assessment of Proposed National Roads – Standard¹ and in accordance with the requirements of the TII Project Management Guidelines², the TII Project Manager’s Manual³ and the TII Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis PE-PAG02031⁴. The assessment includes both a quantitative and qualitative element. Each impact is scored qualitatively based on the PAG seven-point Likert scale and an integer is assigned according to the impact level as shown in Table 1.1.

¹ TII (2022) Climate Assessment of Proposed National Roads – Standard. Available at: <https://www.tiipublications.ie/library/PE-ENV-01105-01.pdf>

² TII (2022) Project Management Guidelines. Available at: <https://www.tiipublications.ie/library/PE-PMG-02041-04.pdf>

³ TII (2019) Project Manger’s Manual for Major National Road Projects PE-PMG-02042. Available from <https://www.tiipublications.ie/library/PE-PMG-02042-01.pdf>

⁴ TII (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis. Available at: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

Table 1.1: PAG Scoring System used in Ranking

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Using a combination of the impact scores and professional judgement, a determination as to the level of the impact of each alternative was provided. The Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports⁵ were also referred to when undertaking this assessment.

Using the impact scores and the professional judgement of the specialist, a determination is made as to whether each Corridor Option that is assessed is either:

- Preferred;
- Least Preferred.

The Corridor Options are then weighted against each other in the assessment matrix of options (Table 1.2).

1.3 Corridor Options Assessment

The climate assessment evaluates potential carbon emissions from road traffic during the operational phase while also considering potential embodied carbon from the construction phase of each corridor. In addition, the traffic data provided for both options is considered in the assessment.

⁵ EPA (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR). Available at: <https://www.epa.ie/publications/monitoring--assessment/assessment/guidelines-on-the-information-to-be-contained-in-environmental-impact-assessment-reports-eiar.php>

The TII Carbon tool is customised for road projects in Ireland and uses emission factors for a wide range of activities and materials to predict the total carbon generated by a project. The most recent version of the TII Carbon Tool (at the time of this assessment), version 2.2 of December 2022, was used to assess carbon emissions during the construction stage for the Stage 2 Corridor Options Assessment and the tool was also used to calculate the embodied carbon for concrete, pavement and earthworks volumes based on the indicative designs for the option corridors.

From a climate perspective, greater vehicle kilometres travelled increases the operational carbon emissions. In addition, the more materials required to construct a corridor option, the greater the embodied carbon generated for the construction phase.

1.3.1 Corridor Option 1

Corridor Option 1 consists of proposed hard shoulder bus priority measures within the hard shoulder in both the eastbound and westbound directions. The land required for this option is within the current road reserve boundary.

The operational carbon, embodied carbon and climate assessment determination are outlined in Table 1.2. There is no change predicted in kilometres travelled on the M4 between Junction 5 and Junction 7 for Corridor Option 1 compared to the Do-Minimum.

Assessment Criteria	Corridor Option 1	Corridor Option 2
Change in vehicle km travelled (km) per year against Do-Minimum	0	+849
Difference between Do-Minimum and Do-Something (%) km travelled	0	+1.22%
Estimated embodied carbon (t CO ₂ e)	+2,036	+2,861
Difference in embodied carbon (tCO ₂ e)	Corridor Option 2 is predicted to generate 825 tCO ₂ e more than Corridor Option 1	
Qualitative Assessment	Moderately Negative	Moderately Negative
Score/ Impact Level	2	2
Preference –	Preferred	Least Preferred

outlines the predicted embodied carbon generation due to the construction of Corridor Option 1. Road construction will be carried out for widening sections of the existing road, hard shoulders and the construction of emergency refuge areas, as well as pavement overlay works that will be implemented for existing lanes. Construction works and activities under the headings of site clearance, drainage, earthworks, the removal of vehicle restraint systems, utility infrastructure, traffic signs, road markings and road lighting, will generate embodied carbon. Corridor Option 1 is predicted to have a moderately negative impact on the climate.

Therefore, Options Corridor 1 is ranked as Preferred, both in relation to construction and operational phases.

1.3.2 Corridor Option 2

Corridor Option 2 consists of proposed hard shoulder bus priority measures within the hard shoulder in both the eastbound and westbound directions. However, it differs to Corridor Option 1 in that it includes an additional third traffic lane in the westbound direction. Land required is within the current road reserve boundary.

The operational carbon, embodied carbon and climate assessment determination are outlined in

Assessment Criteria	Corridor Option 1	Corridor Option 2
Change in vehicle km travelled (km) per year against Do-Minimum	0	+849
Difference between Do-Minimum and Do-Something (%) km travelled	0	+1.22%
Estimated embodied carbon (t CO ₂ e)	+2,036	+2,861
Difference in embodied carbon (tCO ₂ e)	Corridor Option 2 is predicted to generate 825 tCO ₂ e more than Corridor Option 1	
Qualitative Assessment	Moderately Negative	Moderately Negative
Score/ Impact Level	2	2
Preference –	Preferred	Least Preferred

. There is no change predicted in kilometres travelled on the M4 between Junction 5 and Junction 7 for Corridor Option 2 compared to the Do-Minimum and Corridor Option 1.

Assessment Criteria	Corridor Option 1	Corridor Option 2
Change in vehicle km travelled (km) per year against Do-Minimum	0	+849
Difference between Do-Minimum and Do-Something (%) km travelled	0	+1.22%
Estimated embodied carbon (t CO ₂ e)	+2,036	+2,861
Difference in embodied carbon (tCO ₂ e)	Corridor Option 2 is predicted to generate 825 tCO ₂ e more than Corridor Option 1	
Qualitative Assessment	Moderately Negative	Moderately Negative
Score/ Impact Level	2	2
Preference –	Preferred	Least Preferred

outlines the predicted embodied carbon generation due to the construction of Corridor Option 2. Road construction will be carried out for widening sections of the existing road, hard shoulders and the construction of emergency refuge areas, pavement overlay works that will be implemented for existing lanes, as well as the construction of a new westbound lane. Construction works and activities under the headings of site clearance, drainage, earthworks, the removal of vehicle restraint systems, utility infrastructure, traffic signs, road markings and road lighting, will generate embodied carbon. Corridor Option 2 is predicted to have a moderately negative impact on the climate.

Therefore, due to the additional embodied carbon generated by the additional westbound traffic lane, Options Corridor 2 is ranked as Least Preferred, both in relation to construction and operational phases.

1.3.3 Corridor Options Assessment Matrix

Table 1.2: Climate Assessment Matrix of Options Corridors

Assessment Criteria	Corridor Option 1	Corridor Option 2
Change in vehicle km travelled (km) per year against Do-Minimum	0	+849
Difference between Do-Minimum and Do-Something (%) km travelled	0	+1.22%
Estimated embodied carbon (t CO ₂ e)	+2,036	+2,861
Difference in embodied carbon (tCO ₂ e)	Corridor Option 2 is predicted to generate 825 tCO ₂ e more than Corridor Option 1	
Qualitative Assessment	Moderately Negative	Moderately Negative
Score/ Impact Level	2	2
Preference –	Preferred	Least Preferred

1.4 Summary

Corridor Option 1 is Preferred as there is no predicted increase in operational carbon and will result in less construction embodied carbon generated when compared with Corridor Option 2. Corridor Option 2 is predicted to result in an increase in operational carbon and a moderately negative impact on the climate caused by the embodied carbon of the construction of the corridor. Therefore, Corridor Option 2 is Least Preferred.

As the embodied carbon is generated through the use of new materials for construction purposes, there is significant potential to reuse materials from the existing road. This will have the effect of potentially significantly reducing the embodied carbon during the construction phase.

1.5 References

EPA (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR). Available at:
<https://www.epa.ie/publications/monitoring--assessment/assessment/guidelines-on-the-information-to-be-contained-in-environmental-impact-assessment-reports-eiar.php>

TII (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis. Available at: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

TII (2019) Project Manger's Manual for Major National Road Projects PE-PMG-02042. Available from <https://www.tiipublications.ie/library/PE-PMG-02042-01.pdf>

TII (2022) Climate Assessment of Proposed National Roads – Standard. Available at: <https://www.tiipublications.ie/library/PE-ENV-01105-01.pdf>

TII (2022) Project Management Guidelines. Available at:
<https://www.tiipublications.ie/library/PE-PMG-02041-04.pdf>

Kildare County Council

Maynooth to Leixlip Project

Options Report - Stage 2
Hydrogeology Corridor Options
Assessment

Draft 1 | 31 August 2023

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Table 1.1: TII PAG Impact Scoring Criteria

Table 1.2: TII Project Appraisal Guidelines Scoring Criteria

Table 1.3: Correlation of NRA Guidelines Significance Rating to an equivalent NRA PAG Score

Table 1.4: Hydrogeology Assessment Criteria Summary

Table 1.5: Hydrogeological Assessment Matrix of Corridor Options

1 Stage 2 Hydrogeology Corridor Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Corridor Options for the Maynooth to Leixlip Project with respect to the Hydrogeology constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4.

1.2 Methodology

This assessment was prepared in accordance with the requirements of the Transport Infrastructure Ireland (TII), formerly National Roads Authority (NRA) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, NRA 2009¹.

In line with these Guidelines, the study area for this Phase 2 Stage 2 Corridor Options Assessment encompasses two proposed Corridor Options along the M4/N4 between Maynooth and Leixlip.

1.2.1 Scoring Procedure

The NRA Guidelines¹ provide criteria for ranking of the identified hydrogeological constraints within the study area (herein referred to as Criteria), that are presented in the Constraints Report. Criteria for rating an impact significance that may arise at each hydrogeological constraint are provided within Box 4.4 of the NRA Guidelines¹ and in Table 1.1. The impact significance assessment considers the attribute importance and the predicted scale and duration of the likely impacts.

Table 1.1: TII PAG Impact Scoring Criteria

Impact Level	Attribute Importance				
	Extremely High*	Very High	High	Medium	Low
Profound	Any permanent impact on attribute	Permanent impact on significant proportion of attribute			
Significant	Temporary impact on	Permanent impact on	Permanent impact on		

¹ TII (2009) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes. Available from: <https://www.tii.ie/technical-services/environment/planning/Guidelines-on-Procedures-for-Assessment-and-Treatment-of-Geology-Hydrology-and-Hydrogeology-for-National-Road-Schemes.pdf>

Impact Level	Attribute Importance				
	Extremely High*	Very High	High	Medium	Low
	significant proportion of attribute	small proportion of attribute	Significant proportion of attribute		
Moderate	Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute	
Slight		Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute
Imperceptible			Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute

**In rating impacts on an 'European site' account must be taken of Article 6(3) and 6(4) of the Habitats Directive (Council Directive 92/43/EEC). Also see guidance contained within Guidelines for Assessment of Ecological Impacts of National Road Schemes (Rev 2, National Roads Authority, 2008)*

The TII Project Appraisal Guidelines for National Roads (PAG) Unit 7.0 - Multi-Criteria Analysis² provide a qualitative and quantitative procedure for scoring each option against the assessment criteria, as shown in Table 1.2.

Table 1.2: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

The significance rating of environmental impacts from the NRA Guidelines have been correlated with the equivalent qualitative and quantitative assessment scores from the TII Project Appraisal Guidelines, as shown in Table 1.3.

² TII (2016) Project Appraisal Guidelines for National Roads Unit 7.0 Multi Criteria Analysis. Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

Table 1.3: Correlation of NRA Guidelines Significance Rating to an equivalent NRA PAG Score

Significance Rating (NRA Guidelines)	Equivalent PAG (Description)	Impact	Score
Profound	Major or highly negative	Results in loss of attribute and /or quality and integrity of attribute	1
Significant	Major or highly negative	Results in loss of attribute and /or quality and integrity of attribute	1
Moderate	Moderately negative	Results in impact on integrity of attribute or loss of part of attribute	2
Slight	Minor or slightly negative	Results in minor impact on integrity of attribute or loss of small part of attribute	3
Imperceptible	Not significant or neutral	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	4

The final stage of the assessment methodology was to ensure that the requirements of the TII PAG Unit 7.0 - multi-criteria analysis were met by assigning a score to each Corridor Option based on the scoring procedure within these Guidelines. Using the impact scores and professional judgement, Preferred or Least Preferred rankings were assigned to each Corridor Option.

The hydrogeological attributes which are considered in the assessment of the alternatives are presented in Table 1.4. This table also outlines the assessment criteria that will be applied to each of these features.

Table 1.4: Hydrogeology Assessment Criteria Summary

Hydrogeological Features to be assessed	Means of assessment of potential impacts
<p><i>Groundwater Flow, Levels and Aquifer Vulnerability</i></p> <p>The classification and extent of aquifers underlying each alternative and increased risk presented to them by each alternative</p>	<p>Aquifer classification.</p> <p>Extent of aquifer – assessed as the extent underlain by a particular aquifer classification.</p> <p>Aquifer vulnerability – assessed as the extent underlain by aquifer which is classified as extreme or high vulnerability.</p> <p>Removal of subsoil cover or part of aquifer (cuttings associated with an alternative) which may give rise to changes in groundwater level and change in aquifer vulnerability.</p>
<p><i>Karst</i></p> <p>Karst features and the risk presented to them by each alternative</p>	<p>The proximity to the feature.</p> <p>The extents of the alternative within feature protection zone or zone of contribution.</p>

Hydrogeological Features to be assessed	Means of assessment of potential impacts
<p><i>Groundwater Sources</i></p> <p>High yielding water supply wells and springs and increased risk presented by each alternative</p> <p><i>Groundwater Contamination</i></p> <p>Groundwater discharges and emissions have the potential to impact groundwater quality.</p> <p><i>Groundwater Flooding</i></p> <p>Historic groundwater flooding located within a fenceline, or junction have a potential to be impacted.</p>	<p>The proximity to the feature.</p> <p>The extent of the alternative within protection zone or zones of contribution.</p>
<p><i>Hydro-Ecology</i></p> <p>Groundwater dependent habitats and the risk presented to them by each alternative</p>	<p>The proximity and the position (upgradient or downgradient) to the feature.</p> <p>Removal of subsoil cover or part of aquifer (cuttings along junctions) which may give rise to changes in groundwater level.</p> <p>Removal of part of the habitat by an alternative.</p>

1.3 Corridor Options Assessment

1.3.1 Aquifer Classification and Groundwater Bodies

The potential impact on the aquifers along both Corridor Options is a combination of the type and extent of the aquifer, aquifer vulnerability and presence of deep cuttings (removal of soil and/or rock to road design elevations) along both Corridor Options.

Corridor Option 1 and Corridor Option 2 are predominantly underlain by Dinantian Upper Impure Limestone. The bedrock aquifer is classified as a Locally Important Aquifer where the bedrock which is moderately productive only in local zones (LI) except for a narrow band (approximately 300m wide) located 1.6km to the east of Junction 7 Maynooth which is classified as a Poor Aquifer where the bedrock is generally unproductive except for local zones (PI).

The western part of the two Corridor Options overlies Dinantian Pure Unbedded Limestone which is classified as a Locally Important Aquifer where the bedrock is moderately productive only in local zones (LI).

In this assessment the aquifer extent and type for the Corridor Options are compared by the depth of cutting in each aquifer type. Cuts between 5 and 10m in depth are considered to be a permanent impact on a small proportion of the aquifer. Cuts greater than 10m in depth are considered to be a permanent impact on a significant proportion of the aquifer.

Roads constructed in deep cuttings can impact on the groundwater by causing dewatering of the groundwater in the vicinity. The deeper the cutting the more significant and more extensive the impact. In addition, the removal of the soil and bedrock in the excavation will increase the vulnerability of the aquifer at that location, as vulnerability is largely dependent on the depth and permeability of subsoil above the aquifer.

There are no cuttings deeper than 0.5m in the two Corridor Options. The proposed River Liffey Bridge has the potential for local impact on groundwater quality and levels during construction in the immediate vicinity of the bridge abutments.

Therefore, with regard to groundwater, the impact in the Corridor Option 1 is considered to be imperceptible, resulting in a PAG ranking of not significant or neutral (4) and the impact in the Corridor Option 2 is considered to be minor or slightly negative, resulting in a PAG ranking of (3).

1.3.2 Karst Features

Karst features located within both Corridors Options have the potential to be impacted by removal of the feature or modification of the flow to or from the feature. Therefore, where a karst feature is located within a Corridor Option, it is considered a permanent impact on a significant proportion of the attribute.

There are no karst features recorded within the extent of the Corridor Options. Therefore, with regard to karst features both Corridors Options are considered neutral and the impact is imperceptible, resulting in a PAG ranking of not significant or neutral (4) for both Corridor Options.

It is important to highlight that the underlying bedrock geology may be susceptible to karst as karst features were recorded in the same formations outside of the extent of the Corridor Options.

1.3.3 Groundwater Sources

Groundwater sources include springs, wells or boreholes which are used for groundwater abstraction by domestic, agricultural, commercial, industrial, local authority or group water scheme users. Groundwater sources can be impacted by lowering of the water-table which may reduce the supply available and by accidental spillages or releases of contaminants which may impact the water quality.

Source Protection Zone (SPZ) reports have been produced by the GSI and EPA. The reports aim to guide development planning and regulation to provide protection to groundwater sources. There are no high yield water supply springs and wells i.e. public water supplies or group water scheme supplies along the Corridor Options. No Source Protection Zones associated with public, or group groundwater supply schemes are located along the Corridor Options.

Nine boreholes and springs from the GSI database have been identified within the extent of the Corridor Options. These groundwater abstraction wells identified within both Corridor Options are of low importance. The NRA Guidelines¹ suggests that little or no weighting should be given to the number of such wells along each Corridor Option and/or their distance from the centreline when assessing relative impacts. In the case of low yielding water supply wells, the ranking of the level of potential impact is unnecessary, as wells will either have to be replaced or removed. Therefore, with regard to groundwater sources both Corridor Options are considered neutral, and the impact is imperceptible resulting in a PAG ranking of not significant or neutral (4) for both Corridor Options.

1.3.4 Groundwater Flooding

There are no areas of historic groundwater flooding within either of the Corridor Options. Therefore, with regard to groundwater flooding both Corridor Options are considered neutral and the impact is imperceptible resulting in a PAG ranking of not significant or neutral (4) for both Corridor Options.

1.3.5 Groundwater Discharge Licenses

Kildare County Council and South Dublin County Council have been consulted for their records of groundwater discharge licences within the extent of the Corridor Options. There are no licences to discharge to groundwater identified within the extent of either Corridor Options. Therefore, with regard to groundwater discharge licenses both corridors are considered neutral and the impact is imperceptible resulting in a PAG ranking of not significant or neutral (4) for both Corridor Options.

1.3.6 Hydro-ecology

Biodiversity impacts on groundwater dependent habitats are assessed as part of the biodiversity assessment. The hydrogeological assessment of groundwater dependent habitats focuses on the groundwater components of the features i.e. changes to groundwater level which may impact recharge to the feature, or changes to groundwater quality.

The proximity of the habitat to the Corridor Options is considered with regard to increased pollution risk from untreated surface water run-off or accidental spillage of fuel from the road affecting groundwater quality. However, as per Section 4.4 of the NRA Guidelines, the assessment has considered the application of standard mitigation and best practice during construction is unambiguous and success is highly likely. Therefore, it is assumed that standard drainage measures will be put in place to reduce the risk of run-off from the road affecting groundwater quality, reducing this risk.

A conservative approach was taken regarding water dependent habitats. In advance of a detailed survey at environmental impact assessment stage, features are considered as if they are dependent on both surface water and groundwater.

There are no groundwater dependant habitats within the extent of the Corridor Options. The Liffey Valley pNHA is located within 100m of the Corridor Options. However, as there are no cuttings greater than 0.5m in depth associated with either of the Corridor Options, the impact from both Corridor Options on the pNHA is considered to be neutral and the impact is imperceptible resulting in a PAG ranking of not significant or neutral (4) for both Corridor Options.

1.3.7 Corridor Options Assessment Matrix

Table 1.5: Hydrogeological Assessment Matrix of Corridor Options

Assessment Criteria	Corridor Option 1	Corridor Option 2
Karst	No Karst Features identified. Impact is not significant or neutral.	No Karst Features identified. Impact is not significant or neutral.
Aquifer classification/Vulnerability	No cuttings >5m in depth and no change in vulnerability. Cuttings are not deeper than 0.5m. Impact is not significant or neutral.	No cuttings >5m in depth and no change in vulnerability. Cuttings are not deeper than 0.5m. Works involving the Liffey River Bridge. Impact is minor or slightly negative.
Groundwater Sources/Resources	No features impacted. Impact is not significant or neutral.	No features impacted. Impact is not significant or neutral.
Groundwater flooding	No groundwater flooding areas. Impact is not significant or neutral.	No groundwater flooding areas. Impact is not significant or neutral.
Hydro-ecology	No groundwater habitats impacted. Impact is not significant or neutral.	No groundwater habitats impacted. Impact is not significant or neutral.
Scoring		
Qualitative Assessment	Not Significant or Neutral	Minor or Slightly Negative
Score / Impact Level	4	3
Preference	Preferred	Least Preferred

1.4 Summary

The Corridor Options have been assessed for the hydrogeological constraints identified within each Corridor Option.

There are no cuttings greater than 0.5m in depth associated with either Corridor Option. The Corridor Option 2 would involve works at the River Liffey Bridge, and therefore the impact on the aquifers is considered to be minor or slightly negative (3), while in the Corridor Option 1 is considered to be not significant or neutral (4).

There are no impacts involving groundwater dependant habitats outside the Corridor Options, therefore this impact is considered to be not significant or neutral (4).

There are no karst features, groundwater dependant habitats, groundwater discharge licenses or records of historical groundwater flooding identified within the Corridor Options. There are also no groundwater sources or groundwater abstractions which are considered greater than low importance within the Corridor Options. Therefore, these features are all considered not significant or neutral (4) when comparing the Corridor Options.

Based on the assessment of the Corridor Options on the hydrogeological constraints the PAG ranking is considered to be not significant or neutral (4) for the Corridor Option 1, which is the preferred option and minor or slightly negative (3) for the Corridor Option 2, which is the least preferred option.

Kildare County Council

Maynooth to Leixlip Project

Options Report - Stage 2 Hydrology
- Corridor Options Assessment

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Table 1.2: TII PAG Impact Scoring Criteria

Table 1.3: Correlation of NRA Guidelines Significance Rating to an equivalent NRA PAG Score

Table 1.4: Impacts Scores Relating to the Individual Hydrological Attributes

Table 1.5: Hydrology Assessment Summary Matrix

1 Stage 2 Hydrology Corridor Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Corridor Options for the Maynooth to Leixlip Project with respect to the Hydrology constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4.

1.2 Methodology

This assessment was prepared in accordance with the requirements of the TII, formerly NRA Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, NRA 2009¹.

The NRA Guidelines provide criteria for ranking the identified hydrology constraints within the study area. These criteria are presented in the Constraints Report (Route Corridor Selection) of the NRA Guidelines. Criteria for rating an impact significance that may arise at each hydrology constraint are provided within Box 4.4 of the NRA Guidelines and are reproduced in Table 1.1. The impact significance assessment considers the attribute importance and the predicted scale and duration of the likely impacts.

Table 1.1: Rating of Significant Environmental Impacts from Box 4.4 of the Guidelines

Impact Level	Attribute Importance				
	Extremely High*	Very High	High	Medium	Low
Profound	Any permanent impact on attribute	Permanent impact on significant proportion of attribute			
Significant	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on Significant proportion of attribute		

¹ TII (2009) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes. Available from: <https://www.tii.ie/technical-services/environment/planning/Guidelines-on-Procedures-for-Assessment-and-Treatment-of-Geology-Hydrology-and-Hydrogeology-for-National-Road-Schemes.pdf>

Impact Level	Attribute Importance				
	Extremely High*	Very High	High	Medium	Low
Moderate	Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute	
Slight		Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute
Imperceptible			Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute

**In rating impacts on an 'European site' account must be taken of Article 6(3) and 6(4) of the Habitats Directive (Council Directive 92/43/EEC). Also see guidance contained within Guidelines for Assessment of Ecological Impacts of National Road Schemes (Rev 2, National Roads Authority, 2008)*

The TII Project Appraisal Guidelines for National Roads (PAG) Unit 7.0 - Multi-Criteria Analysis² provide a qualitative and quantitative procedure for scoring each option against the assessment criteria, as shown in Table 1.2.

Table 1.2: TII PAG Impact Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

The significance rating of environmental impacts from the NRA Guidelines have been correlated with the equivalent qualitative and quantitative assessment scores from the TII Project Appraisal Guidelines, as shown in Table 1.3.

² TII (2016) Project Appraisal Guidelines for National Roads Unit 7.0 Multi Criteria Analysis. Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

Table 1.3: Correlation of NRA Guidelines Significance Rating to an equivalent NRA PAG Score

Significance Rating (NRA Guidelines)	Equivalent PAG (description)	Impact	Score
Profound	Major or highly negative	Results in loss of attribute and /or quality and integrity of attribute	1
Significant	Major or highly negative	Results in loss of attribute and /or quality and integrity of attribute	1
Moderate	Moderately negative	Results in impact on integrity of attribute or loss of part of attribute	2
Slight	Minor or slightly negative	Results in minor impact on integrity of attribute or loss of small part of attribute	3
Imperceptible	Not significant or neutral	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	4

The final stage of the assessment methodology was to ensure that the requirements of the TII PAG Unit 7.0 - multi-criteria analysis were met by assigning a score to each corridor option based on the scoring procedure within these Guidelines. Using the impact scores and professional judgement, Preferred, Intermediate or Least Preferred rankings were assigned to each of the corridor options.

1.3 Corridor Options Assessment

Each Corridor Option was scored by how it was deemed to impact the identified hydrological constraints using the methodology previously outlined. This assessment is detailed in Table 1.4.

Table 1.4: Impacts Scores Relating to the Individual Hydrological Attributes

Corridor Option	Feature	Description	Attribute Importance	Magnitude of Impact	Score
Corridor Option 1	River Lyreen and its tributary the Meadowbrook	The River Lyreen is a watercourse in the Liffey and Dublin Bay Catchment Surface water runoff from the M4 discharges to the Meadowbrook River, approximately 3km upstream of the Rye Water Valley SAC	High Flood Relief Scheme and floodplains protecting between 5 and 50 residential or commercial properties from flooding	Not significant or neutral Negligible change in predicted peak flood level. Calculated risk of serious pollution incident.	4
	River Liffey and its tributary the Kilmacredock Upper	The River Liffey is the primary watercourse in the Liffey and Dublin Bay Catchment	High River Waterbody Risk Projection: Under review Q value status: Good	Not significant or neutral Negligible change in predicted peak flood level. Calculated risk of serious pollution incident.	4
	Leixlip Reservoir	Manmade reservoir on the River Liffey	Very High River Waterbody Risk Projection: Under review WFD status: assumed good based on River Liffey values Abstraction for Drinking water	Not significant or neutral Negligible change in predicted peak flood level. Calculated risk of serious pollution incident.	4
Corridor Option 2	The features and impact scores for Corridor Option 2 are deemed to be the same as Corridor Option 1				

Both Corridor Options involve increasing the paved area of the carriageway and by doing so they may:

- Increase pollutant concentrations draining to watercourses during both the construction and operational phases;
- Increase sediment loads to watercourses during construction; and
- Alter the catchment characteristics resulting in an increase in both pluvial flood risk to the M4/N4 and fluvial flood risk on downstream watercourses.

The estimated increases in paved area for the respective options are:

- Option 1: > 9% increase in paved area; and
- Option 2: > 25% increase in paved area.

It should be noted that mitigation measures such as pollution controls and attenuation tanks can decrease the aforementioned risks.

1.3.1 Assessment Matrix

Table 1.5: Hydrology Assessment Summary Matrix

Assessment Criteria	Corridor Option 1	Corridor Option 2
River Lyreen and its tributary the Meadowbrook	Not significant or neutral	Not significant or neutral
River Liffey and its tributary the Kilmacredock Upper	Not significant or neutral	Not significant or neutral
Leixlip Reservoir	Not significant or neutral	Not significant or neutral
Scoring		
Qualitative Assessment	Not significant or neutral	Not significant or neutral
Score/ Impact Level	4	4
Preference	Preferred	Least Preferred

1.4 Summary

The Corridor Options are similar, primarily differentiated by the number of lanes and subsequent width of the carriageway. As a result, the determined impacts of each Corridor Option on the hydrological features are similar.

The impacts of both Corridor Options on the hydrological features of the study area is summarised in Table 1.5. Corridor Option 1 is Preferred, and Corridor Option 2 is Least Preferred. Corridor Option 1 is preferred because it has the least amount of paved area.

Kildare County Council

Maynooth to Leixlip Project

Appendix 7 - Stage 2 Landscape and
Visual - Corridor Options
Assessment

Draft 1 | 31 August 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Tables

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Landscape and Visual Assessment Matrix of Corridor Options

1 Stage 2 Landscape and Visual Corridor Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Corridor Options for the Maynooth to Leixlip Project with respect to the Landscape and Visual constraints identified in Chapter 4 of this report. It assesses the potential significance of effects on landscape receptors and visual receptors, positively or negatively, based on its sensitivity and the magnitude of change.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4.

1.2 Methodology

The landscape and visual constraints assessment involved desktop studies where the Landscape and Visual specialist has developed an understanding of the character of the existing landscape through study of the Landscape Character Assessment incorporated into the Kildare County Development Plan 2017-2023, South Dublin County Council Development Plan 2016 -2022, Fingal Development Plan 2017-2023 and Meath County Development Plan 2013-2019 (carried through to the Development Plan 2020-2026) as well as other landscape and visual references in the County Development Plans and to review of the landscape and visual environment based on other principal sources of information.

The assessment has had regard to the following documents:

- Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Specified Infrastructure Projects – Overarching Technical Document (PE-ENV-01101), December 2020 TII;
- Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Proposed National Roads - Standard (PE-ENV-01102), December 2020 TII;
- Draft Advice Notes for Preparing Environmental Impact Statements, Draft September 2015 Environmental Protection Agency;
- Guidelines on the information to be contained in Environmental Impact Assessment Reports, Draft August 2017 EPA;
- Guidelines for Landscape and Visual Impact Assessment, 3ed. April 2013 Landscape Institute & Institute of Environmental Management and Assessment;
- Kildare County Development Plan 2017-2023, Kildare County Council, 2017;
- South Dublin Development Plan 2016-2022, South Dublin County Council, 2016;

- Celbridge Local Area Plan 2017-2023, Kildare County Council, 2017; and
- Maynooth Local Area Plan 2013-2019 (As Amended), Kildare County Council, 2017; and
- Leixlip Local Area Plan 2020-2023, Kildare County Council, 2019.

Other principal sources of information were:

- Ordnance Survey Ireland Geohive (<http://map.geohive.ie/mapviewer.html>);
- Environmental Protection Agency GIS Mapping (<https://gis.epa.ie/EPAMaps/>);
- Heritage Council GIS Mapping (<https://heritagemaps.ie/>);
- National Biodiversity Data Centre (<https://data.gov.ie/organization/national-biodiversity-data-centre/>); and
- Google Aerial Photography and Mapping (<https://www.google.ie/maps>).

