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Kildare County Council

Proposed Civic Amenity Centre & Waste Transfer Facility at Kilmacredock Upper & Castletown, Celbridge, Co. Kildare

Civil Infrastructure Design Report in Support of Part 8 Planning Application

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1 Introduction

This report has been prepared by Donnachadh O'Brien & Associates Consulting Engineers Ltd. (DOBA) on behalf of Kildare County Council in support of a Part 8 Planning Application for the proposed Civic Amenity Centre & Waste Transfer Facility

The proposed site is located on a c. 1.20 Ha Greenfield site 1,100m North-East of Celbridge Town, in the Townland of Kilmacredock Upper & Castletown. The site is bounded to the North by the M4 Motorway, to the South by the R449, to the West by Kildare County Council owned lands and to the East by a Local Authority materials storage depot. The site topography is generally flat with elevation ranging from +66.500mOD to +67.000mOD.

Figure 1 Site Location (outlined in red)

The overall development consists of the construction of 1.2Ha Civic Amenity Centre & Waste Transfer Facility with dedicated chargeable and non-chargeable waste areas, 4 single storey buildings which include a Staff Building, a Pay Station Building, Weighbridge Building and Household Hazardous Waste Storage Building together with all ancillary site development, landscape works and a new access onto the R449.

The existing site layout is indicated on drawings C-0010 while the proposed site layout is indicated on drawing C-0015.

This report outlines the proposed development works under the following areas:-

- Surface Water Drainage,
- Foul Water Drainage,
- Water Supply,
- Roads Infrastructure

The following report should be read in conjunction with the engineering drawings listed below, which are submitted in support of this planning application:-

- C-0001 Site Location Map
- C-0010 Site Plan – Existing
- C-0015 Site Plan – Proposed Works
- C-0016 Proposed Staff Building
- C-0017 Proposed Pay Station Building
- C-0018 Proposed Household Hazardous Waste Building
- C-0019 Proposed Weighbridge Building
- C-0020 Proposed Surface Water Drainage Layout
- C-0030 Proposed Foul Drainage Layout
- C-0040 Proposed Watermain Layout
- C-0050 Proposed Site Layout Sheet 1-of-2
- C-0051 Proposed Site Layout Sheet 2-of-2
- C-0060 Proposed Road Markings Sheet 1-of-2
- C-0061 Proposed Road Markings Sheet 2-of-2
- C-0070 Proposed Autotrack Access Sheet 1-of-2
- C-0071 Proposed Autotrack Access Sheet 2-of-2
- C-0080 Proposed Exit Sightlines
- C-0090 Proposed Treatment Plant Layout & Details
- C-0100 Proposed Typical Drainage & Manhole Details
- C-0110 Proposed Surface Water Attenuation Tank Details
- C-0120 Proposed Typical Siteworks Details
- C-0121 Proposed Site Boundary & Entrance Gate Details
- C-0130, C-0131, C-0132 Typical Watermain Details
- C-0140, C-0141 Proposed Road Long Sections with SW and FW Drainage
- C-0150 Proposed Site Sections

2 Planning Stage Site Investigation

IGSL were commissioned by DOBA to carry out a Planning Stage Site Investigation (refer to Appendix B for the SI Report) consisting of the following:-

- **Trial Pits to 2.00m and 2.20m BEGL**. Encountered ground conditions in TP01 included top soil overlying stiff sandy gravelly CLAY while TP02 included topsoil overlying stiff very gravelly clayey SILT with occasional cobbles.
- **BRE365 soakaway test at 2.0m BEGL:-** The infiltration rate calculated of $6.59x10^{-6}$m/s demonstrates unfavourable ground conditions for disposal of surface water to ground.
- **Window Sampling**:- 4 no. 100mm dia. cores of the sub soils were taken using Window Sampling methods. The recovered soil cores not topsoil in each of the 4 locations overlying firm to stiff brown or grey brown sandy gravelly SILT/ CLAY, typically containing cobble sized material.
- **Site Characterisation:-** Site Characterisation tests were carried out by Declan Kearns & Associates Consulting Engineers. The results of the EPA suite of "P" and "T" Tests note that a proprietary wastewater treatment system and sand polishing filter should be installed to treat a P.E. of 10.
- **Plate Bearing Tests:-** 3 No. PBTs were carried out and equivalent CBR values were calculated with second cycle results yielding results of 12.5% to 26.1% at 0.60m BEGL.