1.2.1 Scoring Procedure

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG scoring procedure. The PAG seven-point scale scoring procedure is shown in Table 1.1.

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Using a combination of the impact scores and professional judgement, a determination as to the level of the impact of each Corridor Option was provided.

Using the impact scores and the professional judgement of the specialist, a determination is made as to whether each Corridor Option that is assessed is either:

- Preferred; or
- Least Preferred.

1.3 Corridor Options Assessment

1.3.1 Corridor Option 1

Corridor Option 1 will have impacts on roadside verges, trees and other vegetation on both the eastbound and westbound carriageway. This has potential for localised impacts on landscape and visual receptors through reduction in the screening effect of roadside vegetation, particularly where visual receptors may gain views of the carriageway and traffic movement and noise may become more apparent.

Moderate negative effects are most likely to occur for residential receptors at Griffin Rath Manor where a proposed emergency refuge area will necessitate earthworks and associated tree removal from the roadside planting to the south of the residences, where the road is in an elevated position. There is also potential for moderate negative effects, resulting from provision of an emergency refuge area and loss of roadside vegetation, at the Wonderful Barn and environs, which are the focus of objective BH1.6 of Leixlip Local Area Plan: *“To promote The Wonderful Barn as an integrated tourism attraction including the restoration of the main features of the complex and its historical landscape”*.

As works will be largely within the footprint of existing road infrastructure, Option 1 is not likely to result in significant landscape and visual effects. There will be no notable change to the character of the road corridor with this Corridor Option. Nevertheless, there is potential for moderate negative effects on nearby landscape or visual receptors, where screening vegetation is removed from the roadside. In these cases, mitigation through provision of replacement planting, where feasible, will be important in order to reduce these effects. Due to the generally young age of roadside vegetation, these measures would be likely to be effective in neutralising effects in the short to medium-term.

1.3.2 Corridor Option 2

The impact on vegetation for this Corridor Option will be greater than for Corridor Option 1, due to the greater width of the proposed corridor, and the resulting effects on some receptors to the south of the road corridor will be greater, although they are unlikely to exceed a moderate negative effect, at most. The greater width of this option, with the additional westbound traffic lane, will result in a reduced amenity of the road corridor itself in comparison to Corridor Option 1. However, the receptors using the road are deemed to be low sensitivity due to speed of travel and mode of transport, and the resulting effect would be negligible / slight, negative.

1.3.3 Corridor Options Assessment Matrix

Table 1.2: Landscape and Visual Assessment Matrix of Corridor Options

Assessment Criteria	Corridor Option 1	Corridor Option 2
Designated Landscapes / Amenities	1	2
Archaeological Features	0 (No Impact)	0 (No Impact)
Architectural Heritage Features	1	2
Natural Landscape Features topographical features, rivers, trees/hedgerows	1	2
Demesne Features	0 (No Impact)	0 (No Impact)
Landscape Scoring	3	6
Residential Properties/ Visual Receptors	1	2
Designated views/scenic routes/areas	1	2
Visual Scoring	2	4
Qualitative Assessment	Moderate negative. Some loss of vegetation/hedgerows for introduction of refuge areas and cut and fill, with resulting impacts on surrounding landscape and visual receptors.	Moderate negative. Overall marginally greater impacts than Option 1. Some loss of vegetation/hedgerows for introduction of refuge areas, westbound lane and cut and fill, with resulting impacts on surrounding landscape and visual receptors.
Score/ Impact Level	2	2
Preference	Preferred	Least Preferred

1.4 Summary

Corridor Option 1 is not expected to have significant landscape and visual effects. There is potential for moderate negative effects on some receptors such as Griffin Rath Manor and the Wonderful Barn and environs due to removal of roadside vegetation, as well as lesser effects on some other surrounding receptors. This Corridor Option is preferred in terms of landscape and visual impacts.

Corridor Option 2 is not expected to have significant landscape and visual effects. There is potential for moderate negative effects on the same receptors as for Corridor Option 1, with a slightly greater impact on receptors to the south. Therefore, Corridor Option 2 is least preferred in terms of landscape and visual impacts. However, the impacts predicted for both Corridor Option 1 and Corridor Option 2 are predicted to be Not Significant or Neutral.

There is potential for neutralisation of some effects with adequate replacement planting. A good quality and considered landscape planting scheme should be developed and implemented with the Corridor Options to help incorporate the proposed development into the landscape / townscape and provide landscape enhancements where feasible. Micro-siting of the proposed emergency refuge areas may also potentially reduce impacts by repositioning areas of tree loss to limit impacts on sensitive receptors. Potential for adequate mitigation is greatest for Corridor Option 1 and secondly for Corridor Option 2.

Kildare County Council

Maynooth to Leixlip Project

Options Report - Stage 2 Material
Assets – Agriculture Corridor
Options Assessment

Draft 1 | 31 August 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Tables

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Corridor Options Material Assets – Agriculture - Assessment Summary

1 Stage 2 Material Assets – Agriculture - Corridor Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Corridor Options for the Maynooth to Leixlip Project with respect to the Material Assets Agriculture constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4 and references are provided in Section 1.5.

1.2 Methodology

The following guidelines and legislation were referred to when undertaking this Stage 2 Corridor Option assessment:

- European Union (2018) (Planning and Development) (Environmental Impact Assessment) Regulations. (SI 296 of 2018);
- Environmental Protection Agency (EPA) (August 2017) Guidelines on the Information to be contained in Environmental Impact Assessment Reports¹; and
- Transport Infrastructure Ireland (TII) (2016) Project Appraisal Guidelines Unit 7.0 - Multi Criteria Analysis, PE-PAG-02031².

This assessment is a combination of a desktop assessment of available data sources as set out in Section 4.11.2, combined with the on-site survey conducted in January 2021. The assessment in this section compares the impacts of the Corridor Options (as presented in Chapter 7 of this report) on the agricultural constraints identified in Section 4.11.3.1. The five criteria as set out in Section 3.1.5 of the 2016 PAG Guidelines² are assessed for each Corridor Option i.e.

1. The farm size along each corridor option.

This criteria was assessed by referencing the CSO data (Tables 4.33 and 4.34 of Section 4.11.3.1) for the study area. Larger farms are generally more resilient to land loss than smaller farms. The farm size is assumed to be the same along each of the Corridor Options;

¹Environmental Protection Agency (EPA) (August 2017) Guidelines on the Information to be contained in Environmental Impact Assessment Report. Available from:

<https://www.epa.ie/pubs/advice/ea/EPA%20EIA%20Guidelines.pdf> [Accessed 09 April 2020]

² Transport Infrastructure Ireland (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf> [Accessed: 09 April 2020]

2. The types of farm enterprises along each corridor option.

In assessing this criteria, high and very high sensitive farm enterprises along each Corridor Option are distinguished from low – medium sensitivity farm enterprises according to criteria set out in Table 4.31 of Section 4.11.2. Dairy, equine farms, horticultural and other highly sensitive enterprises were identified from aerial photography³ and the site survey. The folios of these high and very high sensitivity enterprises were identified using the PRAI⁴ data;

3. Landtake impacts (including impacts of farm yards) for each corridor option.

A high level assessment of the potential landtake impacts was made by assessing the Corridor Options. The potential landtake of agricultural land (as identified in Section 4.11.3 and Figure 11.1 – Land Use) and impacts on farm yards is assessed.;

4. Mitigated severance impacts along each Corridor Option.

The severance impacts of the Corridor Options were assessed by measuring offline lengths (if any) of the options.

5. Impacts on farm viability.

Farm viability describes the capacity of a farm to survive, grow and develop. High viability is associated with large farm size, good land quality, intensive land-use and the presence of high sensitivity farm enterprises such as dairy and equine. The farm viability within the study area is high due to the presence of good quality land, a large farm size (50.6ha compared to national average of 32.7 hectares – see Table 4.34 of Chapter 4) and the presence of regionally important stud farms.

1.2.1 Scoring Procedure

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG scoring procedure. The PAG seven-point scale scoring procedure is shown in Table 1.1.

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative

³ Google Earth Imagery (2023) Viewed on 13th September 2023. Available at: [Google Earth](#)

⁴ Footnote 4 should be Property Registration Authority of Ireland viewed on September 13th 2023 available at <https://www.landdirect.ie/>

Assessment Score	Description
1	Major or highly negative

In the first instance, individual assessments were carried out on each criterion followed by an overall assessment. A score was assigned to both Corridor Options based on the TII PAG seven point scale, and the overall preference for each Corridor Option of Preferred, Intermediate, or Least Preferred was assigned using a combination of the assessment criteria results and professional judgement.

1.3 Corridor Options Assessment

1.3.1 Corridor Option 1

The farms adjacent to this Corridor Option are approximately 50.6 hectares (Table 4.34). This is larger than the County Kildare average (44.1 hectares) and the State average (32.7 hectares).

There are three high and very high sensitivity farm enterprises adjoining this Corridor Option.

The landtake is assessed to be imperceptible. The proposed hard shoulder bus priority measure in both the eastbound and westbound directions will be constructed within the existing fenceline - with the potential for a very small amount of additional land.

The mitigated severance impact will be imperceptible because the development of the proposed hard shoulder bus priority measure in both the eastbound and westbound directions will be within the existing fenceline.

The farm viability adjacent to Corridor Option 1 is high due to the presence of good quality land, a large farm size and the presence of two regionally important stud farms and one high sensitivity equine farm and dog kennels.

Having assessed the five criteria (farm size, farm type, landtake, severance and viability) this Corridor Option is assessed to have a Not Significant or Neutral impact - PAG Score 4 on the seven point scale. This option is Preferred, because there is unlikely to be potential for any landtake outside of the existing fenceline.

1.3.2 Corridor Option 2

The farm size, type and farm viability along this Corridor Option is the same as Corridor Option 1. While the cross section of this Corridor Option is circa 1.5m wider than Corridor Option 1 the landtake is also assessed to be imperceptible. The mitigated severance impact is imperceptible because this option will be within the existing fenceline.

Having assessed the five criteria (farm size, farm type, landtake, severance and viability) this Corridor Option is assessed to have a 'Not Significant or Neutral' impact - PAG Score 4 on the seven point scale. This option is also Preferred because there is the potential for only very minimal landtake outside of the existing fenceline.

1.3.3 Assessment Matrix

Table 1.2: Corridor Options Material Assets – Agriculture - Assessment Summary

Assessment Criteria	Corridor Option 1	Corridor Option 2
Quantitative Assessment		
Assessment criteria 1 – Farm Size	50.6ha (compared to the national average of 32.7ha) PAG Score 4	50.6ha (compared to the national average of 32.7ha) PAG Score 4
Assessment criteria 2 – Farm Type	A small number of very high sensitivity stud farms – remainder of farms are medium sensitivity. Potential impacts are assessed to be low due to on-line nature of the Corridor Option PAG Score 3	A small number of very high sensitivity stud farms – remainder of farms are medium sensitivity. Potential impacts are assessed to be low due to on-line nature of the Corridor Option PAG Score 3
Assessment criteria 3 – Landtake		
Sub-criteria – Landtake	Proposed cross section = 29m. Proposed development mainly within the existing fenceline. Landtake is assessed as imperceptible.	Proposed cross section = 30.5m. Proposed development mainly within the existing fenceline. Landtake is assessed as imperceptible.
Sub-criteria – Length on-line / off-line	Approx. 8.4km (100%) of entire length is on-line.	Approx. 8.4km (100%) of entire length is on-line.
Impacts On farm-yards	There are 2 farm yards along the existing fenceline – the impacts on these yards will not increase significantly.	There are 2 farm yards along the existing fenceline – the impacts on these yards will not increase significantly.
Sub-criteria – Quality of landtake	Main soil type is a Luvisol – good quality land - with a minority of heavy gley soils PAG Score 4	Main soil type is a Luvisol – good quality land - with a minority of heavy gley soils PAG Score 4
Assessment criteria 4 – Severance (length off-line)	Approx. 8.4km (100%) of entire length is on-line, therefore not significant severance impact. PAG Score 4	Approx. 8.4km (100%) of entire length is on-line, therefore not significant severance impact. PAG Score 4
Assessment criteria 5 – Viability	Viability is high along this Corridor option – but impact on the viability of farms is low. PAG Score 3	Viability is high along this Corridor option – but impact on the viability of farms is low. PAG Score 3

Assessment Criteria	Corridor Option 1	Corridor Option 2
Qualitative Assessment	<p>Neutral or Not significant</p> <p>Corridor Option is almost entirely within existing fenceline and entirely on-line thus minimising the landtake and severance impacts.</p> <p>Large farms. There are three high and very high sensitivity farms adjacent to this Corridor Option, however potential impacts are at the edge of these enterprises. High viability but low impacts.</p>	<p>Neutral or Not significant</p> <p>Corridor Option is almost entirely within existing fenceline and entirely on-line thus minimising the landtake and severance impacts.</p> <p>Large farms. There are three high and very high sensitivity farms adjacent to this Corridor Option, however potential impacts are at the edge of these enterprises. High viability but low impacts.</p>
Overall Score / Impact Level	4	4
Preference	Preferred	Preferred

1.4 Summary

The differences between Corridor Option 1 and Corridor Option 2 arise solely from the additional 1.5m wide carriageway which would result in a marginally higher landtake for Corridor Option 2. This difference is not significant enough to differentiate an option preference. The potential impacts associated with both Corridor Options are predicted to be Neutral or Not Significant.

Both Corridor Option 1 and Corridor Option 2 are Preferred.

Kildare County Council

Maynooth to Leixlip Project

Options Report – Stage 2 Noise and
Vibration Corridor Options
Assessment

Draft 1 | 31 August 2023

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Table 1.1: Summary of AADT Data used for Stage 2 Assessment

Table 1.2: Classification of magnitude of traffic noise impacts in long term (DMRB 2020)

Table 1.3: TII PAG Impact Scoring Criteria

Table 1.4: Corridor Option 1 PIR

Table 1.5: Corridor Option 2 PIR

Table 1.6: Corridor Options Assessment Matrix

1 Stage 2 Noise and Vibration - Corridor Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Corridor Options for the M4 Maynooth to Leixlip Project with respect to the Noise and Vibration constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4 and references are provided in Section 1.5.

1.2 Methodology

There are two corridor options identified as part of the Phase 2 Stage 2 process. These are summarised as follows:

Corridor Option 1: Hard Shoulder Bus Priority Measure in both eastbound and westbound directions.

Corridor Option 2: Hard Shoulder Bus Priority Measure in both eastbound and westbound directions and an additional third traffic lane in the westbound direction.

The assessment has ranked the corridor options in order of preference considering their potential impacts to Noise and Vibration on the surrounding environment.

Junctions and or bridges options, park and ride infrastructure, active travel and demand management will be considered and applied equally on both Corridor Options, where the preferred solution is established for each.

1.2.1 Data Sources

For guidance on the Noise and Vibration impact assessment, reference has been made to the following guidance documents:

- Section 5.0 of the Guidelines for the Treatment of Noise and Vibration in National Road Schemes (TII Noise Guidelines 2004)¹
- Section 2 of the 2014 Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (TII Noise Guidelines 2014)²

¹ Transport Infrastructure Ireland, Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2004. Available from: https://www.tii.ie/technical-services/environment/planning/Guidelines_for_the_Treatment_of_Noise_and_Vibration_in_National_Road_Schemes.pdf

² Transport Infrastructure Ireland, Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes, 2014. Available from: <https://www.tii.ie/technical->

- UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability and Environmental Appraisal LA 111 Noise and Vibration Revision 2 (DMRB 2020)³

This assessment has also been carried out in accordance with the requirements of the TII Project Management Guidelines 2019⁴, and the TII Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis PE-PAG-02031, October 2016⁵.

1.2.2 Noise

In terms of operational noise, the TII Noise Guidelines 2004¹ and TII Noise Guidelines 2014² consider it appropriate to set the design goal for road traffic noise for new national roads in Ireland as follows:

- Day-evening-night 60 dB L_{den} (free field)

The following three conditions must be satisfied under the TII guidelines for noise mitigation to be provided:

- The combined expected maximum traffic noise level, i.e., the relevant noise level, from the proposed corridor option together with other traffic in the vicinity is greater than the design goal of 60 dB L_{den}.
- The relevant noise level is at least 1 dB more than the expected traffic noise level without the proposed corridor option in place
- The contribution to the increase in the relevant noise level from the proposed corridor option is at least 1 dB

Both of the TII documents referred to above acknowledge that it may not always be sustainable to achieve this design goal. In such circumstances, nevertheless, a structured approach should be taken to ameliorate as far as practicable road traffic noise through the consideration of measures such as alignment changes, barrier type (e.g., earth mounds) or low noise road surfaces.

It has been assumed for the purpose of this assessment that existing noise barriers or earth embankments along the existing N4 shall be replaced with an equal or enhanced construction depending on identified impacts during the detailed design assessment in areas where widening into the verge is required.

[services/environment/planning/Good_Practice_Guidance_for_the_Treatment_of_Noise_during_the_Planning_of_National_Road_Schemes.pdf](#)

³ UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability and Environmental Appraisal LA 111 Noise and Vibration Revision 2 (hereafter referred to as DMRB Noise and Vibration) (UKHA 2020);

Available from <https://www.standardsforhighways.co.uk/prod/attachments/cc8cfcf7-c235-4052-8d32-d5398796b364?inline=true>

⁴ Transport Infrastructure Ireland, Project Management Guidelines PE-PMG-02041, 2020. Available from: <https://www.tiipublications.ie/library/PE-PMG-02041-03.pdf>

⁵ Transport Infrastructure Ireland, Project Appraisal Guidelines for National Road Schemes Unit 7.0 – Multi Criteria Analysis, October 2016. Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

1.2.3 Vibration

In terms of vibration, the TII Noise Guidelines 2004¹ and TII Noise Guidelines 2014² note that road traffic along normal well-maintained surfaces, in line with corridor options, generates very low levels that are normally not perceptible to building occupants. Vibration magnitudes from road traffic are also orders of magnitude below those associated with any form of cosmetic damage to buildings and vulnerable structures. For the purposes of this assessment, therefore, it is assumed that both corridor options will have a comparable low vibration impact during their operational phase and vibration is not assessed further from a ranking point of view.

1.2.4 Construction Noise and Vibration Impacts

The potential noise or vibration impacts of the Stage 2 options during the construction phase relate to the works required to incorporate the priority bus lanes and, where relevant additional third lane in the westbound direction. This will require widening into the central median and into the road verges at junctions in addition to general road works including levelling, road surfacing, lane markings etc. These works will be required along the full extent of the Proposed Scheme along the two corridor options.

Corridor Option 2 will require widening of the existing River Liffey Bridge or require construction of a new separate bridge to facilitate the additional westbound traffic lane. This would have localised noise impacts to NSLs in the immediate vicinity of the bridge. Higher potential localised construction noise impacts are therefore associated with this option, particularly if night-time work are required for part of the bridge works.

The potential noise and vibration impacts associated with the construction phase of both corridor options will be of short-term duration (less than 7 years). The construction phase for each corridor options will be undertaken using standard road construction techniques and will be controlled through the use of construction noise limits.

During the construction phase, there is potential for minor vibration levels to be generated depending on the works involved, however the magnitude of which will be orders of magnitude below those associated with any form of building or structure cosmetic damage. Any construction activity will be controlled through strict vibration limits.

Based on the above, Corridor Option 2 will have a marginally higher potential noise impact associated with its construction phase, localised in the vicinity of the River Liffey Bridge. The temporary to short term and localised impacts associated with this specific work area would not have a significant effect overall on the preference of one route over another. No further consideration has therefore been given to the construction phase to differentiate either corridor option.

1.2.5 Assessment Methodology

The assessment of potential noise impacts and ranking of corridor options is based upon property counts and on the calculated change in traffic noise levels as a result of alignment changes and any forecast changes in traffic flows. The assessment also considers the likely requirement for noise mitigation measures based on triggering the three conditions for noise mitigation discussed above. The following steps have been taken to assess the impact rating of each of the corridor options under consideration:

- Property counts have been conducted within four bands from the edge of each corridor option, i.e., 0 to 50m, 50 to 100m, 100 to 200m and 200 to 300m. Using this information, the Potential Impact Ratings (PIR) for each corridor option and switches were established.
- The change in noise level between the Do Minimum and Do Something scenario at the closest noise sensitive locations (NSLs) for each corridor option was established considering the horizontal alignments, projected future traffic flows and traffic speed for the corridor options.
- An assessment of the potential number of properties likely to be increased by 1dB, and hence require noise mitigation was determined.

In summary, the potential noise impacts and ranking of corridor options is based on the following assessment criteria:

- Potential Impact Rating (PIR) (Quantitative);
- Potential Changes in Traffic Noise Levels (Quantitative); and
- Likely need for Noise Mitigation (Qualitative).

Each of the above criteria for the two corridor options are discussed in detail in the following sections.

1.2.5.1 Potential Impact Rating (PIR)

A Potential Impact Rating (PIR) based upon property counts for each corridor option has been used to determine which corridor option has the lowest nominal potential impact on existing properties.

For this study, property counts of Noise Sensitive Receptors (NSRs) include existing residential properties, hospitals and medical buildings, educational buildings and religious buildings which were identified using OS mapping data and Geo-directory data provided by the design team.

The number of NSRs potentially sensitive to noise and/or vibration within 300m of each of the proposed corridor options has been identified.

Property counts have been undertaken for four bands from the centreline of each corridor option, i.e., 0 to 50m, 50 to 100m, 100 to 200m and 200 to 300m. A weighting value for each distance band has been applied with a weighting factor of 4 for the closest distance band (0 to 50m) down to 1 for the furthest distance band (200 to 300m). For the PIR assessment, the calculated weighted value for each distance band is summed to obtain a total PIR value. The corridor option with the lowest PIR has the lowest nominal potential noise impact on existing NSRs.

1.2.5.2 Assessment of Change in Traffic Noise Levels and Likely Need for Noise Mitigation

The potential traffic noise levels associated with each corridor option have been calculated using the horizontal road alignments, projected traffic volumes and traffic speed. This review has been undertaken to assess the change in noise levels between the Do-Minimum and Do Something scenario for each corridor options.

For this Stage 2 assessment, traffic flows in Annual Average Daily Traffic (AADT) flows, percentage Heavy Goods Vehicles (HGVs) and indicative working horizontal alignments have been provided by the design team.

Proprietary noise calculation software, SoftNoise Predictor, was used to calculate traffic noise levels at the closest NSRs for each of the corridors option. The software calculates traffic noise levels in accordance with Calculation of Road Traffic Noise (CRTN) and TII guidance using the following methodology:

- The potential traffic noise levels at the affected NSRs associated with each corridor option has been established considering the indicative horizontal alignments in addition to Annual Average Daily Traffic flows (AADT) and percentage HGV for the future year provided by the design team. The AADT flows that were used for noise calculations is shown in Table 1.1. Bus volumes along each bus lane are modelled as 1% of the AADT traffic in each direction.
- Noise levels were calculated at the same assessment locations for the Do Minimum scenario. This was undertaken to calculate changes in traffic noise at properties along each corridor option and to determine likely requirements for noise mitigation.
- A standard hot rolled asphalt road surface was used for all corridor options. A traffic speed of 120km/hr was modelled for the Do Minimum scenario and each corridor option. Subsequently, a speed of 100km/hr was modelled for the two corridor option between Junction 7 and Junction 5 for all traffic lanes.

Table 1.1: Summary of AADT Data used for Stage 2 Assessment

Scenario	M4 West of Junction 7		M4 Between Junction 7 and Junction 6		M4 Between Junction 6 and Junction 5		M4 East of Junction 5	
	AADT	% HGV	AADT	% HGV	AADT	% HGV	AADT	% HGV
Do Minimum	53,679	8.2%	69,801	7.5%	77,656	7.0%	86,507	7.0%
Corridor Option 1	53,679	8.2%	69,801	7.5%	77,656	7.0%	86,507	7.0%
Corridor Option 2	53,782	8.2%	70,650	7.4%	78,091	6.9%	86,668	7.0%

In the absence of any Irish guidelines or standards relating to assessing the effects associated with changes in road traffic noise levels, reference is made to the UK's Design Manual for Roads and Bridges (DMRB) LA 111 Noise and vibration (2020)³. This document provides suggested magnitude rating tables relating to changes in noise levels associated with road traffic noise.

The magnitude of impacts is assessed by comparing the Do Minimum noise level against the Do Something scenario. The calculated road traffic noise levels used in this study relate to the future design year, hence in line with the DMRB guidance, the following magnitude of change is applied for the long-term period (design year) as shown in Table 1.2.

Table 1.2: Classification of magnitude of traffic noise impacts in long term (DMRB 2020)

Long-term Magnitude	Long term noise change, dB
Major	Greater than or equal to 10.0
Moderate	5.0 to 9.9
Minor	3 to 4.9
Negligible	Less than 3.0

For each corridor option, the calculated change in traffic noise level has been determined and ranked in accordance with Table 1.2. The change can be related to either positive changes (decrease in noise levels) or negative changes (increase in noise levels).

1.2.6 Scoring Procedure

The comparative evaluation of corridor options has been assisted by scoring of impacts for each of the corridor options using a summary assessment matrix broadly based on Table 7.1.2 of the Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis (TII PAG).

Each impact is scored based on the PAG seven-point Likert scale (listed below) and a number assigned according to the level of significance of the impacts.

Table 1.3: TII PAG Impact Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

It should be noted that the PAG score assigned to both corridor options is based on a comparison of that corridor option with the Do Minimum Option.

Following the assessment methodology process outlined in this section, a determination is made as to whether each corridor option is either Preferred Intermediate or Least Preferred based on a combination of the assigned impact scores, the specific impacts and professional judgement and compares the corridor options against each other.

1.3 Corridor Option Assessments

1.3.1 Corridor Option 1

Potential Impact Rating

An assessment of the potential noise impact based on the number of noise sensitive receptors within specified distance bands of Corridor Option 1 is set out below. The PIR value per distance band is included in the table with the related NSL counts and weighting value in parenthesis. The total PIR is the sum of each distance band. The PIR values for Corridor Option 1 are presented in Table 1.4.

Table 1.4: Corridor Option 1 PIR

Corridor Option	PIR 0-50m Band	PIR 50-100m Band	PIR 100-200m Band	PIR 200-300m Band	Total PIR
Corridor Option 1	88 (22 x 4)	183 (61 x 3)	802 (401 x 2)	522 (522 x 1)	1,595

Corridor Option 1 has a total PIR value of 1,595. The majority of NSLs are located between 200 and 300m from the road centreline, with the highest PIR value within the 100 to 200m distance band. There are a total of 22 NSLs counted within 50m of the road centreline for this corridor option.

Change in Traffic Noise Levels

A total of 84 receiver locations representative of the closest NSLs were modelled along the extent of Corridor Option 1 and also for the Do Minimum alignment. The difference in noise levels between the Do Minimum and Do Something scenarios was then determined. The assessment has concluded the operation of a new bus priority lane in the eastbound and westbound direction results in a negligible change in traffic noise levels at the modelled NSLs compared to the Do Minimum scenario. At NSLs further from the road edge, outside of the model extent, the change in noise level will also be negligible.

The difference in traffic noise level is calculated between +0.2 and +0.3 dB at the closest modelled NSLs with an operational speed at 120km/hr during both scenarios. The negligible change is due to the road traffic remaining dominated by traffic along the mainline traffic lanes which comprising significantly higher volumes of cars, light good vehicles (LGVs) and heavy goods vehicles (HGVs) compared to the small volume of buses along the priority bus lanes.

Reducing the operational speed along the mainline and the proposed new bus lanes to 100km/hr results in a reduction in traffic noise level between of -1dB and -1.3 dB at the modelled locations when compared to the Do Minimum scenario, thus resulting in a negligible (positive) change.

Reference to Table 1.2 confirms the change in noise level is negligible. The overall noise and vibration impact for Corridor Option 1 is concluded to be Not significant or Neutral.

1.3.2 Corridor Option 2

Potential Impact Rating

An assessment of the potential noise impact based on the number of noise sensitive receptors within specified distance bands of Corridor Option 2 is set out below. The PIR value per distance band is included in the table with the related NSL counts and weighting value in parenthesis. The total PIR is the sum of each distance band. The PIR values for Corridor Option 2 are presented in Table 1.5.

Table 1.5: Corridor Option 2 PIR

Corridor Option	PIR 0-50m Band	PIR 50-100m Band	PIR 100-200m Band	PIR 200-300m Band	Total PIR
Corridor Option 2	108 (27 x 4)	174 (58 x 3)	876 (438 x 2)	415 (415 x 1)	1,573

Corridor Option 2 has a total PIR value of 1,573. The majority of NSLs are located between 100 and 300m from the road centreline, with the highest PIR value within the 100 to 200m distance band. There are a total of 27 NSLs counted within 50m of the road centreline for this corridor option, which results in a higher PIR in this closest band compared to Corridor Option 2.

Change in Traffic Noise Levels

A total of 84 receiver locations representative of the closest NSLs were modelled along the extent of Corridor Option 2 and also for the Do Minimum alignment. The difference in noise levels between the Do Minimum and Do Something scenarios was then determined. The assessment has concluded the operation of a new bus priority lane in the eastbound and westbound direction and the addition of a third lane in the westbound direction results in a negligible change in traffic noise levels at the modelled NSLs compared to the Do Minimum scenario.

The difference in traffic noise level is calculated between +0.3 and +0.8 dB at the modelled NSLs with an operational speed at 120km/hr during both scenarios. The negligible change is due to the road traffic remaining dominated by traffic along the mainline traffic lanes which comprising significantly higher volumes of cars, light good vehicles (LGVs) and heavy goods vehicles (HGVs) compared to the small volume of buses along the priority bus lanes.

Reducing the operational speed along the mainline and the proposed new bus lanes to 100km/hr results in a reduction in traffic noise level between -0.5 to -1 dB at the modelled locations when compared to the Do Minimum scenario, thus resulting in a negligible (positive) change.

Reference to Table 1.2 confirms the change in noise level is negligible. The overall noise and vibration impact for Corridor Option 2 is concluded to be Not significant or Neutral.

1.3.3 Corridor Options Assessment Matrix

Taking account the assessments undertaken for the two corridor options, both have been scored equally as Not Significant or Neutral (PAG Score 4). The scoring is balanced based on the view that whilst both corridor options result in reconfigured alignments of traffic lanes and the introduction of bus priority lanes into the hard shoulder areas, the change in traffic noise levels compared to the Do Minimum scenario is Not Significant. For both corridor options, the proposal to reduce traffic speeds to 100km/hr between Junction 7 and Junction 5 results in a negligible reduction in a traffic noise at the closest NSLs to the road edge.

Table 1.6: Corridor Options Assessment Matrix

Assessment Criteria	Corridor Option 1	Corridor Option 2
Potential Impact Rating (PIR)	1,595	1,573
No of properties likely to require noise mitigation	0	0
Change in Noise Level (dB) DMRB long term rating	Negligible	Negligible
Scoring		
Qualitative Assessment	Not significant or neutral	Not significant or neutral
Score / Impact Level	4	4
Preference	Preferred	Preferred

1.4 Summary

Both Corridor Options are ranked as Preferred, given the marginal difference in noise impact between them. Whist Corridor Option 1 overall has a lower number of properties within 0 – 50m of the road edge and will result in a marginally greater reduction in traffic noise levels at the closest NSLs, the difference is negligible and, therefore, both result in a not significant or neutral impact overall.

1.5 Reference

Transport Infrastructure Ireland, Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2004.

Transport Infrastructure Ireland, Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes, 2014.

UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability and Environmental Appraisal LA 111 Noise and Vibration Revision 2 (UKHA 2020);

Transport Infrastructure Ireland, Project Management Guidelines PE-PMG-02041, 2020.

Transport Infrastructure Ireland, Project Appraisal Guidelines for National Road Schemes Unit 7.0 – Multi Criteria Analysis, October 2016.

Kildare County Council

Maynooth to Leixlip Project

Options Report - Stage 2 Population
Junction Options Assessment

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This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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Table 1.1: Junction Options Population Assessment Matrix

1 Stage 2 Population Corridor Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Junction Options for the M4 Maynooth to Leixlip Project with respect to the Population constraints identified in Chapter X of this report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4 and references are provided in Section 1.5.

1.2 Methodology

1.2.1 Scoring Procedure

Scores have been applied to the Junction Options Assessment in accordance with the Project Appraisal Guidelines for National Roads Unit 7.0 – Multi-Criteria Analysis (PAG, 2016) as summarised in Section xx. There are five principal assessment criteria for the assessment of Population as set out below. Each criterion is weighted equally for the purposes of the MCA scoring.

Journey Characteristics and connectivity

This criterion takes account of journey patterns based on the nature of the transport network and observed or projected journeys to key destinations, workplaces and community facilities. Sub-criteria include journey time, journey time reliability, accessibility, and journey connectivity (the availability of connections between desired origins and destinations). These sub-criteria depend also on the projected traffic data and are assessed for all road users including private drivers, commercial drivers, public transport users, cyclists and pedestrians.

Journey Amenity

Relevant effects arise from the proximity to vehicle traffic and to the volume, speed or movement of traffic as it affects the pleasantness of journeys, and the actual or perceived safety of pedestrians, cyclists, public transport users and drivers. Journey amenity will also be affected by the facilities available for these road users (e.g. pavement footpaths, cycle paths, crossing facilities, etc), the distance and physical separation of vehicular traffic from pedestrians or cyclists, the proportion of HGVs, the nature of any junctions to be negotiated, and the location of public transport stops. For vulnerable road users, age and physical ability are taken into account. Particular issues include the exposure and delay presented by road crossings or junctions, and the legibility of the transport network, i.e. being able to find one's way (including directional signage).

General Amenity

Community facilities may be directly or indirectly impacted. There can also be effects on residential quality of life or community wellbeing, or on amenity and recreation, due to a combination of environmental effects (e.g. noise, air quality or visual) for which significance has been identified in respective assessments. There are links between General Amenity and health or social inclusion given the importance of access to community facilities used by sensitive receptors.

Community Severance

This refers to the ability of people to access community facilities, workplaces, friends or neighbours, particularly as it affects sensitive receptors such as older people, children or people with disabilities. Physical severance can take the form of new severance due to the barrier presented by a new road, or relief from severance, for example from reductions in vehicle traffic or the provision of crossings facilities. Social severance can also occur where such barriers cause people to feel contained without road boundaries, especially if this reduces their social interaction. Higher or lower traffic volumes have respective effects on new severance or relief from severance.

Economic

These effects arise from changes in economic activity affecting local businesses or employment, either directly or indirectly. These effects can occur due to direct impacts on business premises, from changes in accessibility, or from changes in development opportunities for the local economy.

1.3 Corridor Options Assessment

1.3.1 Option 1 – Maintain and Optimise/Improve Existing Junction

Journey characteristics

Option 1 splits eastbound departures from the M4 between the R408 Newtown Road in the west of Maynooth and the R406 Staffan Road in the east. Connectivity is maintained between the M4 and the east of Maynooth, but significantly improved, along with reduced journey times, between the M4 and the west of Maynooth without the need to enter the centre of the town.

Westbound exits from the M4 at Junction 7 would follow a realigned westbound diverge direct to the R406 rather than to the current roundabout on the R406 which is shared with Maynooth Business Campus where some delay is currently incurred.

Journey amenity

Journey amenity is impacted positively in that there is no need for trips from the M4 to the outer western suburbs of Maynooth to encounter delays when negotiating the centre of the town and to incur congestion at peak times. Additional vehicle traffic would be placed on Newtown Road, Meadowbrook Road and Meadowbrook Link Road with slight negative implications for the journey amenity of cyclists, at least on the first of these.

General amenity

General amenity would be improved in the town centre of Maynooth where community facilities are concentrated by the transfer of a proportion of traffic to the R408 by the new Outer Orbital Route. Traffic is moderately increased on Newtown Road with some implications for residential amenity.

Community severance

Compared with a Do-minimum scenario, Option 1 is projected to place moderately more morning and afternoon traffic (c44% over the course of the day) on the upper section of Newtown Road into the centre of Maynooth. An increase would follow for the extension into Parson Street where the entrance to St. Patrick's College (NUIM) is located and where currently there are no crossing facilities before the junction with Main Street. Traffic volumes would be increased on Meadowbrook Road at c71%, and Meadowbrook Link Road at c40% compared with the Do-minimum, although volumes remain moderate. The relative increase in traffic on the Newtown Road applies to both options, but for the latter road only to Option 1. The increase in traffic volumes will have the effect of increasing community severance, mainly with respect to journeys between residential estates, except in the vicinity of a small retail centre and bar at the corner of Beaufield Close and Meadowbrook Road.

Economic

There are no distinct economic impacts.

1.3.2 Option 2 – Provide a New Junction between Newtown Road and Straffan Road and convert the existing to an Overbridge

Journey characteristics

Option 2 splits both eastbound and westbound departures from the M4 between the R408 Newtown Road in the west of Maynooth and the R406 Staffan Road in the east, but from a single new junction, replacing the current Junction 7. The proposed junction would directly provide for the larger proportion of journeys to and from Dublin. Compared to a Do-minimum scenario, connectivity is maintained between the M4, via the Out Orbital Route to the east of Maynooth, but would be significantly improved, along with reduced journey times, between the M4 and the west without the need to enter the centre of the town.

Journeys to Maynooth Business Campus to and from Dublin would be less direct, being extended by around 800m via the proposed Outer Orbital Route, due to the conversion of the existing Junction 7 to a flyover.

Journey amenity

Journey amenity is impacted positively in that there is no need for trips from the M4 to the outer western suburbs of Maynooth to encounter delays when negotiating the centre of the town or to incur congestion at peak times. Additional vehicle traffic would be placed on Newtown Road with slight negative implications for the journey amenity of cyclists.

General amenity

General amenity would be improved in the town centre of Maynooth where community facilities are concentrated by the transfer of a proportion of traffic to the R408 by the new Outer Orbital Route. Traffic is moderately increased on Newtown Road with some implications for residential amenity. Projected traffic volumes on the Orbital Route to the R406 would be higher for Option 2 where they pass within 50-75m of residential properties on Brookfield Avenue and to the rear of properties on Straffan Crescent with consequent environmental effects in terms of noise and visual (for which see relevant assessments).

Community severance

Compared with a Do-minimum scenario, Option 2 is projected to place moderately more morning and afternoon traffic (c33-45% over the course of the day) on the upper section of Newtown Road into the centre of Maynooth. An increase would follow for the extension into Parson Street where the entrance to St. Patrick's College (NUIM) is located and where currently there are no crossing facilities before the junction with Main Street. The increase in traffic volumes will have the effect of increasing community severance, However, there would no increase in severance on Meadowbrook Road and Meadowbrook Link Road as traffic volumes would remain similar to those at present compared with a relative increase for Option 1. Moderate relief from severance would follow the reduction in traffic volumes on the R406 Straffan Road of up to -33% compared with both the Do-minimum scenario and -27% for Option 1.

Economic

A slight loss of passing trade is likely for the service station on Straffan Road due to the lower traffic volumes projected for Option 2.

1.3.3 Corridor Options Assessment Matrix

Table 1.1: Junction Options Population Assessment Matrix

Assessment Sub-Criteria	Junction 7 – Option 1	Junction 7 – Option 2
Journey characteristics	Splits eastbound departures from the N4 between the R408 Newtown Road and R406 Straffan Road. Improved connectivity to Newtown Road. Proposed new westbound exit reduces pressure on entrance to Maynooth Business Campus.	Splits eastbound and westbound departures from the N4 between the R408 Newtown Road and R406 Straffan Road. Improved connectivity to Newtown Road. Less direct link to Maynooth Business Campus.
Journey Amenity	Additional traffic placed on Newtown Road, Meadowbrook Road and Meadowbrook Link Road with implications for cyclist journey amenity.	Additional traffic placed on Newtown Road with implications for cyclist journey amenity. Reduced traffic on R406 Straffan Road.
General Amenity	Environmental impact to the front of properties on Brookfield Avenue and to the rear of properties on Staffan Avenue.	Greater environmental impact to the front of properties on Brookfield Avenue and to the rear of properties on Staffan Avenue.
Community severance	Increase in traffic flows on Meadowbrook Road or Meadowbrook Link Road. Increase in physical severance between residential estates.	No increase in severance on Meadowbrook Road or Meadowbrook Link Road. Moderate relief from severance on R406 Straffan Road.
Economic	No significant economic impacts.	Slight-moderate loss of passing trade for service station on R406.
Scoring		
Qualitative Assessment	Not Significant or Neutral	Minor or Slightly positive
Score/ Impact Level	4	5
Preference	Least Preferred	Preferred

1.4 Summary

Both Options have the effect of splitting traffic between the east and west of Maynooth, Option 2 more directly for westbound traffic. There are positive impacts in terms of improved accessibility for the west side of the town and for reduced traffic in the centre of the town, but also some moderate increases in traffic and residential severance elsewhere. Option 2 has a distinct positive impact in reducing traffic on Staffan Road providing for reduced congestion and some relief from severance.

1.5 References

Kildare County Council

Maynooth to Leixlip Project

Options Report - Stage 2 Soils and
Geology Corridor Options
Assessment

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Table 1.7: Soils and Geology Assessment Matrix of Corridor Options

1 Stage 2 Soils and Geology Corridor Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Corridor Options for the Maynooth to Leixlip Project with respect to the Soils and Geology constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4.

1.2 Methodology

The Stage 2 assessment has been prepared in accordance with the following guidance:

- Transport Infrastructure Ireland (TII) guidance, formally National Roads Authority (NRA) guidance, Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology on National Road Schemes (herein referred to as NRA Guidelines)¹
- The Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports²
- Transport Infrastructure Ireland (TII) guidance, formally National Roads Authority (NRA). Environmental Impact Assessment of National Road Schemes – a Practical Guide³

The NRA Guidelines provide useful criteria for rating of the identified Soils and Geology constraints (herein referred to as Criteria) that are presented in the Soils and Geology section of Constraints Report. Each criterion comprises of individual attributes which have been assigned an Importance using Box 4.1 of the NRA Guidelines. The Importance ratings are listed in Table 1.1.

¹ National Roads Authority, 2009. Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, Ireland: s.n. Available at: <https://www.tii.ie/technical-services/environment/planning/Guidelines-on-Procedures-for-Assessment-and-Treatment-of-Geology-Hydrology-and-Hydrogeology-for-National-Road-Schemes.pdf>

² Environmental Protection Agency, 2022. Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. Available at: https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf [Accessed: 15 December 2022]

³ National Roads Authority, 2008. Environmental Impact Assessment of National Road Schemes – a Practical Guide. Available at: <https://www.tii.ie/technical-services/environment/planning/Environmental-Impact-Assessment-of-National-Road-Schemes-Practical-Guide.pdf>

Table 1.1: Rating of Significant Environmental Impacts ¹

Importance of Attribute	Magnitude of Impact			
	Negligible	Small Adverse	Moderate Adverse	Large Adverse
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant / Moderate	Profound / Significant	Profound
High	Imperceptible	Moderate / Slight	Significant / Moderate	Severe / Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

The Magnitude of Impact assesses the impact that each Corridor Option has on each criterion attribute, a Magnitude of Impact is assigned using Box 5.1 of the NRA Guidelines as presented in the table above. The magnitude of the potential impacts that arise for each criterion attribute have been assessed based on the information that is currently available.

A Significance of Impact has then been determined from the table above based on the 'Importance of Attribute' and the 'Magnitude of Impact'.

Once a significance of impact is determined for each associated criterion attribute for each Corridor Option, an overall impact rating was assigned to that criterion using the TII Project Appraisal Guidelines (PAG) for National Roads Unit 7.0 – Multi-Criteria Analysis (MCA)⁴. The following scoring system as outlined in Section 2.4 of the TII PAG was then used to score the Corridor Options:

Table 1.2: PAG Scoring System used in Ranking

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

⁴ Transport Infrastructure Ireland, 2016. Project Appraisal Guidelines for National Roads Unit 7.0 - Multi-Criteria Analysis. Available at: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

1.2.1 Assessment Criteria

The soils and geology criteria which have been considered as part of this assessment are as follows:

- Soil Deposits comprising well drained soil types which are important for agriculture;
- Contaminated Sites which comprise the horizontal extent of Made Ground;
- Bedrock Geology comprising areas where bedrock outcrops and sub crops are recorded;
- Soft Soils comprising alluvium deposits (soft ground);
- Earthworks comprising bulk cut and fill volumes and the cut/fill balance.

Each of these criteria are impacted by the Corridor Options and are considered to be differentiators in the assessment of options.

The following constraints identified in the Soils and Geology section of the Constraints Report have been excluded from this Stage 2 assessment for the following reasons:

- **Glacial Till:** Glacial Till is widespread throughout the study area and common to all alternatives it is not considered a differentiator and was eliminated from the analysis under the Subsoil criterion
- **Bedrock Karst:** There are no karst features identified within the study area;
- **Landslide Susceptibility:** No areas of moderately high to high landslide susceptibility noted on the GSI Landslide Susceptibility are impacted by the Stage 2 Corridor Options;
- **Historic industrial sites, pits, quarries and mines:** These features are not impacted by the Corridor Options;
- **Industrial facilities:** There are no industrial facilities impacted by the Corridor Options;
- **Prospecting Licences:** There are two prospecting licences between Junction 7 and Junction 5 that are common to all options and not considered a differentiator between Corridor Options; and
- **Economic Geology:** It is unlikely that the high to very high crushed rock aggregate potential that has been identified immediately adjacent to the existing M4 east and west of the R405 Ballygoran Overbridge and from the River Liffey Bridge to Junction 5 will be a viable economic resource due to its location. For this reason, it has been excluded from the Stage 2 assessment.

The criterion of Soft Soils will be assessed as an attribute under the criterion of Earthworks for this assessment as it is considered in terms of material management requirements and not in terms of subsoil importance.

1.2.2 Assumptions

- All excavated material from the Corridor Options will be taken off site to an appropriate licenced facility;
- Earthwork volumes (i.e. bulk cut/fill and surplus/deficit volumes) have been estimated based on the indicative designs with the following assumptions;
 - Cut volumes are based on 1V:2H slopes;
 - Fill volumes are based on 1V:2H slopes;
 - Volumes are based on 100mm depth of topsoil on slopes and verges;
 - Volumes reported are for the mainline of the Corridor Options (i.e. volumes exclude side roads, junctions, excavated material for utilities, gantries, and structures);
 - Volumes do not consider topsoil removal, over-excavation in soil and rock, temporary works, or construction compounds;
 - Bulk earthwork volumes do not include for excavate and replace volumes associated with soft soils and made ground areas;
 - Volumes relate to in-situ volumes only, material bulking factors have not been applied; and
 - Volumes have been rounded up to the nearest 100m³.

1.3 Corridor Options Assessment

All the Soils and Geology criteria are considered of high importance (high quality/significance/value on a local scale) aside from Earthworks which is considered to be of medium importance as it has medium significance on a local scale.

Corridor Option 1 follows the footprint of the existing M4/N4 (with the exception of the proposed emergency refuge areas), therefore the impact on Soils and Geology for this Corridor Option for Soil Deposits, Bedrock Geology and Contaminated Sites criteria is negligible. The impact for the Earthworks criterion for this Corridor Option is considered small adverse as cut and fill will only be undertaken in the emergency refuge areas. There are the 16 emergency refuge areas of which eight are located adjacent to the westbound carriageway and eight are located adjacent to the eastbound carriageway.

Corridor Option 2 has a greater impact on the soils and geology due to the addition of a westbound lane of the M4/N4 and the widening of the existing River Liffey Bridge or the construction of a separate bridge adjacent. The impact of Corridor Option 2 on the criteria of Soil Deposits and Bedrock Geology is small adverse. The impact of Corridor Option 2 on Contaminated Sites is negligible as very little of the Made Ground attribute that comes under this criterion is impacted. Corridor Option 2 has a moderate adverse impact on the Earthworks criterion for the following reasons:

- **Cut/Fill attribute:** There is 37,000 m³ of cut and 2,300 m³ of fill proposed for Corridor Option 2 which results in a 34,700 m³ surplus which has a small adverse impact.

- **Soft Soil attribute:** The widening or construction of a separate bridge adjacent to the existing River Liffey Bridge to accommodate an additional westbound traffic lane has a small adverse impact on this attribute.

The assessment of the Soils and Geology criteria are presented in the tables below.

Table 1.3: Soil Deposits

Corridor Option	Criterion	Criterion Attributes	Description	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall Qualitative Assessment
Corridor Option 1	Soil Deposits	EPA National Soils Important for Agriculture	Soils Important for Agriculture	High	Negligible	Imperceptible	Not Significant or Neutral
Corridor Option 2	Soil Deposits	EPA National Soils Important for Agriculture	Soils Important for Agriculture	High	Small Adverse	Moderate / Slight	Minor or Slightly Negative

Table 1.4: Contaminated Sites

Corridor Option	Criterion	Criterion Attributes	Description	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall Qualitative Assessment
Corridor Option 1	Contaminated Sites	Made Ground	Extent of impact on Made Ground Deposits	High	Negligible	Imperceptible	Not Significant or Neutral
Corridor Option 2	Contaminated Sites	Made Ground	Extent of impact on Made Ground Deposits	High	Negligible	Imperceptible	Not Significant or Neutral

Table 1.5: Bedrock Geology

Corridor Option	Criterion	Criterion Attributes	Description	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall Qualitative Assessment
Corridor Option 1	Bedrock Geology	GSI Shallow Bedrock	Shallow Bedrock 0 to 5m Below Ground Surface	High	Negligible	Imperceptible	Not Significant or Neutral
Corridor Option 2	Bedrock Geology	GSI Shallow Bedrock	Shallow Bedrock 0 to 5m Below Ground Surface	High	Small Adverse	Moderate / Slight	Minor or Slightly Negative

Table 1.6: Earthworks

Corridor Option	Criterion	Criterion Attributes	Description	Volume (m ³) or Quantity	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall Qualitative Assessment
Corridor Option 1	Earthworks	Bulk Earthworks	Cut (m ³)	18,100	Medium	Small Adverse	Moderate / Slight	Minor or Slightly Negative
			Fill (m ³)	2,200		Negligible	Imperceptible	
			Surplus (m ³)	15,900		Small Adverse	Moderate / Slight	
			Soft Deposits	Not impacted		-	-	
Corridor Option 2	Earthworks	Bulk Earthworks	Cut (m ³)	37,000	Medium	Small Adverse	Moderate / Slight	Moderately Negative
			Fill (m ³)	2,300		Negligible	Imperceptible	
			Surplus (m ³)	34,700		Small Adverse	Moderate / Slight	
			Soft Deposits	Impacted		Small Adverse	Slight	

1.3.1 Corridor Options Assessment Matrix

Table 1.7: Soils and Geology Assessment Matrix of Corridor Options

Assessment Criteria	Corridor Option 1	Corridor Option 2
Soil Deposits	Not Significant or Neutral	Minor or Slightly Negative
Contaminated Site	Not Significant or Neutral	Not Significant or Neutral
Bedrock Geology	Not Significant or Neutral	Minor or Slightly Negative
Earthworks	Minor or Slightly Negative	Moderately Negative
Overall Qualitative Assessment	Minor or Slightly Negative	Moderately Negative
Score/ Impact Level	3	2
Preference	Preferred	Least Preferred

1.4 Summary

Corridor Option 1 is considered to have a minor or slightly negative impact on the soils and geology and Corridor Option 2 has a moderately Negative impact soils and geology. Corridor Option 1 is Preferred as it has the least impact on soils.



MAYNOOTH TO LEIXLIP PROJECT

Appendix 6.3B
Stage 2 PAM
Environmental Assessments
(Junctions)

Kildare County Council

Maynooth to Leixlip Project

Options Report - Stage 2 Material
Assets – Agriculture Junction
Options Assessment

Draft 1 | 31 August 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Tables

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Junction 7 Options Assessment Matrix

1 Stage 2 Material Assets – Agriculture – Junction Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Junction Options for the Maynooth to Leixlip Project with respect to the Material Assets Agriculture constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4 and references are provided in Section 1.5.

1.2 Methodology

The following guidelines and legislation were referred to when undertaking this Stage 2 Junction Option assessment:

- European Union (2018) (Planning and Development) (Environmental Impact Assessment) Regulations. (SI 296 of 2018);
- Environmental Protection Agency (EPA) (May 2022) Guidelines on the Information to be contained in Environmental Impact Assessment Reports¹; and
- Transport Infrastructure Ireland (TII) (2016) Project Appraisal Guidelines Unit 7.0 - Multi Criteria Analysis, PE-PAG-02031².

This assessment is a combination of a desktop assessment of available data sources combined with the on-site survey conducted in January 2021. The assessment in this section compares the impacts of the Junction Options on the agricultural constraints identified in the Constraints Report. There are six criteria set out in Section 3.1.5 of the 2016 PAG Guidelines². Five of these criteria are applicable to the Junction Options and are therefore assessed. These five criteria are as follows:

1. The farm size along each Junction Option.

This criterion was assessed by referencing CSO data for the study area. Larger farms are generally more resilient to land loss than smaller farms. The farm size is assumed to be the same along each Junction Option;

¹Environmental Protection Agency (EPA) (May 2022) Guidelines on the Information to be contained in Environmental Impact Assessment Report. Available from: [Guidelines on the information to be contained in Environmental Impact Assessment Reports \(EIAR\) \(epa.ie\)](#)[Accessed 13 September 2023]

²Transport Infrastructure Ireland (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>[Accessed: 13 September 2023]

2. The types of farm enterprises along each Junction Option.

In assessing this criterion, high and very high sensitive farm enterprises for each Junction Option are distinguished from low – medium sensitivity farm enterprises. Dairy, equine farms, horticultural and other highly sensitive enterprises were identified from aerial photography³ and the site survey. The folios of these high and very high sensitivity enterprises were identified using the PRAI⁴ data;

3. Landtake impacts (including impacts of farm yards) for each Junction Option.

A high-level assessment of the potential landtake impacts was made by assessing the Junction Options. The potential landtake of agricultural land and impacts on farm yards was assessed.;

4. Mitigated severance impacts along each Junction Option.

The severance impacts of the Junction Options were assessed by measuring offline lengths (if any) of the options.

5. Impacts on farm viability.

Farm viability describes the capacity of a farm to survive, grow and develop. High viability is associated with large farm size, good land quality, intensive land-use and the presence of high sensitivity farm enterprises such as dairy and equine. The farm viability within the study area is high due to the presence of good quality land, on average large farm sizes (50.6ha compared to the national average of 32.7 hectares) and the presence of regionally important stud farms.

1.2.1 Scoring Procedure

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG scoring procedure. The PAG seven-point scale scoring procedure is shown in Table 1.1.

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

³ Google Earth Imagery (2023) Viewed on 13th September 2023. Available at: [Google Earth](#)

⁴ Property Registration Authority of Ireland (2023) Viewed on 13th September 2023. Available at: <https://www.landdirect.ie/>

In the first instance, individual assessments were carried out on each criterion followed by an overall assessment. A score was assigned to the Junction Options based on the TII PAG seven-point scale, and the overall preference for each Junction Option of Preferred or Least Preferred was assigned using a combination of the assessment criteria results and professional judgement.

1.3 Junction 7 Options Assessment

1.3.1 Option 1

This option would involve the re-alignment of the westbound and eastbound diverges of Junction 7. The westbound diverge would not impact agricultural land. The eastbound diverge would have a minor potential landtake of agricultural grassland – but most of the landtake will be at the edge of the motorway which is currently wooded. The viability of the receiving environment is medium. This Do-something Option is assessed to have a Neutral impact – PAG Score 4 on the seven point scale. This option is Preferred.

1.3.2 Option 2

This option would involve the construction of a new junction west of the existing Junction 7 resulting in agricultural landtake north and south of the motorway. The farmland is medium sensitivity – grassland north of the motorway and tillage south of the motorway. There is the potential for minor severance north of the motorway. There are no farmyards adjacent to this option. The viability of the receiving environment is medium. This option is assessed to have a Moderate Negative impact – PAG Score 2 on the seven point scale. This option is Least Preferred.

1.3.3 Assessment Matrix

Table 1.2: Junction 7 Options Assessment Matrix

Assessment Criteria	Option 1	Option 2
Criteria 1 - Farm Size	50.6ha (compared to the national average of 32.7ha) PAG Score 4	50.6ha (compared to the national average of 32.7ha) PAG Score 4
Criteria 2 - Farm Type	No high sensitive enterprises adjacent to Option 1 PAG Score 4	No high sensitive enterprises adjacent to Option 2 PAG Score 4
Criteria 3 - Landtake		
Sub-criteria – Landtake	Minor Agricultural landtake required	Moderate Agricultural landtake required
Sub-criteria – Length on-line / off-line	100% on-line	100% on-line
Impacts On farm-yards		

Assessment Criteria	Option 1	Option 2
Sub-criteria – Quality of landtake	No farmyards are adjacent to the proposed Option 1. Good quality land PAG Score 4	No farmyards are adjacent to the proposed Option 2. Good quality land PAG Score 2
Criteria 4 – Severance (length off-line)	No severance. PAG Score 4	Minor severance. PAG Score 3
Criteria 5 – Viability	Viability medium. PAG Score 3	Viability medium. PAG Score 3
Qualitative Assessment	Neutral or Not significant No significant agricultural effects	Moderate Adverse Moderate adverse agricultural effects
Overall Score / Impact Level	4	2
Preference	Preferred	Least Preferred

1.4 Summary

Option 1 is Preferred due to its lower footprint on agricultural land resulting in lower landtake and severance impacts.

1.5 References

Environmental Protection Agency (EPA) (May 2022) Guidelines on the Information to be contained in Environmental Impact Assessment Report. Available from: [Guidelines on the information to be contained in Environmental Impact Assessment Reports \(EIAR\) \(epa.ie\)](#)

Transport Infrastructure Ireland (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

Kildare County Council

Maynooth to Leixlip Project

Options Report – Stage 2 Air Quality
Junction Options Assessment

Draft 1 | 31 August 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Tables

Table 1.1: PAG Scoring System used in Ranking

Table 1.2: Air Quality Assessment Matrix of Junction 7 Options

1 Stage 2 Air Quality – Junction Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Junction Options for the Maynooth to Leixlip Project with respect to the Air Quality constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the junction options assessment. A summary is provided in Section 1.4 and references are provided in Section 1.5.

1.2 Methodology

1.2.1 Scoring Procedure

As per the Stage 1 environmental assessment, each specialist is required to define their assessment methodology and assessment sub-criteria based on their expert opinion and best practice. Guidance on what to include as sub-criteria is given in Chapter 3 of the PAG Unit 7. Following this, the potential impacts and their magnitude are to be identified for each Junction Option. The impacts for each sub-criteria shall be scored based on the seven-point scale below and an integer shall be assigned according to the impact level included in Table 1.1.

Table 1.1: PAG Scoring System used in Ranking

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Using a combination of the impact scores and professional judgement, a determination on the level of the impact of each Junction 7 Option was provided. The Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports¹ were also referred to when undertaking this assessment.

Using the impact scores and the professional judgement of the specialist, a determination is made as to whether each Junction 7 Option is either:

- Preferred; or
- Least Preferred.

The Junction Options are then weighted against each other in the assessment matrix.

1.3 Junction 7 Options Assessment

The focus of this assessment is the comparison of the two Junction Options. It is acknowledged that other new infrastructure may be developed with the new/upgraded junction, i.e the Maynooth Outer Orbital Route (MOOR). However, as the MOOR will be implemented as part of both options, it is not considered a differentiator in the assessment of the options. In addition, no significant adverse impacts on air quality are likely to arise from the implementation of the MOOR.

1.3.1 Option 1 – Maintain and Optimise/Improve Existing Junction

Option 1 would consist of maintaining and optimising/improving the existing junction. To provide an optimised junction configuration, the eastbound diverge slip road would be shifted west slightly along the M4 mainline. Option 1 would include a signalised diamond junction. The M4 westbound diverge would be realigned. This would provide a more consistent configuration for Junction 7.

This option is assessed by two sub-criteria, from an air quality perspective: sensitive receptors within 50m of the overbridge and likely traffic volumes. There is the potential for air quality impacts at these receptors due to changes in traffic volumes during the operational phase and due to construction works.

There are six sensitive receptors in a 50m proximity of Option 1 which may be impacted by the construction.

¹ EPA (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR). Available at: <https://www.epa.ie/publications/monitoring--assessment/assessment/guidelines-on-the-information-to-be-contained-in-environmental-impact-assessment-reports-eiar.php>

1.3.2 Option 2 – Provide a New Junction between Newtown Road and Straffan Road and convert the existing to an Overbridge

Option 2 would include a new grade separated junction and convert the existing Junction 7 to an overbridge. The provision of a new grade separated junction and conversion of the existing to an overbridge would facilitate the enhancement of the existing active travel infrastructure on Straffan Road.

This option is assessed by two sub-criteria, from an air quality perspective: sensitive receptors within 50m of the overbridge and likely traffic volumes. There is the potential for air quality impacts at these receptors due to changes in traffic volumes during the operational phase and due to construction works.

There are six sensitive receptors in a 50m proximity of Option 2 which may be impacted by the construction phase.

1.3.3 Junction 7 Options Assessment Matrix

The assessment of the two Junction 7 options is provided in Table 1.2.