3 Surface Water Drainage

3.1 Existing Surface Water Drainage

There is existing surface water infrastructure located to the South of the proposed site associated with the R449.

3.2 Proposed Surface Water Drainage Strategy

The proposed surface water drainage strategy is as follows:-

- The site has been designed to store a 1:100 year rainfall event below ground in the form of Stormtech Parabolic Arched Attenuation Tank with 525m^3 capacity. A minimum of 500mm free-board is to be provided to the lowest building FFL from the top of the attenuation tank system,
- The design of the attenuation system and pipe network for a 1:100 year event includes an allowance for 20% Climate Change,
- Surface Water discharge from the site shall be limited to 2.9 litres/ second using a flow control device fitted to the discharge manhole before entering into the public network via a new manhole constructed on the existing surface water line on the R449,
- Discharge from the site shall be treated through the provision of a suitably sized petrol interceptor installed after the last discharge manhole and before the connection to the public network.
- The design and management of surface water for the proposed development will comply with the policies and guidelines outlined in the Greater Dublin Strategic Drainage Study (GDSDS), SuDS principles and be in compliance with the Kildare County Development Plan surface water and drainage policies. Pipe sizes and gradients will be designed so as to achieve self-cleansing velocities as per the requirements of the Building Regulations Part 'H'.
- The calculations for the surface water drainage network are attached in Appendix C of this report. The proposed surface water drainage details are indicated on the following drawings:-
    - C-0020 Proposed Surface Water Drainage Layouts
    - C-0110 Proposed Surface Water Attenuation Details
    - C-0140, C-0141 Proposed Road Long Sections with SW and FW Drainage

4 Foul Drainage

4.1 Existing Foul Drainage

There is no public foul drainage infrastructure in the vicinity of the site.

4.2 Proposed Foul Drainage Strategy

The proposed foul drainage network design has been carried out in accordance with the Greater Dublin Regional Code of Practice for Drainage Works. Pipe sizes and gradients have been designed so as to achieve self-cleansing velocities as per the requirements of the Building Regulations Part 'H'. The calculations for the foul drainage network are attached in Appendix G of this report.

The proposed foul drainage details are indicated on the following drawings:-

- C-0030 Proposed Foul Drainage Layout
- C-0140, C-0141 Proposed Road Long Sections with SW and FW Drainage

The proposed foul network will collect effluent from the new buildings via a local piped network and discharge into a foul piped network located within the internal access roads of the proposed development. The proposed foul drainage network for the development will then discharge by gravity to a proprietary packaged wastewater treatment system (WWTS) and sand polishing filter. The WWTS and polishing filter have been designed in accordance with the EPA guidelines and based on the Site Characterisation report carried out in September 2018 (refer to Appendix B).

The new proprietary WWTS will consist of a primary and secondary proprietary packaged underground treatment tank and a sand polishing filter percolation area. The new WWTS and associated sand polishing filter has been designed to cater for a Population Equivalent (P.E.) of 10 in order to provide for adequate treatment and disposal of the final effluent for the proposed development.

The hydraulic loading of 20litres/person/day loading rate gives a total WWTS requirement of 1.20m^3/day. The associated required sand polishing filter area is therefore calculated as follows:-

1,200 litres/day / 40 litres/m^2/day = 30m^2.

Based on this minimum required area, the proposed sand polishing filter is designed to be 37.50m^2 to provide adequate treatment.

The proposed WWTP system will allow for a discharge rate of 40l/m^2 of highly treated effluent to the sand polishing filter.

5 Watermains

5.1 Existing Water Supply

The Irish Water maps shows that there is an existing 225mm diameter HPPE located along the existing R449 to the South of the proposed development.

5.2 Proposed Water Supply

A new 150mm diameter HDPE PE-150 looped watermain proposed to be provided to the development with a bulk water meter provided on the new watermain, within the public domain, prior to entering the site. Hydrants will be located throughout the site such that no building is further than 46m away from a hydrant in accordance with Part B of the Building Regulations and the IW requirements. A scour valve will be located on the lowest section of the line and will to discharge to a foul manhole in accordance with the Irish Water requirements while an air valve will be located on the highest section of the line for maintenance in accordance with IW requirements. A Fire Flow Simulation Test shall be carried out at Detailed Design Stage to ascertain the existing flow and pressure in the existing 250mm dia. watermain located on the R449. It is not envisaged that there will be an issue with the minimum flows or pressure requirements in this watermain, however, any deficiencies with regard to Fire Flows shall be addressed through the provision of an underground firefighting water storage tank within the site.
The proposed watermains details are indicated on the following drawings:-