Table 1.2: Air Quality Assessment Matrix of Junction 7 Options

Assessment Criteria	Option 1	Option 2
Sensitive Receptors within 50m	6	6
Traffic volumes	No significant variation expected	No significant variation expected
Scoring		
Qualitative Assessment	Not significant or neutral	Not significant or neutral
Score/ Impact Level	4	4
Preference	Preferred	Least Preferred

Option 1 is Preferred as it requires a lower level of construction compared to Option 2. Option 1 would also be expected to generate a lower level of dust impacts at nearby sensitive receptors.

1.4 Summary

Both Junction 7 Options are expected to result in a not significant or neutral impact on air quality. However, Option 1 is preferred as a lower level of construction works is required, potentially reducing the level of dust generated during the construction phase.

1.5 References

N/A

Kildare County Council

Maynooth to Leixlip Project

Options Report - Stage 2

Archaeological, Architectural and
Cultural Heritage Junction Options
Assessment

Draft 1 | 31 August 2023

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Tables

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Baronies, Parishes and Townlands for Option 1

Table 1.3: Built Heritage - Option 1

Table 1.4: Cultural Heritage - Option 1

Table 1.5: Baronies, Parishes and Townlands - Option 2

Table 1.6: Built Heritage - Option 2

Table 1.7: Cultural Heritage - Option 2

Table 1.8: Assessment Matrix for Junction 7 Options

1 Stage 2 Archaeological, Architectural and Cultural Heritage – Junction Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Junction Options for the Maynooth to Leixlip Project with respect to the Archaeological, Architectural and Cultural Heritage constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4 and references are provided in Section 1.5.

1.2 Methodology

As per the Stage 1 assessment, the Stage 2 assessment of options has been carried out with reference to the NRA Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes (2005) and Assessment of Architectural Heritage Impacts of National Road Schemes (2005), however the guidelines themselves predate the establishment of an options assessment process.

In order to produce a meaningful assessment (in relation to the Archaeological, Architectural and Cultural Heritage resource), a study area of 200m from the edge of the proposed junction options has been utilised for the assessment. A preliminary design has been used to assess the potential direct and indirect impacts on the archaeological, architectural and cultural heritage constraints within a 200m study area for each junction option.

Measurements are made from the edge of the intervention (where applicable) or indicative fenceline to the upstanding remains of the archaeological, architectural or cultural heritage constraint. If no remains are upstanding, the measurement is made to the centre of the site.

Each constraint included in and within 200m of each option is tabulated with measurements from the option included. The impact type is then defined (direct, indirect, no impact, positive, negative, neutral) based on whether the constraint will be physically affected or not by the alternative or option. Dependant on how the constraint will be affected will define the potential impact on the constraint (significant, very significant, profound). The impact types and the definition of the significance of effects are as per Stage 1.

Based on the above therefore, the assessment comprises the calculation and definition of the potential direct and indirect impacts upon the Archaeological, Architectural and Cultural Heritage resource associated with each option and the potential significance of those impacts. This results in the overall assessment of the options in terms of potential impacts and an overall ranking of the options in terms of potential impacts and order of preference.

The assessment included key Archaeological, Architectural and Cultural Heritage constraints, identified during the overall constraints study for the project, along with a desktop assessment carried out in order to identify previously unrecorded sites or structures of Archaeological, Architectural or Cultural Heritage significance. The resources consulted consist of the following:

- Record of Monuments and Places (RMP) for County Kildare;
- Sites and Monuments Record (SMR) for County Kildare;
- Monuments in State Care Database County Kildare;
- Preservation Orders County Kildare;
- Topographical Files of the National Museum of Ireland- County Kildare;
- Historic cartographic scheme study area;
- National Inventory of Architectural Heritage County Kildare (Architectural & Garden Survey);
- Excavations Bulletin (1970-2023);
- Kildare County Development Plan 2023-2029; and
- Aerial photographic coverage.

Record of Monuments and Places (RMP) Section 12 (1) of the National Monuments Act (1994 amendment) provides that the Minister for Arts, Heritage, Gaeltacht and the Islands (now the Minister for Housing, Local Government and Heritage) shall establish and maintain a record of monuments and places (RMP) where it is known that such monuments exist. The record comprises of a list of monuments and relevant places and mapping showing each monument and relevant place in respect of each county in the state. Sites recorded on the Record of Monuments and Places all receive statutory protection under the National Monuments Act. All recorded monuments are referred to as Archaeological Heritage (AH sites) within this assessment.

Sites and Monuments Record (SMR) holds documentary evidence and field inspections of all known archaeological sites and monuments. Some information is also held about archaeological sites and monuments whose precise location is not known e.g. only a site type and townland are recorded. These are known to the National Monuments Service as ‘un-located sites’ and cannot be afforded legal protection. As a result, these are omitted from the Record of Monuments and Places. SMR sites are also listed on a website maintained by the Housing, Local Government and Heritage (DoHLGH) – www.archaeology.ie. All SMR sites are referred to as Archaeological Heritage (AH sites) within this assessment.

National Monuments in the State Care Database is a list of all the National Monuments in the state guardianship or ownership. Each is assigned a National Monument number whether in guardianship or ownership and has a brief description of the remains of each Monument.

A national monument receives statutory protection and is described as ‘a monument or the remains of a monument the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto’ (National Monuments Act, 1930, Section 2).

The Minister for the Department of Housing, Local Government and Heritage may acquire national monuments by agreement or by compulsory order. The state or local authority may assume guardianship of any national monument (other than dwellings). The owners of national monuments (other than dwellings) may also appoint the Minister or the local authority as guardian of that monument if the state or local authority agrees. Once the site is in ownership or guardianship of the state, it may not be interfered with without the written consent of the Minister.

Preservation Orders List and / or Temporary Preservation Orders, can be assigned to a site or sites that are deemed to be in danger of injury or destruction. These are allocated under the 1930 Act.

Preservation Orders make any interference with the site illegal. Temporary Preservation Orders can be attached under the 1954 Act. These perform the same function as a Preservation Order but have a time limit of six months, after which the situation must be reviewed. Work may only be undertaken on or in the vicinity of sites under Preservation Orders with the written consent, and at the discretion, of the Minister (DoHLGH).

Topographical files of the National Museum of Ireland are the national archive of all known finds recorded by the National Museum. This archive relates primarily to artefacts but also includes references to monuments and unique records of previous excavations. The find spots of artefacts are important sources of information on the discovery of sites of archaeological significance.

Historic cartographic sources are important in tracing land use development within the development area as well as providing important topographical information on areas of archaeological potential and the development of buildings. Cartographic analysis of the historic Ordnance Survey Maps has been made to identify any topographical anomalies or structures that no longer remain within the landscape. All sites of potential archaeological or architectural heritage merit identified during the map analysis are listed as Cultural Heritage (CH) sites within this assessment.

Aerial photographic coverage is an important source of information regarding the precise location of sites and their extent. It also provides initial information on the terrain and its likely potential for archaeology. Ordnance Survey aerial photographs (1995-2013), Google Earth coverage (2020) and Bing Maps were examined for this assessment. Any sites identified during cartographic or aerial photographic assessment as identified as Cultural Heritage sites (CH) or Areas of Archaeological Potential (AAP) within this assessment.

Development Plans contain a catalogue of all the Protected Structures, archaeological sites and Architectural Conservation Areas within each county.

The Kildare County Development Plan was examined as part of this assessment, along with relevant local or town plans. All protected structures are referred to as Built Heritage sites (BH) as part of this assessment. Any designated Architectural Conservation Areas (ACAs) are also included, where applicable.

The National Inventory of Architectural Heritage (NIAH) is a government-based organisation tasked with making a nationwide record of significant local, regional, national and international structures, which in turn provides county councils with a guide as to what structures to list within the Record of Protected Structures. The NIAH have also carried out a nationwide desk-based survey of historic gardens, including demesnes that surround large houses. All NIAH structures are referred to as Built Heritage sites (BH) as part of this assessment.

Whilst the NIAH Garden Survey was utilised as part of this assessment, this was carried out in conjunction with detailed analysis of the historic Ordnance Survey maps in order to identify all designed landscapes (DL) within the corridor option corridors.

Excavations Bulletin is a summary publication that has been produced every year since 1970. The hard copy publication summarises every archaeological excavation that has taken place in Ireland during that year up until 2010 and since 1987 has been edited by Isabel Bennett. This information is vital when examining the archaeological content of any area which may not have been recorded under the SMR and RMP files. This information is also available online (www.excavations.ie) from 1970-2023. It should be noted that in some instances, summaries are not lodged for excavations and as such the record cannot be considered to be entirely complete.

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG scoring procedure. The PAG seven-point scale scoring procedure is shown in Table 1.1.

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Using a combination of the impact scores and professional judgement, a determination as to the level of the impact of each Junction Option was provided. Using the impact scores and the professional judgement of the specialist, a determination is made as to whether each Junction Option is either:

- Preferred; or
- Least Preferred.

1.3 Junction 7 Options Assessment

1.3.1 Option 1 – Maintain and Optimise / Improve Existing Junction

Option 1 would consist of maintaining and optimising/improving the existing junction, together with the provision of the Maynooth Outer Orbital Route (MOOR). The MOOR would extend from the R406 Straffan Road to Jackson’s Bridge. The MOOR would have an approximate length of 2.6km and pass through greenfield and the townlands listed in Table 1.2.

Table 1.2: Baronies, Parishes and Townlands for Option 1

Townland	Parish	Barony	County
Dowdstown	Laraghbryan	North Salt	Kildare
Newtown (E.E. Maynooth)			
Treadstown			
Laraghbryan			

There are no recorded archaeological sites (AH) located within 200m of the proposed option. A review of the topographical files held by the NMI failed to identify any stray archaeological objects from within the landscape immediate to the option.

A review of the Excavations Bulletin (1970-2023) has shown that no previous archaeological investigations have been carried out within 200m of Option 1.

There is one built heritage site located within the study area (BH 1). This is Jackson’s Bridge, which is located to the immediate north of Option 1 and is a protected structure and listed in the NIAH.

Table 1.3: Built Heritage - Option 1

Site Ref	Name	Designation	Dist. From Option 1	Impact Type	Significance of Effect
BH 1	Jackson’s Bridge	RPS	To Immediate	Indirect	Moderate Negative

There are no demesne landscapes located within 200m of Option 1.

A review of the historic mapping and aerial photographic coverage revealed a number of structures of architectural heritage merit within 200m of Option 1, which are not listed within the RPS or NIAH.

Table 1.4: Cultural Heritage - Option 1

Site Ref	Name	Designation	Dist. From Option 1	Impact Type	Significance of Effect
CH 5	Newtown House. Marked on first edition OS map and named with larger outbuilding on 25-inch edition.	N/A	155m North	Indirect	Slight Negative
CH 6	Renovated vernacular house, marked within the historic mapping	N/A	72m Southwest	Indirect	Slight Negative

A review of the historic mapping and aerial photographic coverage revealed two AAPs along the route of the option. AAP1 comprises the site of the original Lyreen River channel and the 19th century replacement in the townland of Treadstown. The original channel is marked on the first edition OS map. AAP2 comprises a small stream in the townland of Newtown.

1.3.2 Option 2 – Provide a New Junction between Newtown Road and Straffan Road and convert the existing to an Overbridge

Option 2 would include a new grade separated junction between the R406 Straffan Road and the R408 Newtown Road and convert the existing Junction 7 to an overbridge. The provision of a new grade separated junction and conversion of the existing to an overbridge would facilitate the enhancement of the existing active travel infrastructure on the R406 Straffan Road. Option 2 would also include the provision of the Maynooth Outer Orbital Route (MOOR), which would extend from the R406 Straffan Road to Jackson’s Bridge.

Table 1.5: Baronies, Parishes and Townlands - Option 2

Townland	Parish	Barony	County
Dowdstown	Laraghbryan	North Salt	Kildare
Newtown (E.E. Maynooth)			
Treadstown			
Laraghbryan			

There are no recorded archaeological sites (AH) located within 200m of the proposed option. A review of the topographical files held by the NMI failed to identify any stray archaeological objects from within the landscape immediate to the option.

A review of the Excavations Bulletin (1970-2023) has shown that no previous archaeological investigations have been carried out within 200m of the option.

There is one built heritage site located within the study area (BH 1). This is Jackson's Bridge, which is located to the immediate north of Option 2 and is a protected structure and listed in the NIAH.

Table 1.6: Built Heritage - Option 2

Site Ref	Name	Designation	Dist. From Option 1	Impact Type	Significance of Effect
BH 1	Jackson's Bridge	RPS	To Immediate	Indirect	Moderate Negative

There are no demesne landscapes located within 200m of the option.

A review of the historic mapping and aerial photographic coverage revealed a number of structures of architectural heritage merit within 200m of the option, which are not listed within the RPS or NIAH.

Table 1.7: Cultural Heritage - Option 2

Site Ref	Name	Designation	Dist. From Option 1	Impact Type	Significance of Effect
CH 5	Newtown House. Marked on first edition OS map and named with larger outbuilding on 25-inch edition.	N/A	155m North	Indirect	Slight Negative
CH 6	Renovated vernacular house, marked within the historic mapping	N/A	72m Southwest	Indirect	Slight Negative

A review of the historic mapping and aerial photographic coverage revealed two AAPs along the route of the option. AAP1 comprises the site of the original Lyreen River channel and the 19th century replacement in the townland of Treadstown. The original channel is marked on the first edition OS map. AAP2 comprises a small stream in the townland of Newtown.

1.3.3 Assessment Matrix of Junction 7 Options

Both options are similar, being formed by the most part from the construction of the proposed MOOR. Option 2 would include the construction of a new junction, which means this option would require a greater amount of previously undisturbed greenfield.

Table 1.8: Assessment Matrix for Junction 7 Options

Assessment Criteria	Option 1	Option 2
Potential direct or indirect negative impacts (imperceptible to profound)	Indirect moderate negative impact on Jackson's Bridge (BH1). Indirect slight negative impacts on CH5 and 6. Direct impacts on AAP1-2 that may be moderate to very significant negative (if archaeological remains are present). Greenfield areas required that may contain previously unrecorded archaeological remains. Potential for direct negative impacts that may be moderate to profound negative (if archaeological remains are present).	Indirect moderate negative impact on Jackson's Bridge (BH1). Indirect slight negative impacts on CH5 and 6. Direct impacts on AAP1-2 that may be moderate to very significant negative (if archaeological remains are present). Greenfield areas required that may contain previously unrecorded archaeological remains. Potential for direct negative impacts that may be moderate to profound negative (if archaeological remains are present).
Qualitative Assessment	Minor or slightly negative	Minor or slightly negative
Score/ Impact Level	3	3
Preference	Preferred	Least Preferred

1.4 Summary

Both options are similar in form, being comprised for the most part, by the construction of the MOOR, which runs through open greenfield. As such, the potential impacts are very similar, but Option 2 requires a new junction and as such would result in a greater amount of previously undisturbed greenfield.

Whilst both options are assessed as minor or slightly negative, Option 1 is Preferred as it would require less greenfield.

1.5 References

Bennett, I. (ed.) 1987-2010 Excavations: Summary Accounts of Archaeological Excavations in Ireland. Bray. Wordwell

Department of Arts, Heritage, Gaeltacht and the Islands. 1999a. Framework and Principles for the Protection of the Archaeological Heritage. Government Publications Office, Dublin

Department of Arts, Heritage, Gaeltacht and the Islands. 1999b. Policy and Guidelines on Archaeological Excavation. Government Publications Office, Dublin

Department of Culture, Heritage and the Gaeltacht. 2017. NIAH Handbook

Kildare County Development Plan 2023-2029

National Monument Service, Department of Housing, Local Government and Heritage. Sites and Monuments Record, County Kildare

National Roads Authority. 2005a Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes

National Roads Authority. 2005b Guidelines for the Assessment of Architectural Heritage Impacts of National Road Schemes

www.excavations.ie – Summary of archaeological excavations from 1970-2023. (Accessed September 2023)

www.archaeology.ie – DoHLGH website listing all SMR/RMP, National Monuments, Preservation Orders (Accessed September 2023)

www.osiemaps.ie – Ordnance Survey aerial photographs dating to 1995-2013 and 6-inch/25-inch OS maps. (Accessed September 2023)

www.heritagemaps.ie – The Heritage Council web-based spatial data viewer which focuses on the built, cultural, and natural heritage. (Accessed September 2023)

www.bingmaps.com – Website containing aerial photographic datasets. (Accessed September 2023).

www.logainm.ie – Placenames Database of Ireland launched by Fiontar agus Scoil na Gaelige and the DoHLGH. (Accessed September 2023)

www.googleearth.com – Satellite imagery of the study area. (Accessed September 2023)

www.buildingsofireland.ie – Website listing the results of the NIAH building and garden survey for Kildare (Accessed September 2023).

Kildare County Council

Maynooth to Leixlip Project

Options Report - Stage 2
Biodiversity Junction Options
Assessment

Draft 1 | 31 August 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Table 1.2: Key Ecological Receptors located within, or partially within, a Junction Option

Table 1.3: Biodiversity Assessment Matrix of Junction 7 Options

1 Stage 2 Biodiversity Junction Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Junction Options for the Maynooth to Leixlip Project with respect to the Biodiversity constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the Junctions options assessment. A summary is provided in Section 1.4 and references are provided in Section 1.5.

1.2 Methodology

The Stage 1 biodiversity assessment previously carried out for this project which contained six options for Junction 7 (Option A, Option B, Option C, Option D, Option E and Option F). Two options for Junction 7 were brought forward to Stage 2.

The principal objectives of this assessment are to:

- Evaluate the Junction Options brought forward to Stage 2 assessment, based on ecological criteria, as per the National Road Authority (NRA) *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009)¹ and Chartered Institute for Ecology and Environmental Management (CIEEM) *Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine* (2018)².
- Assess the significance of the likely impacts on each of the biodiversity receptors potentially impacted by each Junction 7 Option. As per the Transport Infrastructure Ireland (TII)¹ guidance, this step discounted biodiversity receptors or ecological sites where the risk of significant impacts is unlikely considering where the application of standard mitigation and best practice during construction is unambiguous and success is highly likely.
- To assess each option in accordance with Transport Infrastructure Ireland's *Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis* (TII, 2016)³.

¹ National Roads Authority (2009) Guidelines for Assessment of Ecological Impacts of National Road Schemes. Available from: <https://www.tii.ie/technical-services/environment/planning/Guidelines-for-Assessment-of-Ecological-Impacts-of-National-Road-Schemes.pdf> [Accessed: August 2023]

² Chartered Institute for Ecology and Environmental Management (CIEEM) (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine. Available from: <https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.1.pdf> [Accessed: August 2023]

³ Transport Infrastructure Ireland (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf> [Accessed: August 2023]

To fulfil these objectives, an assessment of the likely or potential impacts of each Junction Option on ecological receptors is carried out, so that an informed comparison of the proposed Junction Options can be made taking cognisance of the potential ecological consequences.

Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. Alongside the term “biodiversity”, the terms “ecology” and “ecological” are also used throughout this section of the report as a broader term to refer to the relationships of biodiversity receptors to one another and to their environment.

1.2.1 Biodiversity Stage 2 Assessment Process

The Stage 2 junction options assessment process is as follows:

- The key ecological receptors within the study area were identified based on a combination of desktop data, consultation (i.e. relevant bodies/organisations) and field surveys;
- The key ecological receptors were assigned an ecological value based on a geographic frame of reference ranging from international to local importance;
- The likely impacts of each of the Junction Options on the key ecological receptors were identified and assessed, indicating which, if any, of these are likely to be significant, and at what geographical level;
- The impacts of each of the Junction Options on the key ecological receptors were scored in accordance with the TII approach⁴, on a seven-point scale ranging from ‘major or highly negative (1)’ to ‘major or highly positive (7)’;
- The overall cumulative impact of each Junction Options across all the key ecological receptors affected was also scored on the same seven-point scale; and
- The scores attributed to each of the Junction Options were assessed comparatively and assigned a preference ranking.

1.2.2 Key Ecological Receptors

Key ecological receptors are those biodiversity receptors confirmed, or likely to occur, within the study area with an ecological value of local importance (higher value) or greater and, therefore, likely to affect the scoring and ranking of the Junction Options. These include:

- Designated sites for nature conservation (e.g. SACs, SPAs, NHAs, pNHAs and Nature Reserves);

⁴ TII (2016). Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis Document PE-PAG-02031

- Sensitive habitats (e.g., non-Annex I semi-natural woodland habitats and watercourses⁵);
- Sensitive species (e.g. otter *Lutra lutra*); and
- Ecological sites (identified from a combination of desktop and field assessment).

The key ecological receptors were initially identified in the Constraints Report based on collation of available existing information from the desk study and consultations with relevant bodies/organisations and focussed on the known/potential ecological value for the habitats/species present. In the case of the ecological sites, the boundaries were initially defined based on interpretation of orthophotography and collation of available existing habitat information.

Walkover surveys of ecological sites within the wider constraints study area were undertaken in April 2021. This was further supplemented for the Stage 1 assessment with an additional field survey undertaken in December 2021. The purpose of the field surveys was to ground truth and verify the orthophotography interpretation and selection of ecological sites, refine site boundaries, assess the ecological evaluation of each of the identified ecological sites and to detect any additional ecological sites not identified during the desk study. Walkover surveys of ecological sites which were located in proximity to, or overlapped with, one or more of the Junction Options, were undertaken during the December survey.

Additional multidisciplinary surveys of the entire corridor between Junction 5 and Junction 7 were undertaken by Scott Cawley Ltd., in September 2022 to inform the Stage 2 assessments for the Maynooth to Leixlip Project. The purpose of these field surveys was to map all habitats within the proposed Junction Options Corridor boundary, record signs of terrestrial mammals, record trees and structures with Potential Roost Features (PRFs) along the route, record any Third Schedule listed invasive plant species and to detect any additional ecological sites not identified during the desk study.

In some cases, certain sections of the ecological sites (especially those lining the existing M4) were viewed from a distance, owing to limited access or safety issues. However, earlier professional assumptions made on the value of those ecological sites based on local information gathered during previous constraints field surveys and desk study as necessary was supplemented by September 2022 survey work which was undertaken on the existing M4 carriageway verges under the auspices of the traffic safety.

⁵ Watercourses are referred to as per the names presented on the EPA's online Map Viewer. Available from: <https://gis.epa.ie/EPAMaps/> [Accessed August 2023]

Habitat types were classified using the *Guide to Habitats in Ireland* (Fossitt, 2000)⁶ and the likelihood/potential for Annex I habitat types was confirmed or inferred based on the professional judgement of the surveyor, with reference to the *Interpretation manual of European Union Habitats EUR 28* (CEC, 2013)⁷. Where it was not possible to confirm the presence of Annex I habitats, a precautionary approach was adopted with regards to the identification of the potential presence of Annex I habitats within an ecological site.

1.2.3 Scoring Procedure

Ecological Valuation

The key ecological receptors identified have been valued with regard to ecological valuation guidance set out in *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009)¹ and *Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine* (CIEEM, 2018)².

The following geographic frame of reference is used when valuing the key ecological receptors:

- International Importance;
- National Importance;
- County Importance; and
- Local Importance (higher value).

All Annex I habitats that lie outside of European sites, are valued as being of at least national importance, given that these habitats are of high conservation concern. Priority Annex I habitat types that lie outside of European sites may be valued as being of International Importance given that they are of the highest conservation concern at a European level (i.e., natural habitat types in danger of disappearance⁸). No Annex I habitats, priority or otherwise, have been recorded during the walkover surveys.

For individual sites (e.g., designated sites, watercourses or ecological sites identified during the Constraints Study), the overall ecological valuation for each of the key ecological receptors was based upon the highest value receptor known to be present, or potentially present, within the site.

⁶ Fossitt, J.A. (2000) *A Guide to Habitats in Ireland*. Heritage Council, Kilkenny. Available from: <https://www.npws.ie/sites/default/files/publications/pdf/A%20Guide%20to%20Habitats%20in%20Ireland%20-%20Fossitt.pdf> [Accessed: August 2023]

⁷ CEC. (Commission of the European Communities) (2013) *Interpretation manual of European Union Habitats EUR28*. European Commission, DG Environment. Available from: https://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf [Accessed: August 2023]

⁸ From the definition of “*priority natural habitat types*” in Article 1(d) of the Habitats Directive (Council Directive 92/43/EEC).

Assessment Criteria

The assessment of the proposed options for Junction 7 Maynooth included both a quantitative and qualitative assessment. Firstly, the impact on each key ecological receptor is assessed.

Although a given Junction Option may impact upon a particular key ecological receptor, the direct impact(s) on the site may not necessarily directly impact on the highest value receptor(s). This is accounted for in the assessment as much as possible, based on the level of ecological information available.

To assess the likely ecological impacts of each of the two Junction Options on individual key ecological receptors, the following criteria are applied, with the use of professional judgement as to the likelihood of significant effects occurring:

- Potential impacts on an ecological receptor of National / International Importance were assessed as being Major or highly negative;
- Potential impacts on an ecological receptor of County Importance were assessed as being Moderately negative; and
- Potential impacts on a receptor of Local Importance (Higher Value) were assessed as being Minor or slightly negative.

To assess the likely cumulative overall ecological impacts for each Junction Option, the following criteria were applied, in conjunction with the use of professional judgement as to the likelihood of significant effects occurring:

- Biodiversity impacts are major or highly negative) if:
 - The impact is directly on one or more designated sites valued as International or National Importance (i.e. SAC, SPA, pnha or NHA);or
 - The impacts associated with constructing the Junction Option within or alongside the existing road would likely result in an adverse effect on the integrity of the SAC/SPA/pnha/NHA site (i.e. For SAC/SPA this could equate to the loss of Qualifying Interest (QI) habitat or undermining the conservation objectives and for pnha/NHA this could relate to the loss of features for which the site is designated).
- Biodiversity impacts are moderately negative if:
 - The impact is directly on one or more non-designated ecological sites valued as National or County importance, or numerous ecological sites valued as Local Importance (higher value);or
 - The impacts associated with constructing a road within the Junction Option would likely result in permanent/long-term effects on non-qualifying interest Annex I habitat or on a species population considered to be of National Importance.or

- Impacts associated with constructing a road within the Junction Option would likely have permanent/long-term effects on a habitat(s) or on a species population considered to be of County/Local (higher value) Importance.
- Biodiversity impacts are minor or slightly negative if:
 - The impact is directly on a small number of ecological sites valued as Local high importance;
 or
 - The impacts associated with constructing a road within the option corridor would likely have permanent/long-term effects on a habitat(s) or on a species population considered to be of Local (high) Importance.

Considering these cumulative impacts on the key ecological receptors identified, each Junction option was scored, based on the seven-point scale below and an integer was assigned according to the impact significance:

Table 1.1: TII PAG Scoring System

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

As each Junction Option is likely to have some level of a negative impact on biodiversity, neutral or positive impact scorings do not apply in this assessment, as in the absence of a design and /or mitigation there is no understanding that any option requiring construction could be assessed as neutral or positive.

Each of the two Junction Options were also comparatively assessed in terms of the overall impact significance, to provide a preference ranking. The preference ranking was as follows:

- Preferred; or
- Least Preferred.

In accordance with the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009)¹, key ecological receptors within the study area were not assessed against the Junction Options where the risk of significant impacts is unlikely, considering where the delivery of standard mitigation and best practice during construction is unequivocal and success is highly likely. For example, with the application of standard pollution control measures during construction and an operational drainage and pollution control system designed to current standards, sensitive biodiversity receptors downstream of the Junction Options are not likely to be affected. However, the potential watercourse crossings were considered in this assessment, as it cannot be assumed that clear-span crossings will be possible at each crossing point. In addition, potential watercourse crossings will undoubtedly result in indirect impacts on the watercourse in question (e.g. disturbance to QI species, spread of non-native invasive species).

1.3 Summary of Stage 2 Survey Results

Following on from the multi-disciplinary survey undertaken in September 2022, the following habitats, all of which are valued as local importance (higher value) or below, were recorded along the M4/N4:

Local Importance (Higher Value)

- GS2 - Dry meadows and grassy verges;
- WD1 - (Mixed) broadleaved woodland;
- WL1 – Hedgerows;
- WL2 – Treelines;
- WS1 – Scrub; and
- WS2 - Immature woodland.

Local Importance (Lower Value)

- BL3 – Buildings and artificial surfaces;
- WS3 - Ornamental/non-native shrub; and
- GA2 - Amenity grassland (improved).

No Annex II plant species and no records of plant species protected through their inclusion within the Flora (Protection) Order 2022, were recorded during the multi-disciplinary surveys. Additionally, no non-native invasive species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) were recorded along the existing M4/N4 corridor.

A number of Potential Roost Features (PRFs) were recorded along the existing M4/N4 corridor, all Alder *Alnus glutinosa* located within the roadside planting between Junction 5 Leixlip and the River Liffey Bridge.

During the multi-disciplinary survey, 11 bird species were recorded within or adjacent to the existing M4/N4 corridor boundaries including 10 green listed species; blackbird, blackcap, blue tit, dunnock, great tit, long-tailed tit, pied wagtail, robin, wood pigeon, wren and one amber listed species goldcrest.

The various Key Ecological Receptors (KERs) and watercourses and designated sites intersected by each of Junction 7 Options are summarised in Table 1.2.

Table 1.2: Key Ecological Receptors located within, or partially within, a Junction Option

Site Name	Description	Present/Adjacent to Option 1	Present/Adjacent to Option 2	Ecological Value
Royal Canal pNHA	Man-made water feature extending between Dublin and Longford	No	No	National Importance
Gragadder (tributary of the Lyreen watercourse)	Tributary of the Lyreen – eventually joins into Rye water	Yes	Yes	County Importance
Lyreen (watercourse)	Flows into Rye water	Yes	Yes	County Importance
EC12	Narrow woodland band/ Treeline	Yes (both sides)	Yes (both sides)	Local Importance (higher value)
Taghadoc (watercourse)	Flows into Rye Water	Yes	Yes	County Importance
EC18	Narrow woodland band/ Treeline	Possibly western side of intersection	Possibly western side of intersection	Local Importance (higher value)
EC19	Narrow woodland band/ Treeline	Yes	No	Local Importance (higher value)
EC21	Narrow woodland band/ Treeline	Yes	No	Local Importance (higher value)
EC15	Narrow woodland band/ Treeline	No	Yes	Local Importance (higher value)
EC17	Mixed broadleaf woodland	No	Yes	Local Importance (higher value)

1.4 Junction 7 Options Assessment

While the Stage 2 Options assessment relates to the proposed interventions or construction works at Junction 7 Maynooth, both options would also include the Maynooth Outer Orbital Route (MOOR). The MOOR is identified as an objective under the Maynooth Local Area Plan 2013-2019 incorporating amendment no.1.

1.4.1 Option 1 – Maintain and Optimise/Improve Existing Junction

Option 1 would consist of maintaining and optimising/improving the existing junction, together with the provision of the Maynooth Outer Orbital Route (MOOR). The MOOR would extend from Straffan Road to Jackson's Bridge. In order to provide an optimised junction arrangement at the intersection of the MOOR with Straffan Road, the eastbound diverge would be moved west along the M4 mainline. The westbound diverge would also be realigned as part of Option 1. The current configuration is a combination of a diamond junction and a roundabout that provides access to the Maynooth Business Park. Option 1 would include a signalised diamond junction to provide a more consistent configuration.

Starting in the western end of the study area, the option commences immediately south of the Royal Canal pNHA boundary at Jackson's Bridge. Continuing eastwards, the routing of the MOOR, as part of Junction 7 Option 1 interacts with three watercourses, namely the Gragadder, Lyreen and Taghadoe, all of which are assigned as County Importance. This assessment is similar to other watercourses from earlier assessments, owing to their connection to the Rye Water River. In its central portion, the proposed MOOR interacts with a single KER, namely EC12, a narrow woodland band/ treeline occurring on both sides of the R408 Newtown Road.

Continuing eastwards, as the proposed MOOR approaches Junction 7, the proposed M4 eastbound diverge interacts with the linear planting of EC14. The proposed MOOR interacts a second time with EC14 where the proposed road ties into the north side of the R406, along the existing M4 eastbound diverge. It also interacts to a lesser degree with a small part of the western extension of EC18 – roadside woodland. On the M4 westbound diverge section, this option would result in the closure of the westbound diverge and the proposed road realignment which interacts with EC19 (fragmenting this woodland copse) and EC21, resulting in the loss of some linear woodland vegetation.

Option 1 would interact with a similar number of County level importance watercourses as Option 2. However, as this option interacts with a lower number of terrestrial ecological sites, all of which are valued as being of Local importance (higher value) and would require less greenfield landtake, it is Preferred with respect to biodiversity.

1.4.2 Option 2 – Provide a New Junction between Newtown Road and Straffan Road and convert the existing to an Overbridge

Option 2 would include a new grade separated junction between the R406 Straffan Road and the R408 Newtown Road and convert the existing Junction 7 to an overbridge. Option 2 would also include the provision of the Maynooth Outer Orbital Route (MOOR) with a different spatial geometry to Option 1, which would extend from Straffan Road to Jackson's Bridge.

Starting in the western end of the study area, the option commences approximately 50m south of Jackson's Bridge and outside of the Royal Canal pNHA. The proposed MOOR for Option 2 would be similar to Option 1 as far as the eastern side of the R408 Newtown Road crossing point. Option 2 interacts with the same three watercourses as Option 1, namely the Gragadder, Lyreen and Taghadoe, all of which are assigned as County Importance. This option would also interact with EC12, a narrow woodland band/ Treeline occurring on both sides of the R408 Newtown Road. Thereafter, the geometry of the proposed MOOR, is in parts, routed closer to the existing M4 motorway and only deviates inland to accommodate the proposed junction overbridge and accommodation roads. This option interacts with EC 14 at three separate locations, once where the proposed overbridge interacts with the linear planting as well as accommodating other new local roads and further east where the proposed new road ties into the north side of the R406. It also interacts with EC14 to accommodate a new merge to the existing M4. Further west, it would also interact with EC14 again where the MOOR is routed onto the existing eastbound diverge on to the R406. It would also, to a lesser degree, with a small part of the western extension of EC 18 – roadside woodland. The proposed overbridge further west of Junction 7, would result in interactions with other key ecological receptors namely EC15 and EC17, both of which would result in loss of additional woodland vegetation.

Option 2 would interact with a similar number of County level importance watercourses as Option 1. However, as this option interacts with a higher number of terrestrial ecological sites and includes far greater landtake, all of which are valued as being of Local importance, it is Least Preferred with respect to biodiversity.

1.4.3 Assessment Matrix of Junction 7 Options

Table 1.3: Biodiversity Assessment Matrix of Junction 7 Options

Assessment Criteria	Option 1	Option 2
Significant impact on sites of International Importance (major or highly negative)	0 major or highly negative impacts	0 major or highly negative impacts
Significant impact on sites of National Importance	0 major or highly negative impacts	0 major or highly negative impacts
Significant impact on sites of County Importance	3 moderately negative impact	3 moderately negative impact
Significant impact on sites of Local Importance (Higher Value)	3 minor or slightly negative	5 minor or slightly negative
Overall Assessment	There are 3 ‘moderately’ negative impacts and 3 ‘minor or slightly negative’ associated with this Junction Option	There are 3 ‘moderately’ negative impacts and 5 ‘minor or slightly negative’ associated with this Junction Option
Scoring		
Qualitative Assessment	<p>Potential County Level Impacts on three watercourses, namely – Gragadder, Lyreen and Taghadoe, as well as 3 areas of narrow woodland/treeline Local Importance (Higher value). Some are associated with the planted boundary of the existing M4 and the tie in at Junction 7, whilst others associated with either side of the proposed L5041 and Newtown road crossings.</p> <p>Minor Negative</p>	<p>Potential County Level Impacts on three watercourses, namely – Gragadder, Lyreen and Taghadoe, as well as 5 areas of Local Importance (Higher value) narrow woodland/treeline. Some are associated with the planted boundary of the existing M4 and the tie in at Junction 7, whilst others associated with either side of the proposed L5041 and Newtown road crossings. In addition, the proposed new overbridge to the west of the existing Junction 7 includes localised loss on 2 additional KERs, namely EC17 and EC15.</p> <p>Moderate Negative</p>
Score / Impact Level	3	2
Preference	Preferred	Least Preferred

1.5 Summary

Key ecological receptors within the study area were identified and assigned an ecological value based on a geographic frame of reference ranging from National to Local Importance (higher value). The likely impacts of each of the Junction Options on the key ecological receptors were identified and assessed, indicating which, if any, of these are likely to be significant, and at what geographical level.

The impacts of each of the Junction Options on the key ecological receptors were identified and assigned an impact rating. The overall cumulative impact of each option corridor across all the key ecological receptors affected was then scored in accordance with the TII approach³, on a seven-point Likert scale ranging from 'major or highly negative (1)' to 'major or highly positive (7)'. The scores attributed to each of the Junction Options were assessed comparatively and assigned a preference ranking.

Option 1 is Preferred and Option 2 is Least Preferred.

1.6 References

Arup (2023). Phase 2 Stage 2 Options Assessments - Engineering Assumptions and Description for Junction 7 Options

CEC. (Commission of the European Communities) (2013) Interpretation Manual of European Union Habitats EUR 28 April 2013 European Commission, DG Environment Available from:
https://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf

Chartered Institute of Ecology and Environmental Management (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine

Fossitt, J. A. (2000). A Guide to Habitats in Ireland. The Heritage Council.

National Roads Authority (2009). Guidelines for Assessment of Ecological Impacts of National Road Schemes

Transport Infrastructure Ireland (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis. Available from:
<https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

Kildare County Council

Maynooth to Leixlip Project

Options Report – Stage 2 Climate
Junction Options Assessment

Draft 1 | 31 August 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Table 1.1: PAG Scoring System used in Ranking

Table 1.2: Climate Assessment Matrix of Junction 7 Options Corridors

1 Stage 2 Climate Junction Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Junction Options for the Maynooth to Leixlip Project with respect to the Climate constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the Junction Options assessment. A summary is provided in Section 1.4 and references are provided in Section 1.5.

1.2 Methodology

1.2.1 Scoring Procedure

As per the Stage 1 environmental assessment, each specialist is required to define their assessment methodology and assessment sub-criteria based on their expert opinion and best practice. Guidance on what to include as sub-criteria is given in Chapter 3 of the PAG Unit 7. Following this the potential impacts and their magnitude are to be identified for each of the Junction Options. The impacts for each sub-criteria shall be scored based on the seven-point scale below and an integer shall be assigned according to the impact level included in Table 1.1.

Table 1.1: PAG Scoring System used in Ranking

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Using a combination of the impact scores and professional judgement, a determination as to the level of the impact of each Junction Option was provided. The Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports¹ were also referred to when undertaking this assessment.

Using the impact scores and the professional judgement of the specialist, a determination is made as to whether each Junction Option that is assessed is either:

- Preferred; or
- Least Preferred.

The Junction Options are then weighted against each other in the assessment matrix.

1.3 Junction 7 Options Assessment

The focus of this assessment is the comparison of the two Junction Options. It is acknowledged that other new infrastructure may be developed with the new/upgraded junction, i.e the Maynooth Outer Orbital Route (MOOR). However, as the MOOR would be implemented as part of both options, it is not considered a differentiator in the assessment of the options.

1.3.1 Option 1 – Maintain and Optimise/Improve Existing Junction

Option 1 would consist of maintaining and optimising/improving the existing junction. To provide an optimised junction arrangement, the eastbound diverge slip road would be shifted west slightly along the M4 mainline. Option 1 would include a signalised diamond junction. The M4 westbound diverge would be realigned. This would provide a more consistent configuration for Junction 7.

This option is assessed by two sub-criteria from a climate perspective: embodied carbon that may be generated from the construction of the proposal and likely changes to traffic volumes.

1.3.2 Option 2 – Provide a New Junction between Newtown Road and Straffan Road and convert the existing to an Overbridge

Option 2 would include a new grade separated junction and convert the existing Junction 7 to an overbridge. The provision of a new grade separated junction and conversion of the existing to an overbridge would facilitate the enhancement of the existing active travel infrastructure on Straffan Road.

¹ EPA (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR). Available at: <https://www.epa.ie/publications/monitoring--assessment/assessment/guidelines-on-the-information-to-be-contained-in-environmental-impact-assessment-reports-eiar.php>

This option is assessed by two sub-criteria from a climate perspective: embodied carbon from the development of the proposal and likely traffic volumes.

1.3.3 Junction 7 Options Assessment Matrix

The assessment of the two Junction 7 options is provided in Table 1.2.

Table 1.2: Climate Assessment Matrix of Junction 7 Options Corridors

Assessment Criteria	Option 1	Option 2
Embodied Carbon	Option 1 would consist of maintaining and optimising/improving the existing junction.	Option 2 would include a new grade separated signalised junction.
Traffic volumes	No significant changes likely	No significant changes likely
Scoring		
Qualitative Assessment	Not significant or neutral	Minor or slightly negative
Score/ Impact Level	4	3
Preference	Preferred	Least Preferred

Option 1 is Preferred due to the lower level of embodied carbon likely to be generated during the construction phase through the use of existing infrastructure. No significant variation in traffic volumes is expected during the operational phase with no significant carbon emissions generated.

1.4 Summary

Option 1 is Preferred due to the lower level of construction materials required for its implementation compared to Option 2. No significant increase in carbon emissions is expected during the operational phase for either option.

1.5 References

N/A

Kildare County Council

Maynooth to Leixlip Project

Options Report - Stage 2
Hydrogeology Junction Options
Assessment

Draft 1 | 31 August 2023

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Table 1.1: Rating of Significant Environmental Impacts (Box 4.4 of the NRA Guidelines)

Table 1.2: TII Project Appraisal Guidelines Scoring Criteria

Table 1.3: Correlation of NRA Guidelines Significance Rating to an equivalent NRA PAG Score

Table 1.4: Hydrogeology Assessment Criteria Summary

Table 1.5: Summary Assessment

1 Stage 2 Hydrogeology Junction Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Junction Options for the Maynooth to Leixlip Project with respect to the Hydrogeology constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4 and references are provided in Section 1.5.

1.2 Methodology

This assessment was prepared in accordance with the requirements of the National Roads Authority (NRA) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (hereafter referred to as the NRA Guidelines)¹.

In line with the NRA Guidelines, the study area for this Stage 2 Option Assessment extends 250m from the centreline of the proposed options.

1.2.1 Scoring Procedure

The NRA Guidelines¹ provide criteria for ranking of the identified hydrogeological constraints within the study area (herein referred to as Criteria), that are presented in the Constraints Report. Criteria for rating an impact significance that may arise at each hydrogeological constraint are provided within Box 4.4 of the NRA Guidelines¹ and in Table 1.1. The impact significance assessment considers the attribute importance and the predicted scale and duration of the likely impacts.

¹ NRA (2009) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes. Available from: <https://www.tii.ie/technical-services/environment/planning/Guidelines-on-Procedures-for-Assessment-and-Treatment-of-Geology-Hydrology-and-Hydrogeology-for-National-Road-Schemes.pdf>

Table 1.1: Rating of Significant Environmental Impacts (Box 4.4 of the NRA Guidelines)

Impact Level	Attribute Importance				
	Extremely High*	Very High	High	Medium	Low
Profound	Any permanent impact on attribute	Permanent impact on significant proportion of attribute			
Significant	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on Significant proportion of attribute		
Moderate	Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute	
Slight		Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute
Imperceptible			Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute

**In rating impacts on an 'European site' account must be taken of Article 6(3) and 6(4) of the Habitats Directive (Council Directive 92/43/EEC). Also see guidance contained within Guidelines for Assessment of Ecological Impacts of National Road Schemes (Rev 2, National Roads Authority, 2008)*

The TII Project Appraisal Guidelines for National Roads (PAG) Unit 7.0 - Multi-Criteria Analysis² provide a qualitative and quantitative procedure for scoring each option against the assessment criteria, as shown in Table 1.2.

² TII (2016) Project Appraisal Guidelines for National Roads Unit 7.0 Multi Criteria Analysis. Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

Table 1.2: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

The significance rating of environmental impacts from the NRA Guidelines have been correlated with the equivalent qualitative and quantitative assessment scores from the TII Project Appraisal Guidelines, as shown in Table 1.3.

Table 1.3: Correlation of NRA Guidelines Significance Rating to an equivalent NRA PAG Score

Significance Rating (NRA Guidelines)	Equivalent PAG (Description)	Impact	Score
Profound	Major or highly negative	Results in loss of attribute and /or quality and integrity of attribute	1
Significant	Major or highly negative	Results in loss of attribute and /or quality and integrity of attribute	1
Moderate	Moderately negative	Results in impact on integrity of attribute or loss of part of attribute	2
Slight	Minor or slightly negative	Results in minor impact on integrity of attribute or loss of small part of attribute	3
Imperceptible	Not significant or neutral	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	4

The final stage of the assessment methodology was to ensure that the requirements of the TII PAG Unit 7.0 - Multi-Criteria Analysis were met by assigning a score to each Junction Option based on the scoring procedure within these Guidelines. Using the impact scores and professional judgement, Preferred or Least Preferred rankings were assigned to each Junction Option.

1.2.2 Assessment Criteria

The hydrogeological attributes which are considered in the assessment of the options are presented in Table 1.4. This table also outlines the assessment criteria that will be applied to each of these features.

Table 1.4: Hydrogeology Assessment Criteria Summary

Hydrogeological Features to be assessed	Means of Assessment of Potential Impacts	Options Assessment Description
<p>Groundwater Flow, Levels and Aquifer Vulnerability</p> <p>The classification and extent of aquifers underlying each Option and increased risk presented to them by each Option.</p>	<p>Aquifer classification.</p> <p>Extent of aquifer – assessed as the extent underlain by a particular aquifer classification.</p> <p>Aquifer vulnerability – assessed as the extent underlain by aquifer which is classified as extreme or high vulnerability.</p> <p>Removal of subsoil cover or part of aquifer (cuttings associated with an Option) which may give rise to changes in groundwater level and change in aquifer vulnerability.</p>	<p>Excavations can impact groundwater by causing dewatering of the groundwater in the vicinity. The deeper the excavation, the more significant and more extensive the impact. In addition, the removal of the soil and bedrock in the excavation will increase the vulnerability of the aquifer at that location, as vulnerability is largely dependent on the depth and permeability of subsoil above the aquifer.</p> <p>In this assessment, the potential impact on groundwater for each depth of cutting is assessed in the context of the underlying aquifer extent and classification. Cuttings between 5 and 10m in depth are considered to have a permanent impact on a small proportion of the attribute. Cuttings greater than 10m in depth are considered to have a permanent impact on a significant proportion of the attribute. Cuttings that are shallower than 5m may not intercept groundwater and where they do the potential impact is expected to be negligible.</p>
<p>Karst</p> <p>Karst features and the risk presented to them by each Option.</p>	<p>The proximity to the feature.</p> <p>The extent of the Option within the feature protection zone or zone of contribution.</p>	<p>Karst features located within an Option fenceline have the potential to be impacted by the removal of the feature or modification of the flow to or from the feature. Where a karst feature is located within an Option fenceline it is considered to be a permanent impact on a significant proportion of the attribute.</p>

Hydrogeological Features to be assessed	Means of Assessment of Potential Impacts	Options Assessment Description
<p>Groundwater Sources</p> <p>High yielding water supply wells and springs and increased risk presented by each Option.</p>	<p>The proximity to the feature. The extent of the Option within the protection zone or zones of contribution.</p>	<p>Where an abstraction is located within an Option fenceline there is potential for the quantity or quality of the water supplying the abstraction to be altered. This is considered to be a permanent impact on a significant proportion of the attribute.</p> <p>However, the NRA Guidelines states that little or no weighting should be given to the number of wells within the study area when assessing relative impacts. It also states that it is almost inevitable that any large national road scheme will result in at least a small number of low-yielding water supply wells having to be abandoned. In the case of low-yielding water supply wells, the ranking of the level of potential impact is unnecessary, as wells will either have to be replaced or removed.</p>
<p>Groundwater Contamination</p> <p>Groundwater discharges and emissions have the potential to impact groundwater quality.</p>	<p>The proximity to the feature. The extent of the Option within the protection zone or zones of contribution.</p>	<p>Groundwater discharges and emissions have the potential to impact groundwater quality, which results in a potential risk to groundwater receptors including aquifers and groundwater dependent habitats where there may be interaction with the proposed Options. The importance of the potential contamination site is dictated by the potential extent of contamination and the likely contaminant types based on the historical or current site usage The potential impact is assessed in accordance with consideration of the Source-Pathway-Receptor framework.</p>
<p>Groundwater Flooding</p> <p>Historic groundwater flooding located within a fenceline or junction have a potential to be impacted.</p>	<p>The proximity to the feature. The extent of the Option within the protection zone or zones of contribution.</p>	<p>The impacts of the historical groundwater flooding are analysed considering the proximity to the indicative fenceline for each Option. It is assumed that where historic groundwater flooding is located within an indicative fenceline there is a potential impact.</p> <p>If the fenceline intercepts areas of historical or potential groundwater flooding, it is considered to have a permanent impact on a significant proportion of the attribute.</p>

Hydrogeological Features to be assessed	Means of Assessment of Potential Impacts	Options Assessment Description
<p>Hydro-Ecology Groundwater dependent habitats and the risk presented to them by each Option.</p>	<p>The proximity and the position (upgradient or downgradient) to the feature. Removal of subsoil cover or part of aquifer (cuttings) which may give rise to changes in groundwater level. Removal of part of the habitat by an Option.</p>	<p>Deep cuttings and habitat removal are considered the primary potential impacts to groundwater dependent habitats and the local groundwater regime. Where a groundwater dependent habitat is located within the indicative fenceline but there are no cuttings proposed, the potential permanent impact will be relative to the proportion of the feature within the indicative fenceline. Where a groundwater dependent habitat is located within the indicative fenceline or within 100m from the indicative fenceline and there are cuttings that are less than 5m in depth, this is considered to be a potential permanent impact on a small proportion of the attribute. Where a groundwater dependent habitat is located within the indicative fenceline or within 100m from the indicative fenceline and there are cuttings greater than 5m, this is considered to be a potential permanent impact on a significant proportion of the attribute.</p>

1.3 Junction 7 Options Assessment

1.3.1 Option 1 – Maintain and Optimise/Improve Existing Junction

Option 1 consists of maintaining and optimising/improving the existing junction, together with the provision of the Maynooth Outer Orbital Route (MOOR).

A number of shallow cuts are associated with Option 1. As the cuts are all shallower than 5 m deep, the impact on the aquifer is considered to be not significant or neutral resulting in a PAG score of 4.

No karst features were identified within the study area.

There are no groundwater sources including industrial or public supply boreholes or source of protection areas within the study area.

There are no sites of potential groundwater contamination associated with licensed facilities identified within the study area.

The GSI Groundwater Flood Data Maps³ have identified areas of historic and/or potential groundwater flooding from Newtown Road (R408) to Jackson’s Bridge. Even though there are areas of potential groundwater flooding identified within the fenceline of Option 1, aerial photography suggests that there is little evidence of

³ Groundwater Flood Data

<https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228>

regular flooding and consequently the impact is imperceptible, being assessed as not significant or neutral with a PAG score of 4.

It is recommended that shallow groundwater levels are considered from an engineering/road drainage perspective but it is expected these can be managed with standard design options for drainage.

There are no hydro-ecology sites identified within the study area.

1.3.2 Option 2 – Provide a New Junction between Newtown Road and Straffan Road and convert the existing to an Overbridge

Option 2 comprises a new grade separated junction between the R406 Straffan Road and the R408 Newtown Road and conversion of the existing Junction 7 to an overbridge. It also includes the Maynooth Outer Orbital Route (MOOR).

Option 2 includes earthworks associated with the construction of the proposed bridge foundations and cuts between 5m and 10m in depth associated with the proposed road alignments. The earthworks have the potential to encounter the underlying aquifer which is considered to have a permanent impact on a small proportion of the attribute. Therefore, as the aquifer is considered to be of medium importance the impact is considered to be minor or slightly negative resulting in a PAG score of 3.

No karst features were identified within the study area.

There are no industrial, public supply boreholes, abstraction points or source of protection areas within the study area.

There are no sites of potential groundwater contamination associated with licensed facilities identified within the study area.

The GSI Groundwater Flood Data Maps³ have identified minor areas of historic and/or potential groundwater flooding between the R408 Newtown Road and Jackson's Bridge. While there are areas of potential groundwater flooding identified within the fenceline of Option 2, a review of historical mapping and aerial photography suggests that there is little evidence of regular flooding and consequently the environmental impact is imperceptible, being assessed as not significant or neutral with a PAG score of 4. It is recommended that shallow groundwater levels are considered from an engineering/road drainage perspective but it is expected these can be managed with standard design options for drainage.

There are no hydro-ecology sites identified within this study area.

1.3.3 Junction 7 Options Assessment Matrix

Some of the Options assessed present a risk of impact on the hydrogeological environment. A summary of the Stage 2 assessment of the Junction 7 Options is provided in Table 1.5.

Table 1.5: Summary Assessment

Assessment Criteria	Option 1	Option 2
Groundwater Flow, Levels and Aquifer Vulnerability	Cuttings <5m Not significant or neutral PAG: 4	Cuttings 5-10m and earthworks associated with bridge foundations Minor or slightly negative PAG: 3
Karst	No karst features Not significant or neutral PAG: 4	No karst features Not significant or neutral PAG: 4
Groundwater Sources	No industrial or public supply groundwater abstractions Not significant or neutral PAG: 4	No industrial or public supply groundwater abstractions Not significant or neutral PAG: 4
Groundwater Contamination	No contaminated sites Not significant or neutral PAG: 4	No contaminated sites Not significant or neutral PAG: 4
Groundwater Flooding	Fenceline intercepts areas of groundwater flooding between R408 and Jackson bridge Not significant or neutral PAG: 4	Fenceline intercepts areas of groundwater flooding between R408 and Jackson bridge Not significant or neutral PAG: 4
Hydro-ecology	No groundwater dependent habitats Not significant or neutral PAG: 4	No groundwater dependent habitats Not significant or neutral PAG: 4
Scoring		
Qualitative Assessment	Not significant or neutral	Minor or slightly negative
Score/ Impact Level	4	3
Preference	Preferred	Least Preferred

1.4 Summary

The Stage 2 Junction Options assessment for the Maynooth to Leixlip Project has been assessed against the hydrogeological constraints identified within the study area.

Option 1 is Preferred because all the impacts are classified as imperceptible with a PAG ranking of not significant or neutral (4).

Option 2 is Least Preferred because there is a potential impact on the underlying aquifer associated with the earthworks and, resulting in a PAG ranking of minor or slightly negative (3).

1.5 References

NRA (2009) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.

Available from:

<https://www.tii.ie/technical-services/environment/planning/Guidelines-on-Procedures-for-Assessment-and-Treatment-of-Geology-Hydrology-and-Hydrogeology-for-National-Road-Schemes.pdf>

TII (2016) Project Appraisal Guidelines for National Roads Unit 7.0 Multi Criteria Analysis. Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

Groundwater Flood Data

<https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228> [Accessed: 18/08/2023]

Kildare County Council

Maynooth to Leixlip Project

Options Report - Stage 2 Hydrology
Junction Options Assessment

Draft | 31 August 2023

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Table 1.1: Rating of Significant Environmental Effects from the EPA Guidelines

Table 1.2: PAG Scoring System

Table 1.3: Correlation of NRA Guidelines Significance Rating to an equivalent TII PAG Score

Table 1.4: Junction 7 Option 1 Assessment

Table 1.5: Junction 7 Option 2 Assessment

Table 1.6: Junction 7 Options Assessment Matrix

1 Stage 2 Hydrology Junction Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Junction Options for the Maynooth to Leixlip Project with respect to the Hydrology constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4 and references are provided in Section 1.5.

1.2 Methodology

The Junction Options were assessed in accordance with the Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis (TII, 2016). The potential effects were assessed in accordance with the EPA's Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (2022). In determining the preferred option from a hydrology perspective, consideration was given to the following:

- The number of river/stream crossings with hydrologic connection to protected areas and to drinking water abstraction points with a potential to impact on water quality; and
- The risk of flooding to the works and elsewhere.

Data Sources

Data used for the assessment was obtained from the following online sources:

- EPA Water Online map: <https://gis.epa.ie/EPAMaps/Water>; and
- OPW online flood map: <https://www.floodinfo.ie/map/floodmaps/>.

These sources were accessed in August 2023.

The EPA Guidelines provide criteria for ranking hydrology effects within the study area. These criteria are presented in Section 3.7 (Assessment of Effects) of the Guidelines. Criteria for rating the significance of effects are contained within Table 3.4 of the Guidelines and are reproduced here in Table 1.1. The significance of the effect considers the attribute's importance and the predicted scale and duration of the likely effects.

Table 1.1: Rating of Significant Environmental Effects from the EPA Guidelines

Significance of Effects	Description of Effects
Imperceptible	An effect capable of measurement but without significant consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight Effects	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate Effects	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends
Significant Effects	An effect which, by its character, magnitude, duration or intensity, alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity, significantly alters most of a sensitive aspect of the environment
Profound Effects	An effect which obliterates sensitive characteristics

1.2.1 Scoring Procedure

The TII Project Appraisal Guidelines for National Roads (PAG) Unit 7.0 - Multi-Criteria Analysis provide a qualitative and quantitative procedure for scoring each option against the assessment criteria, as shown in Table 1.2.

Table 1.2: PAG Scoring System

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

The significance rating of environmental impacts from the EPA Guidelines have been correlated with the equivalent qualitative and quantitative assessment scores from the TII Project Appraisal Guidelines, as shown in Table 1.3.

Table 1.3: Correlation of NRA Guidelines Significance Rating to an equivalent TII PAG Score

Significance Rating (EPA Guidelines)	Equivalent PAG (Description)	EPA Description of Effect	Score
Imperceptible	Not significant or neutral	An effect capable of measurement but without significant consequences.	4
Not Significant	Minor or slightly negative	An effect which causes noticeable changes in the character of the environment but without significant consequences.	3
Slight Effects	Minor or slightly negative	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.	3
Moderate Effects	Moderately negative	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends	2
Significant Effects	Major or highly negative	An effect which, by its character, magnitude, duration or intensity, alters a sensitive aspect of the environment.	1
Very Significant	Major or highly negative	An effect which, by its character, magnitude, duration or intensity, significantly alters most of a sensitive aspect of the environment	1
Profound Effects	Major or highly negative	An effect which obliterates sensitive characteristics	1

The final stage of the assessment methodology was to ensure that the requirements of the TII PAG were met by assigning a score to each junction option based on the scoring procedure within these Guidelines. Using the effect scores and professional judgement, Preferred or Least Preferred rankings were assigned to each of the junction options.

1.3 Junction 7 Options Assessment

Each Junction Option was scored by how it was deemed to impact the hydrological constraints using the methodology previously outlined. This assessment is detailed in Table 1.4. and Table 1.5.

1.3.1 Option 1 – Maintain and Optimise/Improve Existing Junction

Table 1.4: Junction 7 Option 1 Assessment

Junction Option	Feature	Description of Attribute	Attribute's Importance	Magnitude of Effect	Score
Junction Option 1	M4 Eastbound Diverge works have hydrological connection to the Meadowbrook River	The Joan Slade River is a tributary of the Lyreen River, which ultimately flows to the Liffey River via the Rye Water	High The Joan Slade River is hydrologically connected to the Rye Water Valley SAC. The Water Framework Directive (WFD) Status (2016-21) of the Joan Slade River is Poor	Imperceptible No noticeable risk of serious pollution incidents during construction and operation. Negligible increase in predicted peak flood level.	4

1.3.2 Option 2 – Provide a New Junction

Table 1.5: Junction 7 Option 2 Assessment

Junction Option	Feature	Description of Attribute	Attribute's Importance	Magnitude of Effect	Score
Junction Option 2	New Junction between Straffan Road and Newtown Road	The M4 between J7 and J8 frequently floods because of the Lyreen River. The Lyreen River is a tributary of the Rye Water.	High The Lyreen River is hydrologically connected to the Rye Water Valley SAC. The WFD Status (2016-21) of the Meadowbrook River is Poor.	Not Significant No noticeable risk of pollution, only possible during a flooding scenario. Insignificant increase in predicted flood peak from impervious areas.	3

1.3.3 Assessment Matrix of Junction 7 Options

Table 1.6: Junction 7 Options Assessment Matrix

Assessment Sub-criteria	Option 1	Option 2
Hydrology	The works at the Eastbound Diverge have hydrological connection to the Joan Slade River, a tributary of the Lyreen River. The Lyreen River is a hydrologically connected to the Rye Water Valley SAC. Imperceptible pollution risk expected during construction or operation.	The M4 motorway between Junction 7 and Junction 8 is impacted by the 1% Annual Exceedance Probability (AEP) flood, and there is a risk to water pollution during flood events. Not Significant pollution during construction as risk increases only during flooding.
Flood Risk	The M4 motorway between J7 and J8 floods for the 1% AEP and the Eastbound Diverge may be impacted. The increase in the impervious surface is very small. Imperceptible increase in flood risk to the works and elsewhere.	The M4 motorway between Junction 7 and Junction 8 floods for the 1% AEP and the Eastbound Diverge may be impacted. The increase in the impervious surface is small. Negligible increase in flood risk to the works and elsewhere.
Scoring		
Qualitative Assessment	Not Significant or Neutral	Minor or Slightly Negative
Score/ Impact Level	4	3
Preference	Preferred	Least Preferred

1.4 Summary

The two junction options were assessed in terms of their hydrological (water quality impact) and flood risk. The two options have similar hydrological and flood risk impact.