- C-0040 Proposed Watermain Layout
- C-0130, C-0131, C-0132 Typical Watermain Details

5.3 Water Demand Calculations

Commercial Demand

Occupancy = 10 persons (maximum)

Consumption = 150 litres/ person/ day x 10 persons = 1,500 litres/ day

Average hour daily demand

1,500 litres/ day x 1.25 = 1.875 litres/ day

1,875/ 24 x 60 x 60 = 0.02 litres / second

Peak Hour Daily Demand

0.02 x 5 = 0.1 litres/ second

6 Flooding

6.1 Site Flood History and Flood Data

Information from the following sources has been reviewed in order to identify any existing flood risk to the site and proposed development

- Historic flood maps and reports from the OPW www.floodmaps.ie
- CFRAMS study
- OPW PFRA
- Celbridge Local Area Plan 2017-2023

6.2 Floodmaps.ie

The OPW have established a National Flood Hazard Mapping website, www.floodmaps.ie, which highlights areas at risk through collection of recorded data and observed flood events. The figure below is an extract from the OPW Flood Hazard Maps for the site. There are no historical flood events on the site.

Figure 2 Extract from Floodmaps.ie (site indicated in blue)

Ordnance Survey Ireland (OSi) provides a web based viewer of historic and current mapping at http://maps.osi.ie/publicviewer/. Historic mapping often includes “land liable to floods” and can be a useful indicator or historic flood risk. In the case of the proposed development, the site and surrounding lands do not indicate historical flooding occurrence.

6.3 CFRAMs

The subject site has not been identified as a flood risk area in the national Catchment Flood Risk Assessment and Management (CFRAM) study. The subject site has been designated as an area not subject to potential fluvial flooding under the OPW Preliminary Flood Risk Assessment.

6.4 OPW PFRA

The subject site has not been identified in the OPW Preliminary Flood Risk Assessment.

The figure blow is an extract from the PFRA drawing "Indicative extents and outcomes - Draft for Consultation 2019 / MAP / 237 / A Revision 0" which appears to indicate localized areas of pluvial flooding to the East of the site.

Figure 3 PFRA indicated Localised Pluvial Flooding to the East (proposed site outlined in red)

6.5 Celbirdge Local Area Plan 2017-2023

The LAP notes that Celbridge has been subject to a number of flood events in the past, however, the area around the proposed site has not been identified as an area susceptible to flooding.

6.6 Sources of Flooding

Following the guidance of the Planning Guidelines, Stage 1 of a Flood Risk Assessment requires the identification and consideration of potential sources of flooding. The potential sources of flooding at the proposed development site are as follows:-

- Fluvial
- Pluvial

6.7 Fluvial Flooding

Finalized Flood Hazard and Risk maps, as part of the Eastern CFRAM Flood Risk Management Plans, have not been produced for this site. The subject site has not been identified as an Area for Further Assessment as part of the Eastern CFRAM study and is not considered a flood risk area. Therefore, there is minimal risk of local fluvial flooding to the site or the proposed buildings and no further detailed assessment of fluvial flood risk is required.

6.8 Pluvial Flooding

Pluvial flooding is the result of rainfall-generated overland flows which arise before run-off can enter any watercourse or sewer. It is usually associated with high intensity rainfall. Flood risk from pluvial sources exists in all areas. Provision of adequate storm water drainage systems will minimize the risk from pluvial flooding sources the proposed surface water drainage network and associated infiltration drainage system (as described in Section 2 of this report) have been designed and adequately sized in accordance with GDSDS and best practise SUDS to accommodate flows in peak rainfall events. The drainage system has sufficient capacity to accommodate a 1 in 100 year storm event plus 20% Climate Change below ground. This will serve to significantly reduce any risk of pluvial flooding arising from the development of the site.