Option 1 is Preferred and Option 2 is Least Preferred.

This is because Option 1 involves less additional impervious area resulting in reduced water quality and flood risk impact.

1.5 References

EPA (2022). Guidelines on the information to be contained in Environmental Impact Assessment Reports. Environmental Protection Agency, Ireland.

EPA online map viewer: [EPA Maps](#).

OPW online flood map viewer: [Flood Maps - Floodinfo.ie](#).

TII (2016). Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis (PE-PAG-0231). Transport Infrastructure Ireland.

Kildare County Council

Maynooth to Leixlip Project

Options Report - Stage 2 Landscape
and Visual Junction Options
Assessment

Draft 1 | 31 August 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Table 1.1: Sensitivity Weighting

Table 1.2: TII Project Appraisal Guidelines Scoring Criteria

Table 1.3: Landscape and Visual Assessment Matrix of Junction 7 Options

1 Stage 2 Landscape and Visual Junction Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Junction Options for the Maynooth to Leixlip Project with respect to the Landscape and Visual constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4 and references are provided in Section 1.5.

1.2 Methodology

The Landscape and Visual Stage 2 assessment is primarily desktop, based on understanding the character of the existing landscape with specific reference to Landscape and Visual references in the Kildare County Development Plan 2023 – 2029.

The assessment has had regard to the following documents:

- Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Specified Infrastructure Projects – Overarching Technical Document (PE-ENV-01101), December 2020 TII;
- Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Proposed National Roads - Standard (PE-ENV-01102), December 2020 TII;
- Guidelines on the information to be contained in Environmental Impact Assessment Reports, 2022 EPA;
- Guidelines for Landscape and Visual Impact Assessment, 3ed. April 2013 Landscape Institute & Institute of Environmental Management and Assessment;
- Project Appraisal Guidelines for National Roads Unit 7.0 – Multi-Criteria Analysis (PE-PAG-02031), October 2016 TII¹; and
- Kildare County Development Plan 2023-2029, Kildare County Council, 2022.

For the purposes of the assessment, the plan and profiles for each junction option were analysed along with any associated structures and anticipated changes to the landscape fabric.

¹ PE-PAG-02031, TII (2016). Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

Due to the magnitude of the proposed road infrastructure, any option within this landscape would result in significant landscape/townscape and visual impacts. The nature, extent and duration of such impacts will depend on the intensity of the proposed development, the proximity of residential and related amenity uses, the magnitude of direct impact, the degree and duration of disruption, the sensitivity of the resource and the rarity and/or uniqueness of the landscape. Impacts on the Landscape and Visual environment are also influenced by the interaction with other effects such as community/human beings, heritage, noise and air quality.

In assessing the junction options the following main elements of each were considered as to whether they have the potential for Landscape and Visual impact:

- During construction:
 - Removal of existing vegetation;
 - Demolition of existing residential properties;
 - Landtake and severance;
 - General construction disturbance including excavations, earthworks, construction activity and traffic, lighting and relating noise, dust etc.; and
 - Planting of mitigation vegetation.
- During operation:
 - Significant, elevated structures such as earth retaining walls and bridges;
 - Significant road cutting slopes and embankments;
 - Junctions;
 - Noise barriers and gantry signage;
 - Moving traffic; and
 - Night time lighting effects.

Other elements such as low-level signage, median barriers, culverts, fencing etc. are an integral part of most roads and will have little or no landscape impact due to their small scale in relation to the wider development, and limited off-scheme visibility.

For the purpose of this assessment the details such as signage, lighting and noise barriers are deemed similar for each option. The main element which will differ between the options is geometry and therefore the focus of the assessment include:

- The location and direction through the landscape and what physical impact that will involve;
- The size and height of the embankments, cuttings or elevated structures required for the option which will affect the visual impact;
- The proximity to receptors with clear views, in particular residential receptors; and

- The potential a particular junction option has for mitigation.

1.2.1 Scoring Procedure

Using site knowledge and digital data (GIS/CAD mapping), the number of landscape features, designation and visual receptors within the baseline/receiving environment were analysed and quantified for each option within separate criteria including:

- Landscape - designated landscapes/amenity/recreation features, designated archaeological features, natural landscape features, demesne/designated landscape features; and
- Visual – residential properties, designated views, designated routes, amenity users, designated visual units.

A sensitivity rating (defined in Section 3.1.9 of TII PE-PAG-02031) was then applied to each landscape criteria giving a score rating for each option. The sensitivity weightings applied are shown in Table 1.1.

The primary visual receptors applicable to this assessment are users of residential properties. These are allocated a sensitivity rating of ‘high’ as “*viewers with a proprietary interest and prolonged viewing opportunities such as residents*” – This and Section 3.1.9 of TII PE-PAG-02031 would correspond to a weighting of 3 per receptor. For the purposes of the quantification, one receptor is counted per residential property, given that it is not within the scope of this assessment to determine the number of residents present per property. Every receptor with the potential to experience a significant effect was counted and multiplied by the weighting to provide the score rating for each option.

Table 1.1: Sensitivity Weighting

Weighting	Landscape Sensitivity
1	Low
2	Medium
3	High
4	Very High

It is not intended that the sum of each of the individual scores be used in selecting a preferred option. The overall impact will depend on the sensitivity, context and strength of the individual impacts and a professional judgement by the landscape specialist has been used to weigh up the individual impacts and form a view as to the likely overall impact of the option.

For each option, a qualitative assessment based on professional judgement was then undertaken with an impact rating for each option using the scoring procedure set out in Section 2.4 of TII PE-PAG-02031, this is listed below.

Table 1.2: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Thereafter, a ranking of preference based on likely significant Landscape and Visual impacts is provided for the options.

1.3 Junction 7 Options Assessment

1.3.1 Option 1 – Maintain and Optimise/Improve Existing Junction

Junction Option 1 would have impacts on some areas of roadside planting on the existing M4 from the modification of the junction and from the construction of the M4 Eastbound Diverge. This has the potential for localised impacts on landscape and visual receptors through the reduction in the existing screening of the M4, leading to increased awareness of traffic movement and noise. There would be a loss of trees and hedgerows from several sections of field boundaries which will be intersected by the Maynooth Outer Orbital Route and the Eastbound Diverge. The introduction of new road infrastructure into the undeveloped area between the existing M4 and the southern fringe of Maynooth would effectively eliminate the landscape buffer between the town and the motorway corridor. The changes are likely to result in localised significant effects on the landscape character of this urban / rural fringe area.

There would be an increase in traffic movement, noise and lighting within proximity to residential areas with likely significant effects on residential receptors, most notably at Brookfield Avenue, Brookfield Park and Straffan Crescent due to proximity and minimal existing screening. Other residential receptors are likely to experience a greater level of screening from existing hedgerows but significant effects could be expected in the winter months. The construction and operation of this option would also result in landtake from an area of amenity land adjacent to Brookfield Avenue which is likely to be a significant effect.

The provision of mitigation such as roadside planting and noise barriers, would be important in order to reduce significant effects. It is expected that significant negative effects could be reduced to moderate negative effects over the medium-term as planting establishes to a suitable density and height to screen traffic movement.

1.3.2 Option 2 – Provide a New Junction between Newtown Road and Straffan Road and convert the existing to an Overbridge

Option 2 is also likely to result in a locally significant effect on landscape character resulting from the introduction of new road infrastructure within the buffer area between the existing M4 and the southern edge of Maynooth. For the proposals north of the M4, there will be a similar loss of field boundary hedgerows as for Option 1, but there would be a greater loss of existing roadside planting to facilitate the new junction and filter lanes. The introduction of new road infrastructure to the south of the M4 would result in the loss of further trees and hedgerows from sections of field boundaries and is likely to lead to significant localised effects on the landscape fabric and character of this rural area as well as additional severance of land. Effects on residential receptors in the local area would also be likely with potential for significant construction effects, however, the presence of several intervening hedgerows is likely to limit operational effects to moderate.

As with Option 1, the provision of mitigation such as roadside planting and noise barriers, would be important in order to reduce significant effects. It is expected that significant negative effects could be reduced to moderate negative effects over the medium-term as planting establishes to a suitable density and height to screen traffic movement.

1.3.3 Assessment Matrix of Junction 7 Options

The assessment matrix for the junction options is shown below in Table 1.3 Landscape and Visual Assessment Matrix of Options.

Table 1.3: Landscape and Visual Assessment Matrix of Junction 7 Options

Assessment Criteria (Sensitivity Weighting in brackets)	Junction 7 – Option 1	Junction 7 – Option 2
Landscape Assessment		
Local Amenity Landscapes (2)	1 (2)	0
Archaeological Features (3)	0	0
Architectural Heritage Features (2)	0	0
Natural Landscape Features (2) – topographical features, rivers, trees/hedgerows	17 (34)	23 (46)
Demesne Features (3)	0	0
Landscape Scoring	36	46

Assessment Criteria (Sensitivity Weighting in brackets)	Junction 7 – Option 1	Junction 7 – Option 2
Visual Assessment		
Residential Properties/ Receptors (3)	78 (234)	98 (294)
Designated views/scenic routes/areas (3)	0	0
Visual Scoring	234	294
Qualitative Assessment		
Qualitative Assessment	Major or highly negative. Impacts are limited to the north side of the existing M4. Although a section of the proposed road infrastructure would be closer to residential properties on the southern edge of Maynooth their lower elevation results in less wide-ranging effects due to the presence of existing screening hedgerows and built form. This option directly impacts on an amenity area.	Major or highly negative. Although this option generally has a greater distance to residential receptors in Maynooth, the greater elevation of the junction infrastructure results in more wide-ranging effects. The proposal also impacts on the landscape fabric, landscape character and visual amenity to the south of the existing M4.
Score/ Impact Level	1	1
Preference	Preferred	Least Preferred

1.4 Summary

Although both options would be likely to result in significant localised effects on landscape fabric, landscape character and residential receptors, Option 1 is Preferred due to the reduced vertical alignment, reduced overall footprint as well as the exclusion of any proposals within the rural area to the southern side of the M4 corridor.

There are some benefits to Option 2 such as the increased distance between the proposed horizontal road alignment and residential areas on the southern edge of Maynooth, which is likely to reduce visual effects on receptors in the nearest areas. However, the greater height of the embanked road infrastructure, the provision of the proposed bridge and additional proposals to the south of the M4 result in more wide-ranging effects on other residential properties, thereby nullifying this benefit and resulting in greater overall visual effects. That being said, a significant negative effect is likely for Option 1 from landtake to the amenity area on Brookfield Avenue, which is not the case for Option 2.

Although Option 1 is seen as the preferable option in terms of landscape and visual impacts, it still results in significant effects, most notably from the proximity to residential properties at Brookfield Avenue and the direct impact on the adjacent amenity area. If this is taken forward as the Preferred Option further consideration of mitigation in the design could be carried out to mitigate these impacts where feasible.

1.5 References

Kildare County Council (2023) Kildare County Development Plan 2023 -2029

EPA (2022). Guidelines on the Information to be contained in Environmental Impact Assessment Reports.

TII. (2020). Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Specified Infrastructure Projects – Overarching Technical Document (PE-ENV-01101).

TII (2020). Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Proposed National Roads - Standard (PE-ENV-01102).

EPA (2022). Guidelines on the information to be contained in Environmental Impact Assessment Reports.

Landscape Institute & Institute of Environmental Management and Assessment (2013). Guidelines for Landscape and Visual Impact Assessment, 3rd edition.

TII (2016). Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis (PE-PAG-02031).

Kildare County Council (2022) Kildare County Development Plan 2023-2029.

Kildare County Council

Maynooth to Leixlip Project

Options Report - Stage 2 Material
Assets – Non-Agriculture Junction
Options Assessment

Draft 1 | 31 August 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Table 1.2: Junction 7 Options Area of New Pavement

Table 1.3: Criteria for Assessing the Significance of Impact on Properties and Land Use

Table 1.4: Criteria for Assessing the Significance of Impact on Utilities and Services

Table 1.5: Properties and Land Use Assessment

Table 1.6: Utilities and Services Assessment

Table 1.7: Material Assets Summary Assessment Matrix

1 Stage 2 Material Assets – Non-Agriculture – Junction Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Junction 7 Options for the Maynooth to Leixlip Project with respect to the Material Assets Non-Agricultural constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4.

1.2 Methodology

The following guidelines and legislation were referred to when undertaking this assessment:

- European Union (2018) (Planning and Development) (Environmental Impact Assessment) Regulations. (SI 296 of 2018);
- Environmental Protection Agency (EPA) (May 2022) Guidelines on the Information to be contained in Environmental Impact Assessment Reports¹; and
- Transport Infrastructure Ireland (TII) (2016) Project Appraisal Guidelines Unit 7.0 - Multi Criteria Analysis, PE-PAG-02031².

This assessment is a desktop assessment of available data sources. The desktop study considered the following sources of information i.e., aerial mapping / photography³, Property Registration Authority of Ireland (PRAI)⁴ database.

1.2.1 Scoring Procedure

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG scoring procedure. The PAG seven-point scale scoring procedure is shown in Table 1.1.

¹ Environmental Protection Agency (EPA) (May 2022) Guidelines on the Information to be contained in Environmental Impact Assessment Report. Available from:

https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf [Accessed 4th September 2023]

² Transport Infrastructure Ireland (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf> [Accessed: 4th September 2023]

³ Google Aerial Mapping (2023). Available from: <https://www.google.com/maps> [Accessed: September 2023]

⁴ Property Registration Authority (2021). Available from <https://www.landdirect.ie/index> [Accessed in 2021 and 2022]

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

In the first instance, individual assessments were carried out on each criterion followed by an overall assessment. A score was then assigned to both Junction 7 Options based on the TII PAG seven-point scale, and the overall preference for each Junction 7 Option of Preferred or Least Preferred was assigned using a combination of the assessment criteria results and professional judgement.

1.2.2 Assessment Criteria Overview

The layout of the junction is the primary differentiator between the Junction 7 Options. The surface area of the pavement gives an indication into the changes required to the junction layout. The surface areas of pavement are summarised in Table 1.2. This criterion is used to carry out the assessment on Properties and Land Use and Utilities and Services, and also to determine a preferred Junction 7 Option.

Table 1.2: Junction 7 Options Area of New Pavement

Junction Option	Pavement Area
Junction 7 Option 1	5,274m ³
Junction 7 Option 2	9,940m ³

1.2.3 Assessment Criteria for Properties and Land Use

For the purposes of assessing direct impacts on properties, the extent of both Junction 7 Options is considered to include all lands required for the construction and operation of new infrastructure.

Both options would directly impact one property, removing the existing access to the dwelling. Alternative access would be provided. Option 2 would negatively impact businesses located to the south of Junction 7, as westbound traffic diverging from the M4 would no longer pass by the businesses.

The potential impact of the Junction 7 options on properties is assessed according to the significance criteria detailed in Table 1.3.

Table 1.3: Criteria for Assessing the Significance of Impact on Properties and Land Use

Significance Level/ Degree of Impact	Definition
Major or Highly Negative Profound	A non-agricultural property of national or regional importance is fully within the option extent and will be removed by the proposed option
Moderately Negative	A non-agricultural property or other material asset is fully within the option extent and may result in the demolition or acquisition of a dwelling or, or where acquisition of a property results in loss of employment and total or partial loss of the business
Minor or Slightly Negative	Part of a non-agricultural property or other material asset is within the option extent
Not Significant or Neutral	An impact on a property which is currently occupied by a public right-of-way, e.g., a road or the non-agricultural property or other material asset is in the vicinity of the option but outside the option extent

1.2.4 Assessment Criteria for Utilities and Services

The locations of existing utilities were requested from relevant utility service providers. Key utilities and services have been identified and used to inform this assessment.

In summary, at Stage 2 in the assessment and comparison of the Junction 7 Options, impacts on larger utilities and services were considered as high impact and differentiating factors. The following utilities and services were considered:

- ESB High Voltage (i.e., 38kV, 110kV and 220kV) Overhead Lines;
- ESB High Voltage Underground Lines;
- ESB Medium Voltage (i.e., 10kV, 20kV) Overhead Lines;
- ESB Substations;
- Gas Networks Ireland Infrastructure;
- Irish Water watermains;
- Irish Water foul and combined sewers;
- Water/wastewater treatment plants;
- Telecoms Antennas;
- Eir underground services; and
- E-Net services.

The potential impact of both options on services and utilities is assessed according to the significance criteria detailed in Table 1.4.

Table 1.4: Criteria for Assessing the Significance of Impact on Utilities and Services

Significance Level/ Degree of Impact	Definition
Major or Highly Negative Profound	Removal of a service or utility that is of national or regional importance
Moderately Negative	Major diversion of High Voltage ESB lines (38kV, 110kV or 220kV) or fibre optic telecoms
Minor or Slightly Negative	Minor diversion of High Voltage ESB lines (38kV, 110kV or 220kV) or fibre optic telecoms
Not Significant or Neutral	The diversion of low and medium voltage ESB network, telecommunications or water supply or foul sewer services

1.3 Junction 7 Options Assessment

1.3.1 Properties and Land Use

There are no amenities located within the extents of the Junction 7 options.

Adjacent to the Junction 7 options, there are a number of businesses including the Maynooth Business Campus and Barretts Ltd./Earthridge International Ltd. The Properties and Land Use assessment is summarised in Table 1.5.

Table 1.5: Properties and Land Use Assessment

Assessment Criteria	Junction 7 Option 1	Junction 7 Option 2
Residential	One impacted residential property	One impacted residential property
Commercial/Industrial	The Maynooth Business Campus and businesses adjacent to this option would be directly impacted	The Maynooth Business Campus adjacent to Junction 7 Option 2 would not be directly affected. The businesses adjacent to this option would be negatively affected
Amenity	There are no impacted amenities within Junction 7 Option 1 or Junction 7 Option 2	
Other	N/A	
Qualitative Assessment	Minor or Slightly Negative	Moderately Negative
Score/Impact Level	3	2
Preference	Preferred	Least Preferred

1.3.2 Utilities and Services

There are HV(38kv) and MV/LV(10kv/20kv) ESB overhead lines located to the north of the M4 in the proposed location of the Maynooth Outer Orbital Route for both options. Additionally, there are MV/LV(10kv/20kv) ESB overhead lines in the vicinity of the westbound junction loop of Option 2 to the south of the M4.

There are ESB underground services crossing the Option 1 westbound slip road. The underground services are comprised of MV/LV underground cables which cross the M4 80m from the start of the diverge nose and travel alongside the proposed slip road.

There are two sub-stations located in the greater Maynooth area. The Maynooth 220kv substation is located 2km south of Junction 7 and the Moneycooley 38kv sub-station is located 500m to the east of Junction 7. Both sub-stations run overhead cables through both options.

There is a culvert to allow the Meadowbrook River to pass under the M4. In both options, the Maynooth Outer Orbital Route would cross the Meadowbrook River. Stormwater drains (Ø600mm) are located along the M4 parallel to the road while a stormwater drain (Ø700mm) crosses below the Option 1 westbound diverge slip road.

No gas infrastructure would be impacted by either option. There is a watermain on the western side of the R406 in the area where the proposed junction of the westbound slip and the R406 in Option 1.

There is a combined gravity sewer mains running alongside the R406 at the location of the junction between the proposed westbound slip road and the R406. The gravity combined sewer is located on the eastern side of the R406 in Option 1. No water services/ wastewater services in the area would be affected.

There is Eir services located on the west side of the R406 running parallel to the road. The services would be located adjacent to the proposed junction between the R406 and the westbound slip road for Option 1. No BT infrastructure would be impacted by either option. UPC - Virgin media cables are located in the Brookfield Avenue but would not be impacted by either option.

The assessment is summarised in Table 1.6.

Table 1.6: Utilities and Services Assessment

Assessment Criteria	Option 1	Option 2
ESB High Voltage (i.e., 38kV, 110kV and 220kV) Overhead Lines (HV OH)	ESB lines located to the north of Junction 7 for Option 1 and Option 2	
ESB High Voltage Underground Lines (HV UG)	N/A	
ESB Medium Voltage (i.e., 10kV, 20kV) Overhead Lines (MV OH)	ESB lines located to the north of Junction 7 Option 1	ESB lines located to the north and south of Junction 7 Option 2
ESB Substations	Two sub-stations are located to the south of the M4 (Maynooth 220kv) and to the southeast of the M4 (Moneycooley 38kv)	
Gas Networks Ireland MP gas mains	N/A	
Gas Networks Ireland LP gas mains	N/A	
Irish Water watermains	Minimal impact to the watermains located at the westbound slip road	N/A
Irish Water foul or combined sewers	Minimal impact to the sewer located at the westbound slip road	N/A
Water/wastewater treatment plants	N/A	
Eir underground services	Minimal impact to the Eir services located at the westbound slip road	N/A
Other	N/A	
Qualitative Assessment	Moderately Negative	Moderately Negative
Score/Impact Level	2	2
Preference	Preferred	Least Preferred

The overall ranking preferences for the Junction 7 Options in terms of material assets are shown in Table 1.7.

Table 1.7: Material Assets Summary Assessment Matrix

Assessment Criteria	Option 1	Option 2
Properties	There is one residential property to be impacted by Junction 7 Option 1	There is one residential property to be impacted by Junction 7 Option 2 along with two commercial properties
Utilities	There is a requirement to relocate HV and MV OH lines to the north of the M4	There is a requirement to relocate HV and MV OH lines to the north of the M4 and a requirement to relocate MV OH lines to the south of the M4
Qualitative Assessment	Moderately negative	Moderately negative
Score/Impact Level	2	2
Preference	Preferred	Least Preferred

1.4 Summary

Both Junction 7 Options have a similar moderately negative impact from a properties and utilities perspective primarily because they are both within predominantly greenfield sites. Junction 7 Option 1 would negatively impact one residential property and both HV and MV/LV overhead lines to the north of the M4. Junction 7 Option 2 would negatively impact one residential property and two commercial properties. Additionally, Junction 7 Option 2 would negatively impact both HV and MV/LV overhead lines to the north and south of the M4.

Junction 7 Option 2 is Least Preferred due to the additional negative impacts on commercial properties and utilities.

Junction 7 Option 1 would not negatively impact commercial properties and has impacts fewer MV/LV overhead lines, and therefore is Preferred.

Kildare County Council

Maynooth to Leixlip Project

Options Report – Stage 2 Noise and
Vibration Junction Options
Assessment

Draft 1 | 31 August 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Table 1.1: Summary of AADT Data used for Junction 7 Stage 2 Assessment

Table 1.2: Classification of magnitude of traffic noise impacts in long term (DMRB 2020)

Table 1.3: TII PAG Impact Scoring Criteria

Table 1.4: Potential Impact Rating within 100m of Option 1

Table 1.5: Potential Impact Rating within 100m of Option 2

Table 1.6: Junction 7 Options Assessment Matrix

1 Stage 2 Noise and Vibration - Junction Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Junction Options for the Maynooth to Leixlip Project with respect to the Noise and Vibration constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4 and references are provided in Section 1.5.

1.2 Methodology

There are two Junction 7 options identified as part of the Phase 2 Stage 2 process. These are summarised as follows:

Junction 7 Option 1:

This option would consist of maintaining and optimising/improving the existing junction. In order to provide an optimised junction arrangement, the eastbound diverge would be shifted west slightly along the M4 mainline. Option 1 would include a signalised diamond junction by realigning the westbound diverge.

Junction 7 Option 2:

This option would include a new grade separated junction and convert the existing Junction 7 to an overbridge. The provision of a new grade separated junction and conversion of the existing junction to an overbridge would facilitate the enhancement of the existing active travel infrastructure on Straffan Road.

The assessment has ranked the junction options in order of preference considering their potential impacts to Noise and Vibration on the surrounding environment.

1.2.1 Data Sources

For guidance on the Noise and Vibration impact assessment, reference has been made to the following guidance documents:

- Section 5.0 of the Guidelines for the Treatment of Noise and Vibration in National Road Schemes (TII Noise Guidelines 2004)¹

¹ Transport Infrastructure Ireland, Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2004. Available from: https://www.tii.ie/technical-services/environment/planning/Guidelines_for_the_Treatment_of_Noise_and_Vibration_in_National_Road_Schemes.pdf

- Section 2 of the 2014 Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (TII Noise Guidelines 2014)²
- UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability and Environmental Appraisal LA 111 Noise and Vibration Revision 2 (DMRB 2020)³

This assessment has also been carried out in accordance with the requirements of the TII Project Management Guidelines⁴, and the TII Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis PE-PAG-02031, October 2016⁵.

1.2.2 Noise

In terms of operational noise, the TII Noise Guidelines 2004¹ and TII Noise Guidelines 2014² consider it appropriate to set the design goal for road traffic noise for new national roads in Ireland as follows:

- Day-evening-night 60 dB L_{den} (free field)

The following three conditions must be satisfied under the TII guidelines for noise mitigation to be provided:

- The combined expected maximum traffic noise level, i.e., the relevant noise level, from the proposed junction option together with other traffic in the vicinity is greater than the design goal of 60 dB L_{den};
- The relevant noise level is at least 1 dB more than the expected traffic noise level without the proposed junction option in place; and
- The contribution to the increase in the relevant noise level from the proposed junction option is at least 1dB.

Both of the TII documents referred to above acknowledge that it may not always be sustainable to achieve this design goal. In such circumstances, nevertheless, a structured approach should be taken to ameliorate as far as practicable road traffic noise through the consideration of measures such as alignment changes, barrier type (e.g., earth mounds) or low noise road surfaces.

² Transport Infrastructure Ireland, Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes, 2014. Available from: https://www.tii.ie/technical-services/environment/planning/Good_Practice_Guidance_for_the_Treatment_of_Noise_during_the_Planning_of_National_Road_Schemes.pdf

³ UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability and Environmental Appraisal LA 111 Noise and Vibration Revision 2 (hereafter referred to as DMRB Noise and Vibration) (UKHA 2020); Available from <https://www.standardsforhighways.co.uk/prod/attachments/cc8cfcf7-c235-4052-8d32-d5398796b364?inline=true>

⁴ Transport Infrastructure Ireland, Project Management Guidelines PE-PMG-02041, 2020. Available from: <https://www.tiipublications.ie/library/PE-PMG-02041-03.pdf>

⁵ Transport Infrastructure Ireland, Project Appraisal Guidelines for National Road Schemes Unit 7.0 – Multi Criteria Analysis, October 2016. Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

It has been assumed for the purpose of this assessment that existing noise barriers or earth embankments along the existing M4 shall be replaced with an equal or enhanced construction depending on identified impacts during the detailed design assessment in areas where widening into the verge is required.

1.2.3 Vibration

In terms of vibration, the TII Noise Guidelines 2004¹ and TII Noise Guidelines 2014² note that road traffic along normal well-maintained surfaces, in line with junction options, generates very low levels that are normally not perceptible to building occupants. Vibration magnitudes from road traffic are also orders of magnitude below those associated with any form of cosmetic damage to buildings and vulnerable structures. For the purposes of this assessment, therefore, it is assumed that both junction options will have a comparable low vibration impact during their operational phase and vibration is not assessed further from a ranking point of view.

1.2.4 Construction Noise and Vibration Impacts

The potential noise or vibration impacts associated with the construction of either junction option will require new road construction and construction of new bridges/overpasses etc.

The potential noise and vibration impacts associated with the construction phase of both junction options will be of short-term duration (less than 7 years). The construction phase for each junction option will be undertaken using standard road construction techniques and will be controlled through the use of construction noise limits.

During the construction phase, there is potential for minor vibration levels to be generated depending on the works involved, however the magnitude of which will be orders of magnitude below those associated with any form of building or structure cosmetic damage. Any construction activity will be controlled through strict vibration limits.

Based on the above, given the temporary to short term and localised impacts associated with this specific work area would not have a significant effect overall on the preference of one option over another. No further consideration has therefore been given to the construction phase to differentiate either junction option.

1.2.5 Assessment Methodology

The assessment of potential noise impacts and ranking of junction options is based upon property counts and on the calculated change in traffic noise levels as a result of alignment changes and any forecast changes in traffic flows. The assessment also considers the likely requirement for noise mitigation measures based on triggering the three conditions for noise mitigation discussed above. The following steps have been taken to assess the impact rating of each of the junction options under consideration:

- Property counts have been conducted within two bands from the edge of each junction option, i.e., 0 to 50m and 50 to 100m. Using this information, the Potential Impact Ratings (PIR) for each junction option were established.
- The change in noise level between the Do Minimum and Do Something scenario at the closest noise sensitive locations (NSLs) for each junction option was established considering the horizontal alignments, projected future traffic flows along the existing M4 and the junction roads.
- An assessment of the potential number of properties likely to be increased by 1dB, and hence require noise mitigation was determined.

In summary, the potential noise impacts and ranking of junction options is based on the following assessment criteria:

- Potential Impact Rating (PIR) (Quantitative);
- Potential Changes in Traffic Noise Levels (Quantitative); and
- Likely need for Noise Mitigation (Qualitative).

Each of the above criteria for the two junction options are discussed in detail in the following sections.

1.2.5.1 Potential Impact Rating (PIR)

A Potential Impact Rating (PIR) based upon property counts for each junction option has been used to determine which junction option has the lowest nominal potential impact on existing properties.

For this study, property counts of Noise Sensitive Receptors (NSRs) include existing residential properties, hospitals and medical buildings, educational buildings and religious buildings which were identified using OS mapping data and Geo-directory data provided by the design team.

The number of NSRs potentially sensitive to noise and/or vibration within 300m of each of the proposed junction options has been identified.

Property counts have been undertaken for four bands from the centreline of each junction option, i.e., 0 to 50m, 50 to 100m, 100 to 200m and 200 to 300m. A weighting value for each distance band has been applied with a weighting factor of 4 for the closest distance band (0 to 50m) down to 1 for the furthest distance band (200 to 300m). For the PIR assessment, the calculated weighted value for each distance band is summed to obtain a total PIR value. The junction option with the lowest PIR has the lowest nominal potential noise impact on existing NSRs.

1.2.5.2 Assessment of Change in Traffic Noise Levels and Likely Need for Noise Mitigation

The potential traffic noise levels associated with each junction option have been calculated using the horizontal road alignments, projected traffic volumes and traffic speed. This review has been undertaken to assess the change in noise levels between the Do-Minimum and Do Something scenario for each junction options.

For this Stage 2 assessment, traffic flows in Annual Average Daily Traffic (AADT) flows, percentage Heavy Goods Vehicles (HGVs) and indicative working horizontal alignments have been provided by the design team.

Proprietary noise calculation software, SoftNoise Predictor, was used to calculate traffic noise levels at the closest NSRs for each junction option. The software calculates traffic noise levels in accordance with Calculation of Road Traffic Noise (CRTN) and TII guidance using the following methodology:

- The potential traffic noise levels at the affected NSRs associated with each junction option has been established considering the indicative horizontal alignments in addition to Annual Average Daily Traffic flows (AADT). Table 1.1 presents the AADT flows that were used for noise calculations.
- Noise levels were calculated at the same assessment locations for the Do Minimum scenario. This was undertaken to calculate changes in traffic noise at properties adjacent to each junction option and to determine likely requirements for noise mitigation.
- A standard hot rolled asphalt road surface was used for both options. A traffic speed of 120km/hr was modelled for M4 Road and a speed of 50 km/hr was modelled for all new junctions roads.