6.9 Sequential Approach and Justification Tests

The sequential approach and Justification tests procedures are outlined in 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' 2009 and is summarized and adopted below. A sequential approach is a key tool in ensuring that development, particularly new development, is first and foremost directed towards land that is at low risk of flooding. The philosophy used in this approach is:-

1. Avoid – preferably choose lower risk flood zones for new development
2. Substitute – Ensure the type of development proposed is not especially vulnerable to the adverse impact of flooding
3. Justify – Ensure that the development is being considered for strategic reasons
4. Mitigate – Ensure flood risk is reduced to minimal levels
5. Proceed – Only where Justification Test passed and emergency planning measures are in place

The figure below sets out the mechanism for the use of the sequential approach to development in flood areas from the planning perspective.

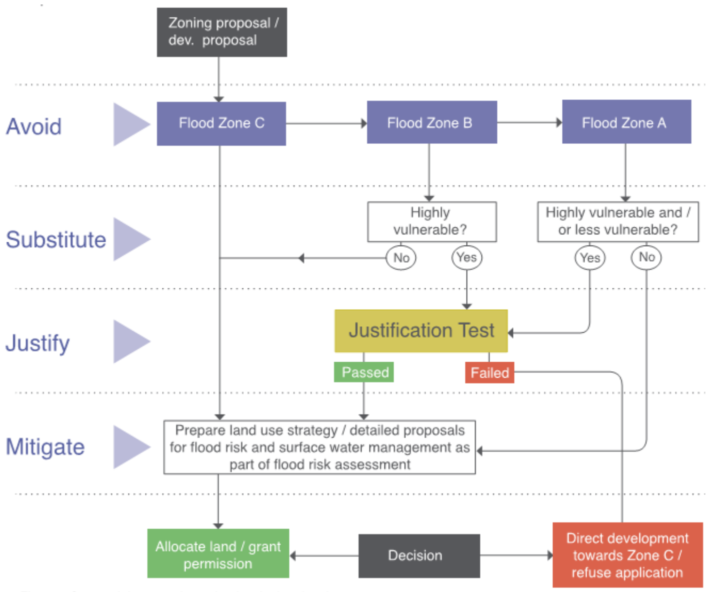


Figure 4 Sequential approach mechanism in the planning process

The sequential approach makes use of flood risk assessment and of prior identification of flood zones for river and coastal flooding and classification of the vulnerability to flooding of different types of development as outlined in the tables below.

Vulnerability class	Land uses and types of development which include*:
Highly vulnerable development (including essential infrastructure)	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less vulnerable development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water-compatible development	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).

*Uses not listed here should be considered on their own merits

Figure 4 Classification of Vulnerability of different types of development

The figure below illustrates those types of development which would be appropriate to each flood zone and those which would be required to meet the Justification test.

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

Figure 5 Vulnerability of Development vs. Flood Zone

Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding)

Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding)

Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding).

Based on Figure 2 we can designate that the site is located within Flood Zone C in accordance with Section 2.23 of the guidelines. Therefore the development is appropriate and there is no requirement for a justification test.

6.10 Summary

As described above, there is no risk from Fluvial Flooding based on the available OPW & CFRAMS data nor is there any risk from Pluvial Flooding. The site is located within Flood Zone C, therefore, no further detailed assessment is deemed necessary and the proposed development is not at risk from flooding.

7 Roads & Traffic

7.1 Existing Arrangement

The site is bounded to the North by the M4 Motorway, to the South by the R449, to the West by Kildare County Council owned lands and to the East by a Local Authority materials storage depot. There is an existing entrance off the R449 which serves the existing lands and Local Authority materials storage depot.

7.2 Proposed Arrangements

The Proposed Roads Layout and associated Siteworks details are indicated on the following drawings:-

- C-0050 Proposed Site Plan
- C-0060 Proposed Road Markings and Signage
- C-0070, C-0071 Proposed Autotrack Layout
- C-0080 Proposed Exit Sightlines
- C-0120 Typical Siteworks Details

7.2.1 Chargeable/ Non-Chargeable Waste Areas

The proposed site shall contain two designated areas for waste disposal and collection which are defined as chargeable and non-chargeable waste areas. The perimeter of each area will be provided with the relevant material containers/ skips which will be accessible by the public and will be served by a dedicated set down area located off the internal access roads. The internal circulation space within the waste disposal areas are provided for staff only and will be used to deliver and remove waste disposal containers/ skips via HGVs. The movements of such vehicles is shown on DR-C-0080 and DR-C0081.

7.2.2 Internal Roads

The proposed internal layout of the site includes a dedicated road network consisting of 4m wide one-way roads located around the perimeter of each waste disposal area. Appropriate signage and road markings are provided to guide visitors to each of the waste disposal areas at which a set down area is provided for off-loading of waste. The existing access to the KCC materials storage depot will be maintained with the access road re-surfaced and a new gate installed as shown on the drawings.

7.2.3 Car Park

A car park with provision for 7 no. car parking spaces is proposed to be provided to the South of the proposed Staff Building in accordance with the Table 15.2 of the Kildare County Development Plan where 1 car parking space is being provided per $33m^2$ of gross floor area. 1 no. disabled car parking space is proposed in accordance with Section 1.4.4 of 'Buildings for Everyone' 2002 published by the National Disability Authority and Part M of the Building Regulations (S.I. No. 179, 2000).

7.2.4 Access onto R449

An existing access exists on the R449 to serve the LA materials storage depot and the KCC lands. It is proposed to move the location of this access further East as shown on the Proposed Site Plan C-0015. The R449 will be required to be locally widened as shown on C-0060 and DR-C-0061 to allow for the provision of a ghost island with right hand turning lane. The design of the ghost island junction has been carried out in accordance with Section 5.6.11 of TII Publication DN-GEO-03060 Geometric Design of Junctions.

7.3 Access and Permeability for Vulnerable Road Users (VRU)

The position of the existing footpath and cyclepath located to the South of the proposed site along the R449 shall be modified to suit the construction of the ghost island junction as described above. An uncontrolled pedestrian crossing point shall be provided at the entrance to the proposed facility. A series of set down areas throughout the site shall be provided along with dedicated footpaths for VRUs to safely access each of the waste disposal areas. Provision has been made for VRUs to cross the internal road network through the use of dropped kerbs and blister paving as indicated on DR-C-0050. Access to the internal waste disposal circulation spaces will be limited through appropriate road markings, fencing, gates and change in surface materials.

7.4 Exit Sightlines and Autotrack

Exit sightlines at the proposed development's exit location of 90m with a 4.50m set-back from the road edge have been provided in accordance with the NRA: DMRB for a 60kph road.
An auto track analysis has been carried out for the internal roads using the following vehicles:-

- 10.20m rigid HGV
- 16.48m articulated HGV
- 8.68m rigid Fire Tender
- 4.91m passenger SUV

The Proposed Autotarck analysis output is indicated on drawings C-0080.

7.5 Transport Assessment

AECOM were commissioned by Kildare County Council to prepare a Traffic and Transport Assessment (refer to Appendix I) to examine the following:-

- traffic and transport impact of the proposed development,
- access to the local area road network from the development,
- investigate the influence the net change in traffic will have on the local road network due to the additional traffic,
- review of existing conditions in terms of site accessibility,

- traffic surveys to identify existing traffic levels,
- percentage change assessment to identify the impact of the proposed development at the junctions within the study area during the AM and PM weekday peak

The principal findings of the Traffic and Transport Assessment are summarised as follows:-

- A review of the existing conditions in the vicinity of the proposed development confirms that the site is well situated, adjacent to the R449 and between the existing towns of Celbridge, Maynooth and Leixlip, as well as being near to West Dublin. It is situated just off the motorway system; with access onto the M4 approximately 300 metres to the northeast, via Junction 6. The nearest bus stop is approximately 1.1km from the site, located on the R405, with services into Celbridge and onwards to Dublin. Accident data was obtained from the Road Safety Authority for the last 10 year period up to the end of 2014which illustrates that four collisions have occurred within the study area, with one fatal collision. The data suggests that there are no existing safety issues which are likely to be exacerbated by the proposed development.
- Access to the site for all modes will be provided via a priority junction on the R449. There will be a footway into the site provided and there will be provision for 7 car parking spaces. In order to determine the level of trips generated by the proposed development, the Trip Rate Information Computer System (TRICS) database has been utilised. This identified that 116 two-way vehicular trips would occur in the AM peak, and 36 two-way vehicular trips would occur in the PM peak. Traffic data was gathered at the M4 Junction 6 Five-arm roundabout and the R449 / R405 Three-arm roundabout. A percentage increase assessment was then undertaken for these junctions. Base scenarios and with Development scenarios were created and compared for the years of 2020, 2025, and 2035. The results of the assessment confirm that there would not be an increase of 10% at either of the junctions. However, for robustness, a capacity assessment for the R449 / R405 Three-arm roundabout has been carried out, along with the R449 / Site Access Priority Junction. The modelling results illustrate that the R449 / R405 Three-arm roundabout and the R449 / Site Access Priority Junction both operate within capacity in all modelled scenarios, and therefore no mitigation measures are required.
- It is considered that the impact of the development is acceptable and therefore it is considered that Kildare County Council should be able to provide a positive recommendation for approval of the application.