Table 1.1 presents the traffic flow data in AADT, rounded to the nearest 100. The percentage HGV traffic on all junction links has been modelled at 1%.

Table 1.1: Summary of AADT Data used for Junction 7 Stage 2 Assessment

Scenario	M4 West of Junction 7		Parallel Road North of M4		Junction Link to M4		M4 Overbridge	
	AADT	% HGV	AADT	% HGV	AADT	% HGV	AADT	% HGV
Do Minimum	54,500	8%	N/A	N/A	N/A	N/A	N/A	N/A
Option 1	50,600	8%	2,400	1%	3,300	1%	N/A	1%
Option 2	47,500	8%	11,000	1%	21,400	1%	10,300	1%

In the absence of any Irish guidelines or standards relating to assessing the effects associated with changes in road traffic noise levels, reference is made to the UK's Design Manual for Roads and Bridges (DMRB) LA 111 Noise and vibration (2020)³. This document provides suggested magnitude rating tables relating to changes in noise levels associated with road traffic noise.

The magnitude of impacts is assessed by comparing the Do Minimum noise level against the Do Something scenario. The calculated road traffic noise levels used in this study relate to the future design year, hence in line with the DMRB guidance, the following magnitude of change is applied for the long-term period (design year) as shown in Table 1.2.

Table 1.2: Classification of magnitude of traffic noise impacts in long term (DMRB 2020)

Long-term Magnitude	Long-term Noise Change, dB
Major	Greater than or equal to 10.0
Moderate	5.0 to 9.9
Minor	3 to 4.9
Negligible	Less than 3.0

For each junction option, the calculated change in traffic noise level has been determined and ranked in accordance with Table 1.2. The change can be related to either positive changes (decrease in noise levels) or negative changes (increase in noise levels).

1.2.6 Scoring Procedure

The comparative evaluation of junction options has been assisted by scoring of impacts for each of the junction options using a summary assessment matrix broadly based on Table 7.1.2 of the Project Appraisal Guidelines for National Roads Unit 7.0 - Multi-Criteria Analysis (TII PAG).

Each impact is scored based on the PAG seven-point Likert scale (listed below) and a number assigned according to the level of significance of the impacts.

Table 1.3: TII PAG Impact Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

The PAG score assigned to both junction options is based on a comparison of that junction option with the Do Minimum Option.

Following the assessment methodology process outlined in this section, a determination is made as to whether each junction option is either Preferred or Least Preferred based on a combination of the assigned impact scores, the specific impacts and professional judgement and compares the junction options against each other.

1.3 Junction 7 Options Assessments

1.3.1 Junction Option 1 - Maintain and Optimise/Improve Existing Junction

Potential Impact Rating

Option 1 would include the Maynooth Outer Orbital Route (MOOR) between Jackson's Bridge and Junction 7 which would be located north of and parallel to the M4. The MOOR would be located south of the residential properties at Staffan Crescent, Brookfield Avenue, Brookfield Park and Newtown Court. The closest NSRs within 50m of the new road centreline are those at Brookfield Avenue and Brookfield Park. Counts of NSRs between 0-50m and 50-100m of the centreline of Option 1 was undertaken. These are summarised in Table 1.4.

Table 1.4: Potential Impact Rating within 100m of Option 1

Property Counts	0 – 50m	50 – 100m	Total
Option 1 – Number of Properties	8	55	63
PIR Weighted Value	4	3	
Potential Impact Rating	32	165	197

The total PIR for this option is 197, within a distance band of 100m. There are 8 NSRs within 50m of the centreline of the full junction alignment. The closest NRs are those in Brookfield Avenue and Brookfield Park.

Change in Traffic Noise Levels

A total of 20 receiver locations representative of the closest NSRs were modelled along the extent of Junction Option 1 and also for the Do Minimum Scenario using the methodology described above and traffic flows forecast along the new junction roads and the existing M4. The difference in noise levels between the Do Minimum and Do Something scenarios was then determined.

The difference in traffic noise level is calculated to be less than 1 dB(A) at the closest modelled NSRs. The negligible change is due to the road traffic remaining dominated by traffic along the mainline traffic lanes which comprises significantly higher volumes of cars, light goods vehicles (LGVs) and heavy goods vehicles (HGVs) compared to the small volume of traffic forecast along the MOOR which is located south of NSRs at Brookfield Avenue and Brookfield Park. Reference to Table 1.2 confirms the change in noise level is negligible.

The assessment has concluded the operation of Option 1 would result in a negligible change in traffic noise levels at the modelled NSRs compared to the Do Minimum scenario. There are no properties where the TII conditions for noise mitigation are likely to be triggered. This is based on the preliminary information at this stage in terms of indicative horizontal alignment, traffic and percentage HGV assumptions. At NSRs further from the road edge, outside of the model extent, the change in noise level would also be negligible.

The overall noise and vibration impact for Option 1 is concluded to be minor or slightly negative with a PAG score of 3. A score of 3 has been applied on the basis that whilst a negligible change in traffic noise levels is calculated, this option would have the highest number of NSRs within 100m of its junction.

1.3.2 Junction Option 2 - Provide a New Junction between Newtown Road and Straffan Road and convert the existing to an Overbridge

Potential Impact Rating

Option 2 would also include the Maynooth Outer Orbital Route (MOOR) between Jackson's Bridge and Junction 7 which would be located north of and parallel to the M4. The MOOR would be located further south of residential properties at Staffan Crescent and Brookfield Avenue compared to Option 1 and at similar distance from Brookfield Park and Newtown Court at the location of the new Junction and overbridge. Counts of NSRs between 0-50m and 50-100m of the centreline of Option 2 was undertaken. These are summarised in Table 1.5.

Table 1.5: Potential Impact Rating within 100m of Option 2

Property Counts	0 – 50m	50 – 100m	Total
Option 1 – Number of Properties	0	21	21
PIR Weighted Value	4	3	
Potential Impact Rating	0	63	63

Within a distance band of 100m, the total PIR for this option is 63. There are no NSRs counted within 50m of the centreline of the full junction alignment. The closest NSRs are those within Brookfield Avenue and Brookfield Park within 100m.

Change in Traffic Noise Levels

A total of 20 receiver locations representative of the closest NSRs were modelled along the extent of Option 2 and also for the Do Minimum Scenario using the methodology described above and traffic flows forecast along the new junction and the existing M4. The difference in noise levels between the Do Minimum and Do Something scenarios was then determined. The assessment concluded the operation of Option 2 would result in a traffic noise increase between 1 to 1.5 dB(A) at the closest NSRs to the new junction at Brookfield Park and Newtown Court, when compared to the Do Minimum scenario. This is due to higher traffic volumes along the MOOR passing the closest NSRs combined with traffic volumes along the M4.

Reference to Table 1.2 confirms the change in noise level is negligible, however the change in traffic noise would trigger the requirement for noise mitigation at the affected properties (9 No. properties at Brookfield Park and Newtown Court) as traffic noise levels are already above 60 dB L_{den} and will be increased by at least 1 dB(A).

The assessment concluded the operation of Option 2 would result in a negligible change in traffic noise levels at the modelled NSRs compared to the Do Minimum scenario, however it would have the greatest noise effect at the closest affected NSRs.

The overall noise and vibration impact for Option 2 is concluded to be minor or slightly negative with a PAG score of 3. A score of 3 has been applied on the basis that whilst this option has a lower number of NSRs within 100m of its alignment and a small change in traffic noise overall, there is a potential for noise mitigation to be required to the closest NSRs to the new junction and overbridge due to higher traffic flows along this section of the new road links.

1.3.3 Junction Options Assessment Matrix

Table 1.6: Junction 7 Options Assessment Matrix

Assessment Criteria	Option 1	Option 2
Potential Impact Rating (PIR)	197	63
Change in Traffic Noise at NSRs	<1dB	≥1dB
Likely Requirement for Noise Mitigation	0 Properties	9 Properties
Scoring		
Qualitative Assessment	Minor or slightly negative	Minor or slightly negative
Score / Impact Level	3	3
Preference	Preferred	Least Preferred

1.4 Summary

In terms of preference both Junction Options are ranked Minor or Slightly Negative due to the proximity of the proposed junction and MOOR to NSRs within 100m and the minor change in traffic noise levels overall associated with both.

Due to the higher traffic volumes along the MOOR and new overbridge north of the M4 associated with Option 2, there is a higher noise impact to NSRs compared to Option 1 and there is a potential requirement for noise mitigation to NSRs at Brookfield Park and Newtown Court.

On this basis, Option 1 is Preferred and Option 2 is Least Preferred.

1.5 Reference

Transport Infrastructure Ireland, Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2004.

Transport Infrastructure Ireland, Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes, 2014.

UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability and Environmental Appraisal LA 111 Noise and Vibration Revision 2 (UKHA 2020);

Transport Infrastructure Ireland, Project Management Guidelines PE-PMG-02041, 2020.

Transport Infrastructure Ireland, Project Appraisal Guidelines for National Road Schemes Unit 7.0 – Multi Criteria Analysis, October 2016.

Kildare County Council

Maynooth to Leixlip Project

Options Report - Stage 2 Population
Junction Options Assessment

Draft 1 | 31 August 2023

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Table 1.1: Junction 7 Options Population Assessment Matrix

1 Stage 2 Population Junction Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Junction Options for the Maynooth to Leixlip Project with respect to the Population constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4 and references are provided in Section 1.5.

1.2 Methodology

1.2.1 Scoring Procedure

Scores have been applied to the Junction Options Assessment in accordance with the Project Appraisal Guidelines for National Roads Unit 7.0 – Multi-Criteria Analysis (PAG, 2016). There are five principal assessment criteria for the assessment of Population as set out below. Each criterion is weighted equally for the purposes of the MCA scoring.

Journey Characteristics and Connectivity

This criterion takes account of journey patterns based on the nature of the transport network and observed or projected journeys to key destinations, workplaces and community facilities. Sub-criteria include journey time, journey time reliability, accessibility, and journey connectivity (the availability of connections between desired origins and destinations). These sub-criteria depend also on the projected traffic data and are assessed for all road users including private drivers, commercial drivers, public transport users, cyclists and pedestrians.

Journey Amenity

Relevant effects arise from the proximity to vehicle traffic and to the volume, speed or movement of traffic as it affects the pleasantness of journeys, and the actual or perceived safety of pedestrians, cyclists, public transport users and drivers. Journey amenity will also be affected by the facilities available for these road users (e.g. pavement footpaths, cycle paths, crossing facilities, etc.), the distance and physical separation of vehicular traffic from pedestrians or cyclists, the proportion of HGVs, the nature of any junctions to be negotiated, and the location of public transport stops. For vulnerable road users, age and physical ability are taken into account. Particular issues include the exposure and delay presented by road crossings or junctions, and the legibility of the transport network, i.e. being able to find one's way (including directional signage).

General Amenity

Community facilities may be directly or indirectly impacted. There can also be effects on residential quality of life or community wellbeing, or on amenity and recreation, due to a combination of environmental effects (e.g. noise, air quality or visual) for which significance has been identified in respective assessments. There are links between General Amenity and health or social inclusion given the importance of access to community facilities used by sensitive receptors.

Community Severance

This refers to the ability of people to access community facilities, workplaces, friends or neighbours, particularly as it affects sensitive receptors such as older people, children or people with disabilities. Physical severance can take the form of new severance due to the barrier presented by a new road, or relief from severance, for example from reductions in vehicle traffic or the provision of crossings facilities. Social severance can also occur where such barriers cause people to feel contained without road boundaries, especially if this reduces their social interaction. Higher or lower traffic volumes have respective effects on new severance or relief from severance.

Economic

These effects arise from changes in economic activity affecting local businesses or employment, either directly or indirectly. These effects can occur due to direct impacts on business premises, from changes in accessibility, or from changes in development opportunities for the local economy.

1.3 Junction Options Assessment

1.3.1 Option 1 – Maintain and Optimise/Improve Existing Junction

Journey Characteristics

Connectivity is maintained and improved between the M4 and the east of Maynooth. Journey times may be reduced between the M4 and the west of Maynooth with the introduction of the Maynooth Outer Orbital Route (MOOR) without the need to enter the centre of the town.

The westbound diverge from the M4 would be realigned and link directly to the R406 rather than to the Straffan Road Roundabout on the R406 which also accommodates the Maynooth Business Campus.

Journey Amenity

Journey amenity may be impacted positively in that there is a reduced likelihood for trips from the M4 to the western suburbs of Maynooth to encounter delays when negotiating the centre of the town and to incur congestion at peak times. Additional vehicle traffic would be placed on Newtown Road, Meadowbrook Road and Meadowbrook Link Road with slight negative implications for the journey amenity of cyclists.

General Amenity

General amenity would be improved in the town centre of Maynooth where community facilities are concentrated, through the potential reduction in traffic with the introduction of the Maynooth Outer Orbital Route. Traffic may be moderately increased on Newtown Road with some implications for residential amenity.

Community Severance

Option 1 may place increased traffic on the northern section of Newtown Road into the centre of Maynooth. An increase may follow into Parson Street where the entrance to St. Patrick's College (NUIM) is located and where currently there are no crossing facilities before the junction with Main Street.

Traffic volumes would also be increased on Meadowbrook Road and Meadowbrook Link Road, compared with the Do-minimum. The relative increase in traffic on the Newtown Road would apply to both options, but for the latter road only to Option 1. The increase in traffic volumes may have the effect of increasing community severance, with respect to journeys between residential estates, except in the vicinity of a small retail centre and bar at the corner of Beaufield Close and Meadowbrook Road.

Economic

There are no distinct economic impacts.

1.3.2 Option 2 – Provide a New Junction between Newtown Road and Straffan Road and convert the existing to an Overbridge

Journey Characteristics

The current Junction 7 would be converted to an overbridge. Connectivity would be maintained and improved via the Maynooth Outer Orbital Route. This may reduce journey times, between the M4 and the west without the need to enter the centre of the town.

Access to Maynooth Business Campus may be less direct, via the proposed Maynooth Outer Orbital Route, due to the conversion of the existing Junction 7 to an overbridge.

Journey Amenity

Journey amenity is impacted positively in that there is a reduced likelihood for trips from the M4 to the western suburbs of Maynooth to encounter delays when negotiating the centre of the town or to incur congestion at peak times. Additional vehicle traffic would be placed on Newtown Road with slight negative implications for the journey amenity of cyclists.

General Amenity

General amenity would be improved in the town centre of Maynooth where community facilities are concentrated by the potential transfer of traffic to the R408 with the introduction of the Maynooth Outer Orbital Route. Traffic may be moderately increased on Newtown Road with some implications for residential amenity. Projected traffic volumes on the Maynooth Outer Orbital Route to the R406 would be higher for Option 2 where they pass within 50m to 75m of residential properties on Brookfield Avenue and to the rear of properties on Straffan Crescent.

Community Severance

Option 2 may increase traffic volumes on the northern section of Newtown Road into the centre of Maynooth. An increase would follow for the extension into Parson Street where the entrance to St. Patrick's College (NUIM) is located and where currently there are no crossing facilities before the junction with Main Street. The increase in traffic volumes may have the effect of increasing community severance.

However, there would be no increase in severance on Meadowbrook Road and Meadowbrook Link Road as traffic volumes would remain similar to those at present compared with a relative increase for Option 1. There may be a reduction in traffic volumes on the R406 Straffan Road compared with both the Do-minimum scenario.

Economic

A slight loss of passing trade is likely for the service station on Straffan Road due to the lower traffic volumes projected for Option 2.

1.3.3 Assessment Matrix of Junction 7 Options

Table 1.1: Junction 7 Options Population Assessment Matrix

Assessment Sub-Criteria	Option 1	Option 2
Journey characteristics	Splits eastbound departures from the N4 between the R408 Newtown Road and R406 Straffan Road. Improved connectivity to Newtown Road. Proposed new westbound exit reduces pressure on entrance to Maynooth Business Campus.	Splits eastbound and westbound departures from the N4 between the R408 Newtown Road and R406 Straffan Road. Improved connectivity to Newtown Road. Less direct link to Maynooth Business Campus.
Journey Amenity	Additional traffic placed on Newtown Road, Meadowbrook Road and Meadowbrook Link Road with implications for cyclist journey amenity.	Additional traffic placed on Newtown Road with implications for cyclist journey amenity. Reduced traffic on R406 Straffan Road.
General Amenity	Environmental impact to the front of properties on Brookfield Avenue and to the rear of properties on Staffan Avenue.	Greater environmental impact to the front of properties on Brookfield Avenue and to the rear of properties on Staffan Avenue.
Community severance	Increase in traffic flows on Meadowbrook Road or Meadowbrook Link Road. Increase in physical severance between residential estates.	No increase in severance on Meadowbrook Road or Meadowbrook Link Road. Moderate relief from severance on R406 Straffan Road.
Economic	No significant economic impacts.	Slight-moderate loss of passing trade for service station on R406.
Scoring		
Qualitative Assessment	Not Significant or Neutral	Minor or Slightly positive
Score/ Impact Level	4	5
Preference	Least Preferred	Preferred

1.4 Summary

There would be positive impacts in terms of improved accessibility for the west side of Maynooth and for reduced traffic in the centre of the town, but also some moderate increases in traffic and residential severance elsewhere.

Option 2 has a distinct positive impact in reducing traffic on Staffan Road providing for reduced congestion and some relief from severance.

Option 2 is Preferred and Option 1 is Least Preferred.

1.5 References

N/A

Kildare County Council

Maynooth to Leixlip Project

Options Report - Stage 2 Soils and
Geology Junction Options
Assessment

Draft 1 | 31 August 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Table 1.4: Assessment of the Soils and Geology Criteria for Junction 7 Option 1

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Table 1.6: Soils and Geology Assessment Matrix of Junction Options

1 Stage 2 Soils and Geology Junction Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Junction Options for the Maynooth to Leixlip Project with respect to the Soils and Geology constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. The assessment criteria are outlined in Section 1.3. Section 1.4 contains the options assessment and a summary is provided in Section 1.5.

1.2 Methodology

1.2.1 Scoring Procedure

This assessment has been prepared taking cognisance of the requirements of the following guidance:

- Transport Infrastructure Ireland (TII) guidance, formally National Roads Authority (NRA) guidance, Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology, and Hydrogeology on National Road Schemes¹ (herein referred to as TII Guidelines).

With additional reference made to:

- The Environmental Protection Agency (EPA) Guidelines on the information to be contained in Environmental Impact Assessment Reports².
- Transport Infrastructure Ireland (TII) guidance, formally National Roads Authority (NRA). Environmental Impact Assessment of National Road Schemes – a Practical Guide³.

¹ National Roads Authority Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology, and Hydrogeology for National Road Schemes, NRA, 2009. Available from: <https://www.tii.ie/technical-services/environment/planning/Guidelines-on-Procedures-for-Assessment-and-Treatment-of-Geology-Hydrology-and-Hydrogeology-for-National-Road-Schemes.pdf>

² Environmental Protection Agency (EPA), Guidelines on the information to be contained in Environmental Impact Assessment Reports, EPA 2022. Available from: <https://www.epa.ie/publications/monitoring--assessment/assessment/guidelines-on-the-information-to-be-contained-in-environmental-impact-assessment.php> [Accessed 09 August 2023]

³ National Roads Authority Environmental Impact Assessment of National Road Schemes – a Practical Guide, NRA 2008. Available from: <https://www.tii.ie/technical-services/environment/planning/Environmental-Impact-Assessment-of-National-Road-Schemes-Practical-Guide.pdf>

The first step in the assessment procedure is to define the assessment study area for each Junction 7 option. The TII Guidelines set this at 250m from the centreline of the corridor, i.e., 500m wide in total. For the purposes of this soils and geology assessment, the footprint of the proposed Junction 7 Maynooth options design is being considered as the proposed area of works, including ancillaries and drainage, etc. A 250m wide buffer is applied around each area of works in all directions.

The second step in the assessment procedure is to identify the soils and geology attributes. The attributes consist of geological features identified in the soils and geology constraints study and Preliminary Sources Study Report (PSSR) that lie within the junction assessment study area. The soils and geology attributes considered as part of this assessment are presented in Section 1.3.

Box 4.1 of the TII Guidelines¹ provides criteria for estimating the importance of the identified soils and geological attributes. Each attribute is assigned an ‘Attribute Importance’ based on the TII Guidance criteria. The importance rating is presented in Table 1.1.

Table 1.1: Rating of Significant Environmental Impacts

Importance of Attribute	Magnitude of Impact			
	Negligible	Small Adverse	Moderate Adverse	Large Adverse
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant / Moderate	Profound / Significant	Profound
High	Imperceptible	Moderate / Slight	Significant / Moderate	Severe / Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

The impact level or significance is rated based on criteria presented in Box 4.4 of the TII Guidance¹. This rating is a function of (a) the attribute importance, and (b) the nature and timeframe of the project.

A ‘Rating of Significant Impacts’ has been determined from Table 1.2 based on the importance of an attribute and the potential impacts. The description of the significance of an impact is based on Box 5.4 from the TII Guidance¹. The attribute importance is defined within the Constraints Report. However, following on from the issue of the Constraints Report, the importance of the attributes has been re-assessed for any updates or alterations in the Junction 7 Maynooth options.

These criteria only consider negative potential impacts, however, the potential for positive impacts will also be considered. The language used in the summary tables to describe the significance of an impact is that used in Box 5.1, not Box 4.4, of the TII Guidance¹ as it is more succinct and easier to present in tabular format.

Once an impact level has been determined for each attribute, the overall impact rating was assigned to that feature type. For the assessment to meet the requirements of the TII Project Appraisal Guidelines for National Roads Unit 7.0 – Multi-Criteria Analysis (MCA)⁴, the two scoring systems needed to be correlated.

The TII MCA scoring criteria from Section 2.4 of the Project Appraisal Guidelines⁴ is summarised in Table 1.2.

Table 1.2: PAG Scoring System used in Ranking

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Table 1.3 summarises how the two Guidelines^{1 4} have been correlated for the purpose of the Junction 7 Maynooth options assessment. The PAG Guidelines⁴ deal with both positive and negative impacts whereas the TII Guidance¹ deal with only negative impacts for soils and geology.

Table 1.3: Correlation of TII Guidelines¹ impact level to an Equivalent TII PAG⁴ Score

Impact Level (TII Guidelines ¹)	Equivalent PAG (Description)	Equivalent PAG (Value)
Profound	Major or highly negative	1
Significant	Major or highly negative	1
Moderate	Moderately negative	2
Slight	Minor or slightly negative	3
Imperceptible	Not significant or neutral	4

⁴ Transport Infrastructure Ireland (TII) Project Appraisal Guidelines for National Roads Unit 7.0 – Multi-Criteria Analysis, TII 2016. Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

1.2.2 Assessment Criteria

The soils and geology criteria which have been considered as part of this assessment include the following:

- Soil deposits comprising well drained soil types which are important for agriculture;
- Contaminated sites which comprise the horizontal extent of made ground;
- Bedrock geology comprising areas where bedrock outcrops and sub crops are recorded; and
- Earthworks comprising bulk cut and fill volumes and the cut/fill balance.

Each of these criteria are impacted by the junction options and are considered to be differentiators in the assessment of options.

The following constraints identified in the Constraints Report have been excluded from this Stage 2 assessment for the following reasons:

- **Glacial Till:** Glacial till is widespread and consistent throughout the study area at each active travel option location and so it is not considered a differentiator between option and was eliminated from the assessment under the Subsoil criterion.
- **Bedrock Karst:** There are no karst features identified within the study area.
- **Landslide Susceptibility:** No areas of moderately high to high landslide susceptibility are noted within the study area.
- **Historical industrial sites, pits, quarries, and mines:** These features are not impacted by the active travel options.
- **Industrial facilities:** There are no industrial facilities impacted by the active travel options.
- **Prospecting Licences:** There are two prospecting licences within the study area that are consistent across all active travel options and so are not considered a differentiator between active travel options.
- **Economic Geology:** It is unlikely that the high to very high crushed rock aggregate potential that has been identified within the study area surrounding the active travel option locations will be a viable economic resource due to the location. For this reason, economic geology has been excluded from the Stage 2 assessment.
- **Soft soils** comprising alluvium deposits (soft ground): There are no soft soils comprising alluvium deposits (soft ground).

1.3 Junction 7 Options Assessment

All of the Soils and Geology criteria are considered high importance (high quality/significance/value on a local scale), aside from Earthworks which is considered to be of medium importance as it has medium significance on a local scale. The assessment of the Soils and Geology criteria are presented in Table 1.4 and Table 1.5 below.

1.3.1 Option 1 – Maintain and Optimise/Improve Existing Junction

Option 1 consists of the optimisation and improvement of the current Junction 7 along with the construction of the Maynooth Outer Orbital Route (MOOR). The impact on Soils and Geology for this Option for Soil Deposits, is considered Moderately Negative. The impact on the Soils and Geology for this Option for Bedrock Geology, Contaminated Sites, and Earthworks is considered Minor or Slightly Negative.

Table 1.4: Assessment of the Soils and Geology Criteria for Junction 7 Option 1

Criterion	Criterion Attribute	Description	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall Qualitative Assessment
Soil deposits	EPA National Soils Important for Agriculture	Soils important for agriculture	High	Moderate Adverse	Severe / Significant	Moderately negative
Contaminated sites	Made ground	Extent of impact on made ground deposits	High	Small Adverse	Moderate / Slight	Minor or slightly negative
Bedrock geology	GSI shallow bedrock	Shallow bedrock 0 to 5m below ground level	High	Small Adverse	Moderate / Slight	Minor or slightly negative
Earthworks	Bulk earthworks	Cut and fill volumes required	Medium	Small Adverse	Moderate / Slight	Minor or slightly negative

1.3.2 Option 2 – Provide a New Junction between Newtown Road and Straffan Road and convert the existing to an Overbridge

Option 2 comprises a new grade separated junction between the R406 Straffan Road and the R408 Newtown Road and conversion of the existing Junction 7 to an overbridge. It also includes the Maynooth Outer Orbital Route (MOOR).

The impact on Soils and Geology for this option for Soil Deposits, is considered Major or Highly Negative. The impact on the Soils and Geology for this Junction Option for Bedrock Geology, Contaminated Sites, and Earthworks is considered Minor or Slightly Negative.

Table 1.5: Assessment of the Soils and Geology criteria for the Junction Option assessment of Junction 7 Option 2

Criterion	Criterion Attribute	Description	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall Qualitative Assessment
Soil deposits	EPA National Soils Important for Agriculture	Soils important for agriculture	High	Large Adverse	Significant / Moderate	Major or highly negative
Contaminated sites	Made ground	Extent of impact on made ground deposits	High	Small Adverse	Moderate / Slight	Minor or slightly negative
Bedrock geology	GSI shallow bedrock	Shallow bedrock 0 to 5m below ground level	High	Small Adverse	Moderate / Slight	Minor or slightly negative
Earthworks	Bulk earthworks	Cut and fill volumes required	Medium	Small Adverse	Moderate / Slight	Minor or slightly negative

1.3.3 Assessment Matrix of Junction 7 Options

Table 1.6: Soils and Geology Assessment Matrix of Junction Options

Assessment Criteria	Option 1 – Improve Existing	Option 2 - New Junction
Soil Deposits	Moderately negative	Major or highly negative
Contaminated Site	Minor or slightly negative	Minor or slightly negative
Bedrock Geology	Minor or slightly negative	Minor or slightly negative
Earthworks	Minor or slightly negative	Minor or slightly negative
Overall Qualitative Assessment	Moderately negative	Major or highly negative
Score/ Impact Level	2	1
Preference	Preferred	Least Preferred

1.4 Summary

Option 1 is considered to have a moderately negative impact on the Soils and Geology.

Option 2 is considered to have a major or highly negative impact on the Soils and Geology due to the potential greater loss of topsoil as a result of the works.

Option 1 is Preferred and Option 2 is Least Preferred because Option 1 has a lesser impact on the Soils and Geology.

1.5 References

N/A



MAYNOOTH TO LEIXLIP PROJECT

Appendix 6.3C
Stage 2 PAM
Environmental Assessments
(Active Travel)

Kildare County Council

Maynooth to Leixlip Project

Options Report - Stage 2 Material
Assets – Agriculture Active Travel
Options Assessment

Draft 1 | 31 August 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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Table 1.2: Assessment Matrix for the R408 Newtown Road Overbridge Active Travel Options

Table 1.3: Assessment Matrix for Junction 7 Maynooth

Table 1.4: Assessment Matrix for the R405 Ballygoran Overbridge Active Travel Options

Table 1.5: Assessment Matrix for Junction 6 Celbridge Active Travel Options

Table 1.6: Assessment Matrix for the R404 Cellbridge Road Overbridge Active Travel Options

Table 1.7: Assessment Matrix for Junction 5 Leixlip Active Travel Options

Table 1.8: Active Travel Options Summary

1 Stage 2 Material Assets – Agriculture – Active Travel Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Active Travel Options for the Maynooth to Leixlip Project with respect to the Material Assets Agriculture constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4 and references are provided in Section 1.5.

1.2 Methodology

The following guidelines and legislation were referred to when undertaking this Stage 2 Active Travel Option assessment:

- European Union (2018) (Planning and Development) (Environmental Impact Assessment) Regulations. (SI 296 of 2018);
- Environmental Protection Agency (EPA) (May 2022) Guidelines on the Information to be contained in Environmental Impact Assessment Reports¹; and
- Transport Infrastructure Ireland (TII) (2016) Project Appraisal Guidelines Unit 7.0 - Multi Criteria Analysis, PE-PAG-02031².

This assessment is a combination of a desktop assessment of available data sources combined with the on-site survey conducted in January 2021. The assessment in this section compares the impacts of the active travel options on the agricultural constraints identified in the Constraints Report. The five criteria as set out in Section 3.1.5 of the 2016 PAG Guidelines² are assessed for each Active Travel Option i.e.

1. The farm size along each active travel option.

This criteria was assessed by referencing CSO data for the study area. Larger farms are generally more resilient to land loss than smaller farms. The farm size is assumed to be the same along each Active Travel Option;

¹Environmental Protection Agency (EPA) (May 2022) Guidelines on the Information to be contained in Environmental Impact Assessment Report. Available from: [Guidelines on the information to be contained in Environmental Impact Assessment Reports \(EIAR\) \(epa.ie\)](#) [Accessed 13 September 2023]

²Transport Infrastructure Ireland (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf> [Accessed: 13 September 2023]

2. The types of farm enterprises along each active travel option.

In assessing this criteria, high and very high sensitive farm enterprises for each Active Travel Option are distinguished from low – medium sensitivity farm enterprises. Dairy, equine farms, horticultural and other highly sensitive enterprises were identified from aerial photography³ and the site survey. The folios of these high and very high sensitivity enterprises were identified using the PRAI⁴ data;

3. Landtake impacts (including impacts of farm yards) for each Active Travel Option.

A high level assessment of the potential landtake impacts was made by assessing the active travel options. The potential landtake of agricultural land and impacts on farm yards is assessed.;

4. Mitigated severance impacts along each active travel option.

The severance impacts of the active travel options was assessed by measuring offline lengths (if any) of the options.