Appendix A Irish Water Watermains Web Map

KCC Civic Amenity Centre

February 7, 2017

1:4,514

0 | 0.1 | 0.2 | 0.4 mi

0 | 0.175 | 0.35 | 0.7 km

Legend

Surface	Other; Unknown	Overflow	Soakaway	Treatment plant	Catchpit	Combined	Unknown	Orifice Plate	District (Boundary Meter)
Surface	Gully	Soakaway	Standard Outlet	Pump station	Hatchbox	Foul	Combined	PRV	Treatment Plant
Cascade	Standard	Other; Unknown	Other; Unknown	Catchpit	Lamphole	Overflow	Foul	PSV	Potable
Catchpit	Other; Unknown	Storm Culverts	Rodding Eye	Gully	Standard	Unknown	Overflow	Other	Raw Water
Hatchbox	Vent/Col	Storm Clean Outs	Flushing Structure	Standard	Other; Unknown	Combined	Unknown	Open	Pump Stations
Lamphole	Other; Unknown	Outfall	Other; Unknown	Other; Unknown	Vent/Col	Foul	Non-return	Closed	
Standard	Outfall	Overflow	Sewer Flow Control Valves	Cascade	Other; Unknown	Overflow	Hydro	Part Closed	

Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland. It should not be relied upon in the event of excavations or other works being carried out in the vicinity of the network. The onus is on the parties carrying out the works to ensure the exact location of the network is identified prior to mechanical works being carried out. Service pipes are not generally shown but their presence should be anticipated. © Irish Water

Irish Water

UISCE ÉIREANN : IRISH WATER

Appendix B Planning Stage Site Investigation

NEW AMENITY CENTRE
CELBRIDGE
CO KILDARE

DOBA
CONSULTING ENGINEER

CONTENTS

APPENDICES

FOREWORD

The following Conditions and Notes on Site Investigation Procedures should be read in conjunction with this report.

General.

Recommendations made, and opinions expressed in the report are based on the strata observed in the exploratory holes, together with the results of in-situ and laboratory tests. No responsibility can be held for conditions which have not been revealed by exploratory work, or which occur between exploratory hole locations. Whilst the report may suggest the likely configuration of strata, both between exploratory hole locations, or below the maximum depth of the investigation, this is only indicative, and liability cannot be accepted for its accuracy.

Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction below or close to the site.

Boring Procedures.

Unless otherwise stated, the 'Shell and Auger' technique of soft ground boring has been employed. All boring operations sampling and/or logging of soils and in-situ testing complies with the recommendations of the British Standard Code of Practice BS 5930 (1981), 'Site Investigation' and BS 1377:1990, 'Methods of test for soils for civil engineering purposes'.

Whilst the technique allows the maximum data to be obtained in soft ground, some disturbance and variation of soft and layered soils is unavoidable. Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

Where peat has been encountered during siteworks, samples have been logged in accordance with the Von Post Classification (ref. Von Post, L. 1992. Sveriges Gologiska Undersoknings torvinventering och nogra av dess hittils vunna resultat (SGU peat inventory and some preliminary results) Svenska Mosskulturforeningens Tidskrift, Jonkoping, Swedden, 36, 1-37 & Hobbs N. B. Mire morphology and the properties of some British and foreign peats. QJEG, Vol. 19, 1986).

Routine Sampling.

Undisturbed samples of soils, predominantly cohesive in nature are obtained unless otherwise stated by a 104mm diameter open-drive tube sampler. In granular soils, and where undisturbed sampling is inappropriate, disturbed samples are collected. Smaller disturbed samples are also recovered at intervals to allow a visual examination of the full strata section.

In-Situ Testing.

Standard penetration tests, utilising either the standard split spoon sampler or solid cone and automatic trip-hammer are conducted unless otherwise where required by instruction. Subsequent to a seating drive of 150mm, a summation for the number of blows for 300mm penetration is recorded on the boring records together with the blow count for each 75mm penetration. In cases where incomplete penetration is obtained, the number of blows for the recorded value of penetration are noted. In coarse granular soils, a cone end is fitted to the sampler and a similar procedure adopted.

Groundwater.

The depth of entry of any influx of groundwater is recorded during the course of boring operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level.

Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage condition, tidal variation or other causes.

Retention of Samples.

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material is discarded unless a period of retention of samples is agreed, it is our normal practice to discard all soil samples one month after submission of our final report.

REPORT ON A SITE INVESTIGATION
FOR A PROPOSED CIVIC AMENITY CENTRE
AT CELBRIDGE

FOR
KILDARE CO CO

DONNACHADH O'BRIEN AND ASSOCIATES
(DOBA)
CONSULTING ENGINEERS

Report No. 21145 **SEPTEMBER 2018**

I Introduction

A plot of land located near the M4 Celbridge Interchange is to be developed as an Amenity Centre for Kildare County Council. The site adjoins an existing county council compound.

An investigation of ground conditions in the area of the development has been ordered by DOBA Consulting Engineers, on behalf of Kildare County Council.

The programme of the investigation included trial pits, dynamic probes and window samples, to establish geotechnical criteria relating to the existing foundations. Work was carried out in accordance with BS 5930, Code of Practice for Site Investigations (1999) and the appropriate Eurocodes.

In addition a Site Suitability Assessment was carried out for on site foul treatment and one Soakaway Tests was carried out in accordance with BRE Digest 365.

A programme of laboratory testing to confirm geotechnical and environmental soil parameters followed site operations.

This report includes all factual data pertaining to the project and comments on the geotechnical findings relative to the proposed development.

II Fieldwork

A detailed site plan was provided by DOBA indicating the various exploratory locations. This is presented in Appendix VIII.

This plan sub-divides the site into three areas, with the Site Suitability Assessment carried out in Area 3.

The programme of the investigation included the following elements:

- Window Sample Cores at 4 locations to identify soil composition
- Heavy Duty Probing at each of the above locations to establish soil strength
- Trial Pit Excavations (One each in Area 1 and Area 3)
- Soakaway Test to BRE Digest 365 in Area 2.
- Site Suitability Assessment for Foul Treatment in Area 3.
- CBR Values by Plate Bearing Test
- Geotechnical Laboratory Tests
- Environmental Laboratory Tests

a. Window Sampling

100mm diameter cores of the sub soils were taken in four locations using Window Sampling Methods. The recovered soil core is extruded in the laboratory and detailed records are prepared. These records with photographs are presented in Appendix I

The records note topsoil in each location overlying firm to stiff brown or grey brown sandy gravelly SILT/CLAY, typically containing cobble sized material. This stratum is boulder clay or glacial till and is typical of the general area.

Sampling continued to refusal at depths between 1.00 and 2.00 metres. The refusal depths are not indicative of rock horizon. No ground water was noted during the course of the investigation.

b. Dynamic Probes

A tracked Competitor Probe Rig was used to establish a strength/depth pattern beside each window sample location. A 50kg hammer falling through 500mm is used to drive a 43.7mm diameter cone into the soil.

Probing is in accordance with the DPH specification of BS 1377: Part 9: 1990. In these tests, the soil resistance is measured in terms of the number of drop-hammer blows required to drive the test probe through each 100 mm increment of penetration. The results are presented in both graphical and tabular form in Appendix I1. Probing is generally terminated following successive blow counts in excess of 25, to avoid damage to the apparatus.

Where very soft soils are encountered, the probe may penetrate the soil under self weight and blow counts of zero may be entered where this happens. Blow counts of zero do not signify a void, unless specifically mentioned.

The four probes confirm the presence of stiff to very stiff soils below surface topsoil. Probes all recorded relatively shallow refusal between 1.00 and 1.20 metres BGL.

c. Trial Pits

Trial Pit TP01 was located at the Site Suitability test location in Area 3. Top soil overlies stiff sandy gravelly CLAY which continued to a final depth of 2.20 metres.

Trial Pit TP02 was located in Area 1. Here topsoil overlies stiff very gravelly clayey SILT, with occasional cobbles. Excavation continued to 2.00 metres and both trial pits were dry.