5. Impacts on farm viability.

Farm viability describes the capacity of a farm to survive, grow and develop. High viability is associated with large farm size, good land quality, intensive land-use and the presence of high sensitivity farm enterprises such as dairy and equine. The farm viability within the study area is high due to the presence of good quality land, a large farm size (50.6ha compared to national average of 32.7 hectares) and the presence of regionally important stud farms.

1.2.1 Scoring Procedure

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG scoring procedure. The PAG seven-point scale scoring procedure is shown in Table 1.1.

Table 1.1: TII Project Appraisal Guidelines Scoring Criteria

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

³ Google Earth Imagery (2023) Viewed on 13th September 2023. Available at: [Google Earth](#)

⁴ Property Registration Authority of Ireland (2023) Viewed on 13th September 2023. Available at: <https://www.landdirect.ie/>

In the first instance, individual assessments were carried out on each criterion followed by an overall assessment. A score was assigned to the active travel options based on the TII PAG seven point scale, and the overall preference for each active travel option of Preferred or Least Preferred was assigned using a combination of the assessment criteria results and professional judgement.

1.3 Active Travel Options Assessment

1.3.1 R408 Newtown Road Overbridge

Option 1 – New bridge parallel to existing on the western side

There are no high sensitive enterprises adjacent to the R408 Newtown Overbridge. The landtake along the embankments to the north and south of the bridge would not be significant – although the landtake to the southeast of the bridge is not agricultural. There is a farm yard to the northwest of the R408 Newtown Overbridge. There would be no severance impact. The farm viability adjacent to Newtown Overbridge is medium due to good agricultural land and no high sensitive enterprises.

Having assessed the five criteria (farm size, farm type, landtake, severance and viability) this option is assessed to have a Not Significant or Neutral impact - PAG Score 4 on the seven point scale. Option 1 is Least Preferred compared to Option 2, because of the proximity of a farmyard on the western side of the R408 and the higher potential for agricultural landtake.

Option 2 – New bridge parallel to existing on the eastern side

The landtake to the southeast of the bridge is not agricultural and therefore the potential landtake of agricultural land is lower on the eastern side of the bridge. There are no farm yards east of the bridge and there would be no severance impact. The farm viability adjacent to Newtown Overbridge is medium due to good agricultural land and no high sensitive enterprises. Having assessed the five criteria (farm size, farm type, landtake, severance and viability), this option is assessed to have a Not Significant or Neutral impact - PAG Score 4 on the seven point scale. Option 2 is Preferred compared to Option 1, because of the proximity of a farmyard on the western side of the R408 and the higher potential for agricultural landtake.

Assessment Matrix of R408 Newtown Road Overbridge

Table 1.2: Assessment Matrix for the R408 Newtown Road Overbridge Active Travel Options

Criteria	Option 1 (West)	Option 2 (East)
Criteria 1 – Farm Size	50.6ha. PAG Score 4.	50.6ha. PAG Score 4.
Criteria 2 – Farm Type	No high sensitive enterprises PAG Score 4	No high sensitive enterprises PAG Score 4
Criteria 3 – Landtake ¹		
Landtake	Insignificant	Insignificant
Length on-line / off-line	100% on-line	100% on-line
Impacts On farm-yards	1 farm yard adjacent to Option	No farm yards adjacent to Option
Quality of landtake	Good quality land PAG Score 4	Good quality land PAG Score 4
Criteria 4 – Severance	No severance. PAG Score 4.	No severance. PAG Score 4.
Criteria 5 – Viability	Viability is medium. PAG Score 3.	Viability is medium. PAG Score 3.
Qualitative Assessment	Neutral or Not significant No significant agricultural effects.	Neutral or Not significant No significant agricultural effects
Overall PAG Score	4	4

1.3.2 Junction 7 Maynooth

Option 1 - New bridge parallel to the existing on the western side

The proposal for a new bridge on the western side of the R406 would be located entirely on non-agricultural land and therefore would have no effects on agriculture. This option is assessed to have a Not Significant or Neutral impact – PAG Score 4 on the seven point scale and is preferred along with Option 2.

Option 2 – New bridge parallel to the existing on the eastern side

The proposal for a new bridge on the eastern side of the R406 would be located entirely on non-agricultural land and therefore would have no effects on agriculture. This option is assessed to have a Not Significant or Neutral impact – PAG Score 4 on the seven point scale and is preferred along with Option 1.

Assessment Matrix of Junction 7 Maynooth Options

Table 1.3: Assessment Matrix for Junction 7 Maynooth

Criteria	Option 1 (West)	Option 2 (East)
Assessment criteria 1 – Farm Size	50.6ha (compared to the national average of 32.7ha) PAG Score 4	50.6ha (compared to the national average of 32.7ha) PAG Score 4
Assessment criteria 2 – Farm Type	No high sensitive enterprises PAG Score 4	No high sensitive enterprises PAG Score 4
Assessment criteria 3 – Landtake ¹		
Sub-criteria – Landtake	No agricultural landtake	No agricultural landtake
Sub-criteria – Length on-line / off-line	100% on-line	100% on-line
Impacts On farm-yards	No farm yards adjacent to proposed Option	No farm yards adjacent to proposed Option
Sub-criteria – Quality of landtake	Good quality land	Good quality land
	PAG Score 4	PAG Score 4
Assessment criteria 4 – Severance	No severance. PAG Score 4	No severance. PAG Score 4
Assessment criteria 5 – Viability	Viability is low. PAG Score 4	Viability low. PAG Score 4
Qualitative Assessment	Neutral or Not significant No significant agricultural effects.	Neutral or Not significant No significant agricultural effects
Overall PAG Score	4	4

1.3.3 R405 Ballygoran Overbridge

Option 1 – New bridge parallel to the existing on the western side

The landtake to the west and east of the bridge would be mainly along wooded embankments. There are no farm yards near the bridge and there would be no severance impact at either side of the bridge. The farm viability adjacent to Ballygoran Overbridge is medium – high due to good agricultural land, no high sensitive enterprises north of the M4 and two high sensitive enterprises south of the bridge.

Having assessed the five criteria (farm size, farm type, landtake, severance and viability) this option is assessed to have a Not Significant or Neutral impact – PAG Score 4 on the seven point scale.

Both Option 1 and Option 2 are Preferred.

Option 2 – New bridge parallel to the existing on the eastern side

The impact on high sensitive enterprises, the landtake impact and severance impact to the east of the bridge are not significant. Having assessed the five criteria (farm size, farm type, landtake, severance and viability) this option is assessed to have a Not Significant or Neutral impact – PAG Score 4 on the seven point scale.

Both Option 1 and Option 2 are Preferred.

Assessment Matrix of R405 Ballygoran Overbridge Options

Table 1.4: Assessment Matrix for the R405 Ballygoran Overbridge Active Travel Options

Criteria	Option 1 (West)	Option 2 (East)
Criteria 1 – Farm Size	50.6ha. PAG Score 4.	50.6ha. PAG Score 4.
Criteria 2 – Farm Type	Two high sensitive enterprises to the south of the proposed bridge PAG Score 3	Two high sensitive enterprises to the south of the proposed bridge PAG Score 3
Criteria 3 – Landtake ¹		
Landtake	Insignificant – mainly confined to wooded embankments	Insignificant – mainly confined to wooded embankments
Length on-line / off-line	100% on-line	100% on-line
Impacts On farm-yards	No farm yard adjacent to Option	No farm yards adjacent to Option
Quality of landtake	Good quality land PAG Score 4	Good quality land PAG Score 4
Criteria 4 – Severance	No severance. PAG Score 4.	No severance. PAG Score 4.
Criteria 5 – Viability	Viability is medium. PAG Score 3.	Viability is medium. PAG Score 3.
Qualitative Assessment	Neutral or Not significant No significant agricultural effects.	Neutral or Not significant No significant agricultural effects
Overall PAG Score	4	4

1.3.4 Junction 6 Celbridge

Option 1 – New bridge on the western side

Construction of a new bridge on the west side would require landtake in a medium sensitivity tillage plot. There are no farm yards near the new bridge and there would be no severance impact due to the new bridge. The farm viability adjacent to Junction 6 Celbridge is medium, however there is a high sensitive stud farm to the northwest (which will not be directly affected).

Having assessed the five criteria (farm size, farm type, landtake, severance and viability) this option is assessed to have a Not Significant or Neutral impact – PAG Score 4 on the seven point scale.

Both Option 1 and Option 2 are Preferred.

Option 2 – New bridge on the eastern side

Construction of a new bridge on the east side would require landtake in a medium sensitivity grass plot. There are no farm yards near the new bridge and there would be no severance impact due to the new bridge. The farm viability adjacent to Junction 6 Celbridge is medium. Having assessed the five criteria (farm size, farm type, landtake, severance and viability) this option is assessed to have a Not Significant or Neutral impact – PAG Score 4 on the seven point scale.

Both Option 1 and Option 2 are Preferred.

Assessment Matrix of Junction 6 Celbridge Options

Table 1.5: Assessment Matrix for Junction 6 Celbridge Active Travel Options

Criteria	Option 1 (West)	Option 2 (East)
Criteria 1 – Farm Size	50.6ha. PAG Score 4.	50.6ha. PAG Score 4.
Criteria 2 – Farm Type	No high sensitive enterprises PAG Score 4	No high sensitive enterprises PAG Score 4
Criteria 3 – Landtake ¹		
Landtake	Agricultural landtake required	Agricultural landtake required
Length on-line / off-line	100% on-line	100% on-line
Impacts On farm-yards	No farm yards adjacent to Option	No farm yards adjacent to Option
Quality of landtake	Good quality land PAG Score 3	Good quality land PAG Score 3
Criteria 4 – Severance	No severance. PAG Score 4.	No severance. PAG Score 4.
Criteria 5 – Viability	Viability is medium. PAG Score 3.	Viability is medium. PAG Score 3.
Qualitative Assessment	Neutral or Not significant No significant agricultural effects.	Neutral or Not significant No significant agricultural effects
Overall PAG Score	4	4

1.3.5 R404 Celbridge Road Overbridge

Option 1 – New bridge on the western side

Construction of a new bridge on the west side would require landtake in a low sensitivity industrial plot. There are no farm yards near the new bridge and there will be no severance impact due to the new bridge. The farm viability adjacent to the west side of the R404 Overbridge is low.

Having assessed the five criteria (farm size, farm type, landtake, severance and viability) this option is assessed to have a Not Significant or Neutral impact – PAG Score 4 on the seven point scale. Option 1 is Preferred compared to Option 2, because Option 1 would be located on non-agricultural land.

Option 2 – New bridge on the eastern side

Construction of a new bridge on the east side would require landtake in a medium sensitivity grassland plot, however the landtake will mainly be confined to wooded embankments. There are no farm yards near the new bridge and there will be no severance impact due to the new bridge. The farm viability adjacent to the east side of the R404 Overbridge is medium.

Having assessed the five criteria (farm size, farm type, landtake, severance and viability) this option is assessed to have a Not Significant or Neutral impact – PAG Score 4 on the seven point scale. Option 2 is Least Preferred compared to Option 1, because potential agricultural impacts will arise only on the east side.

Assessment Matrix of R404 Celbridge Road Overbridge

Table 1.6: Assessment Matrix for the R404 Cellbridge Road Overbridge Active Travel Options

Criteria	Option 1 (West)	Option 2 (East)
Criteria 1 – Farm Size	50.6ha. PAG Score 4.	50.6ha. PAG Score 4.
Criteria 2 – Farm Type	No high sensitive enterprises PAG Score 4	No high sensitive enterprises PAG Score 4
Criteria 3 – Landtake ¹		
Landtake	No Agricultural landtake	Agricultural landtake required
Length on-line / off-line	100% on-line	100% on-line
Impacts On farm-yards	No farm yards adjacent to Option	No farm yards adjacent to Option
Quality of landtake	Good quality land PAG Score 4	Good quality land PAG Score 3
Criteria 4 – Severance	No severance. PAG Score 4.	No severance. PAG Score 4.
Criteria 5 – Viability	Viability is low. PAG Score 4.	Viability is medium. PAG Score 3.
Qualitative Assessment	Neutral or Not significant No significant agricultural effects.	Neutral or Not significant No significant agricultural effects
Overall PAG Score	4	4

1.3.6 Junction 5 Leixlip

Option 1 - New bridge on the western side

Construction of a new bridge on the west side would require landtake in a medium grassland plot south of the M4 – the effect will not be significant. There are no farm yards near the new bridge and there will be no severance impact due to the new bridge. The farm viability adjacent to Junction 5 Leixlip is medium.

Having assessed the five criteria (farm size, farm type, landtake, severance and viability) this option is assessed to have a Not Significant or Neutral impact – PAG Score 4 on the seven point scale. Option 1 is Least Preferred compared to Option 2, because there may be agricultural landtake required for Option 1 and not for Option 2.

Option 2 – New bridge on the eastern side

Construction of a new bridge on the west side would require landtake in a medium grassland plot south of the N4 – the effect would not be significant. There are no farm yards near the new bridge and there will be no severance impact due to the new bridge. The farm viability adjacent to Junction 5 Leixlip is medium.

Having assessed the five criteria (farm size, farm type, landtake, severance and viability) this option is assessed to have a Not Significant or Neutral impact – PAG Score 4 on the seven point scale. Option 2 is Preferred compared to Option 1, because there may be agricultural landtake required for Option 1 and not for Option 2.

Assessment Matrix of Junction 5 Leixlip Options

Table 1.7: Assessment Matrix for Junction 5 Leixlip Active Travel Options

Criteria	Option 1 (West)	Option 2 (East)
Criteria 1 – Farm Size	50.6ha. PAG Score 4.	50.6ha. PAG Score 4.
Criteria 2 – Farm Type	No high sensitive enterprises PAG Score 4	No high sensitive enterprises PAG Score 4
Criteria 3 – Landtake ¹		
Landtake	Agricultural landtake required	Agricultural landtake required
Length on-line / off-line	100% on-line	100% on-line
Impacts On farm-yards	No farm yards adjacent to Option	No farm yards adjacent to Option
Quality of landtake	Good quality land	Good quality land
	PAG Score 4	PAG Score 3
Criteria 4 – Severance	No severance. PAG Score 4.	No severance. PAG Score 4.
Criteria 5 – Viability	Viability is medium. PAG Score 3.	Viability is medium. PAG Score 3.
Qualitative Assessment	Neutral or Not significant No significant agricultural effects.	Neutral or Not significant No significant agricultural effects
Overall PAG Score	4	4

1.4 Summary

All the active travel options have a PAG Score 4 with a predicted neutral effect.

Table 1.8: Active Travel Options Summary

Active Travel Option	Option 1 (West)	Option 2 (East)
R408 Newtown Road Overbridge	PAG Score 4 Neutral	PAG Score 4 Neutral
Preference	Least Preferred	Preferred
Junction 7 Maynooth	PAG Score 4 Neutral	PAG Score 4 Neutral
Preference	Preferred	Preferred
R405 Ballygoran Overbridge	PAG Score 4 Neutral	PAG Score 4 Neutral
Preference	Preferred	Preferred
Junction 6 Celbridge	PAG Score 4 Neutral	PAG Score 4 Neutral
Preference	Preferred	Preferred
R404 Celbridge Road Overbridge	PAG Score 4 Neutral	PAG Score 4 Neutral
Preference	Preferred	Least Preferred
Junction 5 Leixlip	PAG Score 4 Neutral	PAG Score 4 Neutral
Preference	Least Preferred	Preferred

1.5 References

Environmental Protection Agency (EPA) (May 2022) Guidelines on the Information to be contained in Environmental Impact Assessment Report. Available from: <https://www.epa.ie/publications/monitoring--assessment/assessment/guidelines-on-the-information-to-be-contained-in-environmental-impact-assessment.php>

Transport Infrastructure Ireland (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

Kildare County Council

Maynooth to Leixlip Project

Options Report – Stage 2 Air Quality
Active Travel Options Assessment

Draft 1 | 31 August 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 272691-00

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Table 1.7: Air Quality Assessment Matrix of Junction 5 Leixlip Active Travel Options

1 Stage 2 Air Quality – Active Travel Options Assessment

1.1 Introduction

This section details the environmental assessment of the Stage 2 Active Travel Options for the Maynooth to Leixlip Project with respect to the Air Quality constraints identified in the Constraints Report.

The methodology used in this assessment is outlined in Section 1.2. Section 1.3 contains the options assessment. A summary is provided in Section 1.4 and references are provided in Section 1.5.

1.2 Methodology

1.2.1 Scoring Procedure

As per the Stage 1 environmental assessment, each specialist is required to define their assessment methodology and assessment sub-criteria based on their expert opinion and best practice. Guidance on what to include as sub-criteria is given in Chapter 3 of the PAG Unit 7. Following this the potential impacts and their magnitude are to be identified for each of the Active Travel Options. The impacts for each sub-criteria shall be scored based on the seven-point scale below and an integer shall be assigned according to the impact level included in Table 1.1.

Table 1.1: PAG Scoring System used in Ranking

Assessment Score	Description
7	Major or highly positive
6	Moderately positive
5	Minor or slightly Positive
4	Not significant or neutral
3	Minor or slightly negative
2	Moderately negative
1	Major or highly negative

Using the impact scores and the professional judgement of the specialist, a determination shall be made as to whether each Active Travel Option is either Preferred or Least Preferred.

A separate table is included comparing both options for each of the six locations outlined below:

- R408 Newtown Road Overbridge;
- Junction 7 Maynooth;
- R405 Ballygoran Overbridge;
- Junction 6 Celbridge;
- R404 Celbridge Road Overbridge; and
- Junction 5 Leixlip.

1.3 Active Travel Options Assessment

1.3.1 R408 Newtown Overbridge

Option 1 – New bridge parallel to existing on the western side

This option would include a new parallel active travel overbridge on the western side of the existing overbridge. This proposed overbridge would be 4m wide.

This option is assessed by two sub-criteria from an air quality perspective: sensitive receptors within 50m of the overbridge and likely traffic volumes. There is the potential for air quality impacts at these receptors due to changes in traffic volumes during the operational phase and due to construction works.

There are six sensitive receptors within 50m proximity of Option 1. There may be a slight reduction in traffic volumes as a result of the proposed overbridge, due to the possible modal shift from private cars to more active modes of travel.

Option 2 – New bridge parallel to existing on the eastern side

This option would include a new parallel active travel overbridge on the eastern side of the existing overbridge. This proposed overbridge would be 4m wide.

This option is assessed by two sub-criteria from an air quality perspective: sensitive receptors within 50m of the overbridge and likely traffic volumes. There is the potential for air quality impacts at these receptors due to changes in traffic volumes during the operational phase and due to construction works.

There is one sensitive receptor within 50m proximity of Option 2 which may be impacted by the construction. There may be a slight reduction in traffic volumes as a result of the proposed overbridge, due to the possible modal shift from private cars to more active modes of travel.

Assessment Matrix of R408 Newtown Road Overbridge Active Travel Options

Table 1.2: Air Quality Assessment Matrix of R408 Newtown Road Overbridge Active Travel Options

Assessment Criteria	Option 1 (West)	Option 2 (East)
Sensitive Receptors within 50m	6 sensitive receptors	1 sensitive receptor
Traffic volume	Possible slight reduction in traffic volumes due to modal shift from private car to active modes	Possible slight reduction in traffic volumes due to modal shift from private car to active modes
Scoring		
Qualitative Assessment	Minor or slightly positive	Minor or slightly positive
Score/ Impact Level	5	5
Preference	Least Preferred	Preferred

Option 2 is Preferred due to the lower number of sensitive receptors within 50m proximity. Both options are expected to have a minor or slight positive impact on air quality due to the likely modal shift from private car to more active modes (less polluting).

1.3.2 Junction 7 Maynooth

Option 1 – New bridge parallel to existing on the western side

This option would include a new parallel active travel overbridge on the western side of the existing overbridge. This proposed facility would be 4m wide. This option is assessed by two sub-criteria from an air quality perspective: sensitive receptors within 50m of the overbridge and likely traffic volumes. There is the potential for air quality impacts at these receptors due to changes in traffic volumes during the operational phase and due to construction works.

There are no sensitive receptors in a 50m proximity of Option 1 which may be impacted by the construction. There may be a slight reduction in traffic volumes as a result of the proposed overbridge, due to the possible modal shift from private cars to more active modes of travel.

Option 2 – New bridge parallel to existing on the eastern side

This option would include a new parallel active travel overbridge on the eastern side of the existing overbridge. This proposed facility would be 4m wide. This option is assessed by two sub-criteria from an air quality perspective; sensitive receptors within 50m of the overbridge and likely traffic volumes. There is the potential for air quality impacts at these receptors due to changes in traffic volumes during the operational phase and due to construction works.

There are no sensitive receptors in a 50m proximity of Option 2 which may be impacted by the construction. There may be a slight reduction in traffic volumes as a result of the proposed overbridge, due to the possible modal shift from private cars to more active modes of travel.

Assessment Matrix of Junction 7 Maynooth Options

Table 1.3: Air Quality Assessment Matrix of Junction 7 Maynooth Active Travel Options

Assessment Criteria	Option 1 (West)	Option 2 (East)
Sensitive Receptors within 50m	0 sensitive receptors	0 sensitive receptors
Traffic volume	Possible slight reduction in traffic volumes due to modal shift from private car to active modes	Possible slight reduction in traffic volumes due to modal shift from private car to active modes
Scoring		
Qualitative Assessment	Minor or slightly positive	Minor or slightly positive
Score/ Impact Level	5	5
Preference	Preferred	Preferred

Both options are Preferred as there are no sensitive receptors in 50m proximity of either option being impacted during the construction phase. Both options are expected to have a minor or slight positive impact on air quality due to the likely modal shift from private car to more active modes (less polluting).

1.3.3 R405 Ballygoran Overbridge

Option 1 – New bridge parallel to existing on the western side

This option would include a new parallel active travel overbridge on the western side of the existing overbridge. This proposed facility would be 4m wide. This option is assessed by two sub-criteria from an air quality perspective: sensitive receptors within 50m of the overbridge and likely traffic volumes. There is the potential for air quality impacts at these receptors due to changes in traffic volumes during the operational phase and due to construction works. There are no sensitive receptors in a 50m proximity of Option 1 which may be impacted by the construction. There may be a slight reduction in traffic volumes as a result of the proposed overbridge, due to the possible modal shift from private cars to more active modes of travel.

Option 2 – New bridge parallel to existing on the eastern side

This option would include a new parallel active travel overbridge on the eastern side of the existing overbridge. This proposed facility would be 4m wide. This option is assessed by two sub-criteria from an air quality perspective: sensitive receptors within 50m of the overbridge and likely traffic volumes. There is the potential for air quality impacts at these receptors due to changes in traffic volumes during the operational phase and due to construction works. There are no sensitive receptors in a 50m proximity of Option 2 which may be impacted by the construction. There may be a slight reduction in traffic volumes as a result of the proposed overbridge, due to the possible modal shift from private cars to more active modes of travel.

Assessment Matrix of R405 Ballygoran Overbridge Options

Table 1.4: Air Quality Assessment Matrix of R405 Ballygoran Overbridge Active Travel Options

Assessment Criteria	Option 1 (West)	Option 2 (East)
Sensitive Receptors within 50m	0 sensitive receptors	0 sensitive receptors
Traffic volume	Possible slight reduction in traffic volumes due to modal shift from private car to active modes	Possible slight reduction in traffic volumes due to modal shift from private car to active modes
Scoring		
Qualitative Assessment	Minor or slightly positive	Minor or slightly positive
Score/ Impact Level	5	5
Preference	Preferred	Preferred

Both options are Preferred as there are no sensitive receptors in 50m proximity of either option being impacted in the construction phase. Both options are expected to have a minor or slight positive impact on air quality due to the likely modal shift from private car to more active modes (less polluting).

1.3.4 Junction 6 Celbridge

Option 1 – New bridge parallel to existing on the western side

This option would include a new parallel active travel overbridge on the western side of the existing overbridge. This proposed facility would be 4m wide. This option is assessed by two sub-criteria from an air quality perspective: sensitive receptors within 50m of the overbridge and likely traffic volumes. There is the potential for air quality impacts at these receptors due to changes in traffic volumes during the operational phase and due to construction works.

There are no sensitive receptors in a 50m proximity of Option 1 which may be impacted by the construction. There may be a slight reduction in traffic volumes as a result of the proposed overbridge, due to the possible modal shift from private cars to more active modes of travel.

Option 2 – New bridge parallel to existing on the eastern side

This option would include a new parallel active travel overbridge on the eastern side of the existing overbridge. This proposed facility would be 4m. This option is assessed by two sub-criteria from an air quality perspective: sensitive receptors within 50m of the overbridge and likely traffic volumes. There is the potential for air quality impacts at these receptors due to changes in traffic volumes during the operational phase and due to construction works.

There are no sensitive receptors in a 50m proximity of Option 2 which may be impacted by the construction. There may be a slight reduction in traffic volumes as a result of the proposed overbridge, due to the possible modal shift from private cars to more active modes of travel.

Assessment Matrix of Junction 6 Celbridge Options

Table 1.5: Air Quality Assessment Matrix of Junction 6 Celbridge Active Travel Options

Assessment Criteria	Option 1 (West)	Option 2 (East)
Sensitive Receptors within 50m	0 sensitive receptors	0 sensitive receptors
Traffic volume	Possible slight reduction in traffic volumes due to modal shift from private car to active modes	Possible slight reduction in traffic volumes due to modal shift from private car to active modes
Scoring		
Qualitative Assessment	Minor or slightly positive	Minor or slightly positive
Score/ Impact Level	5	5
Preference	Preferred	Preferred

Both options are Preferred as there are no sensitive receptors in 50m proximity of either option being impacted in the construction phase. Both options are expected to have a minor or slight positive impact on air quality due to the likely modal shift from private car to more active modes (less polluting).

1.3.5 R404 Celbridge Road Overbridge

Option 1 – New bridge parallel to existing on the western side

This option would include a new parallel active travel overbridge on the western side of the existing overbridge. This proposed facility would be 4m wide. This option is assessed by two sub-criteria from an air quality perspective: sensitive receptors within 50m of the overbridge and likely traffic volumes. There is the potential for air quality impacts at these receptors due to changes in traffic volumes during the operational phase and due to construction works.

There are no sensitive receptors in a 50m proximity of Option 1 which may be impacted by the construction. There may be a slight reduction in traffic volumes as a result of the proposed overbridge, due to the possible modal shift from private cars to more active modes of travel.

Option 2 – New bridge parallel to existing on the eastern side

This option would include a new parallel active travel overbridge on the eastern side of the existing overbridge. This proposed facility would be 4m wide. This option is assessed by two sub-criteria from an air quality perspective: sensitive receptors within 50m of the overbridge and likely traffic volumes. There is the potential for air quality impacts at these receptors due to changes in traffic volumes during the operational phase and due to construction works.

There are no sensitive receptors in a 50m proximity of Option 2 which may be impacted by the construction. There may be a slight reduction in traffic volumes as a result of the proposed overbridge, due to the possible modal shift from private cars to more active modes of travel.

Assessment Matrix of R404 Celbridge Road Overbridge

Table 1.6: Air Quality Assessment Matrix of the R404 Celbridge Road Overbridge Active Travel Options

Assessment Criteria	Option 1 (West)	Option 2 (East)
Sensitive Receptors within 50m	0 sensitive receptors	0 sensitive receptors
Traffic volume	Possible slight reduction in traffic volumes due to modal shift from private car to active modes	Possible slight reduction in traffic volumes due to modal shift from private car to active modes
Scoring		
Qualitative Assessment	Minor or slightly positive	Minor or slightly positive
Score/ Impact Level	5	5
Preference	Preferred	Preferred

Both options are Preferred as there are no sensitive receptors in 50m proximity of either option being impacted in the construction phase. Both options are expected to have a minor or slight positive impact on air quality due to the likely modal shift from private car to more active modes (less polluting).

1.3.6 Junction 5 Leixlip

Option 1 – New bridge parallel to existing on the western side

This option would include a new parallel active travel overbridge on the western side of the existing overbridge. This proposed facility would be 4m wide. This option is assessed by two sub-criteria from an air quality perspective: sensitive receptors within 50m of the overbridge and likely traffic volumes. There is the potential for air quality impacts at these receptors due to changes in traffic volumes during the operational phase and due to construction works.

There are two sensitive receptors in a 50m proximity of Option 1 which may be impacted by the construction. There may be a slight reduction in traffic volumes as a result of the proposed overbridge, due to the possible modal shift from private cars to more active modes of travel.

Option 2 – New bridge parallel to existing on the eastern side

This option would include a new parallel active travel overbridge on the eastern side of the existing overbridge. This proposed facility will be 4m wide. This option is assessed by two sub-criteria from an air quality perspective: sensitive receptors within 50m of the overbridge and likely traffic volumes. There is the potential for air quality impacts at these receptors due to changes in traffic volumes during the operational phase and due to construction works.

There are three sensitive receptors in a 50m proximity of Option 2 which may be impacted by the construction. There may be a slight reduction in traffic volumes as a result of the proposed overbridge, due to the possible modal shift from private cars to more active modes of travel.

Assessment Matrix of Junction 5 Leixlip Options

Table 1.7: Air Quality Assessment Matrix of Junction 5 Leixlip Active Travel Options

Assessment Criteria	Option 1 (West)	Option 2 (East)
Sensitive Receptors within 50m	2 sensitive receptors	3 sensitive receptors
Traffic volume	Possible slight reduction in traffic volumes due to modal shift from private car to active modes	Possible slight reduction in traffic volumes due to modal shift from private car to active modes
Scoring		
Qualitative Assessment	Minor or slightly positive	Minor or slightly positive
Score/ Impact Level	5	5
Preference	Preferred	Least Preferred

Option 1 is Preferred due to the lesser number of sensitive receptors in 50m proximity being impacted in the construction phase, compared to Option 2, where there are 3 sensitive receptors in 50m proximity that may possibly be affected by construction. Both options are expected to have a minor or slight positive impact on air quality due to the likely modal shift from private car to more active modes (less polluting).

1.4 Summary

All options are expected to generate a minor or slightly positive impact on air quality due to the potential for modal shift from private car to active modes. The preference for options is based on the number of receptors located within 50m of the construction works.

1.5 References

TII Air Quality Assessment of Proposed National Roads – Standard, TII 2022