Trial Pit records are contained in Appendix III.

d. BRE Digest 365 Soakaway

One soakaway test was carried out in Area 2. The test was performed in accordance with BRE Digest 365, over two stages following initial soakage. Test data including a detailed trial pit record are presented in Appendix IV. An infiltration Rate of 'f' = 0.0004 m/minute was calculated from the field data.

e. Site Characterisation

Site Suitability for foul water disposal was determined by Declan Kearns and Associates. Their detailed report is presented in Appendix V to this document

f. CBR by Plate Test

Plate bearing tests were carried out at three locations and equivalent CBR values were calculated. Results are presented in Appendix VI. CBR values on the initial load cycle range from 4.5 to 7.1% and on the second cycle increase to 12.5 to 26.1%.

III Testing

(a) Laboratory :

All samples from the site have been returned to the IGSL laboratory for initial visual inspection, a schedule of testing was prepared and tests as appropriate carried out.

The testing included the following elements and results are presented in Appendix VI1 Geotechnical Tests were carried out by IGSL in their INAB-Accredited facility. Chemical and environmental testing was carried out by CHEMTEST in their UKAS laboratory.

a. Classification (Liquid and Plastic Limits)
b. Grading Analysis
c. Sulphate and pH
d. RILTA Environmental.

Classification
The liquid and plastic limits were established for samples of the gravelly clay. Values are tabulated with relevant moisture contents and plotted on the standard Casagrande Chart, falling both in the CI and Non-Plastic Zones. The results indicate that the soil matrix varies from clay to silt, is of uniformly low-plasticity with a high sensitivity to moisture content variation.

Grading (PSD)
Two samples of the boulder clay have had particle size distribution established by wet sieve hydrometer analysis. The straight line grading curves are typical of the local boulder clay deposition.

Sulphate and Ph
Sulphate Content and pH was established for two samples. Sulphate (2:1 Water Soluble) content is < 0.010 g/l. pH values range from 8.1 to 8.4.
No special precautions are necessary to protect foundation concrete from sulphate aggression. A sulphate design class of DS-1 (ACEC Classification for Concrete) is indicated for concentrations less than 0.5 g/l.

RILTA Environmental Suite
One samples was submitted for RILTA Suite (WAC) analysis. The detailed test data indicates the material is classed as INERT. Excavated material from this site may be disposed of on site or removed to as suitably licensed landfill facility.

No Asbestos traces were detected during routine screening.

IV. Discussion:

The investigation has been carried out at a proposed County Council Depot in Celbridge.

The findings confirm that stiff brown gravelly silt or clay (boulder clay) is encountered directly below topsoil. The characteristics of the boulder clay are very well documented.

The soils will readily support loads of the order of 150 to 200 KPa on traditional strip or pad footings placed at 0.70 to 0.80 metres BGL.

CBR values are in excess to 5% indicating suitability of the sub soils for roads or paved areas.

BRE Digest 365 testing indicates low permeability in the boulder clay, with an infiltration rate of 0.0004 m/minute obtained.

Suitability of Area 3 of the site for foul water disposal has been determined by specialist environmental engineering consultant.

IGSL/JC
September 2018

Appendix I Window Sample Records

IGSL

WINDOW SAMPLE RECORD

REPORT NUMBER 21145

CONTRACT	Celbridge Civic Amenity Centre	PROBE NO.	WS01
		SHEET	Sheet 1 of 1
CO-ORDINATES		DATE COMMENCED	31/07/2018
GROUND LEVEL (mOD)		DATE COMPLETED	31/07/2018
CLIENT	Kilmacredock Upper, Celbridge	SAMPLED BY	C. Kavanagh
ENGINEER	Donnachadh O'Brien Consulting Engineers	LOGGED BY	K. Kinsella

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Depth of Sample Run (m)	Recovery (%)	Blowcount	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	Firm dark brown TOPSOIL with rootlets		0.12							
	Firm to stiff brown/light brown slightly sandy SILT with rare angular to subangular gravel		0.60							
	Stiff dark brownish grey sandy very gravelly SILT, rare 130mm subrounded cobble at 0.70m		1.10			0.00-1.00	100	250 blows		
1.0	Firm dark brownish grey to dark grey sandy gravelly CLAY with occasional subrounded cobbles up to 80mm		2.00			1.00-2.00	60	250 blows		
2.0	Obstruction - Pushing large cobble Final Depth 2.00m									
3.0										
4.0										
5.0										

General Remarks

Installations

WINDOW SAMPLE RECORD

IGSL

REPORT NUMBER 21145

CONTRACT Celbridge Civic Amenity Centre

PROBE NO. **WS02**

SHEET Sheet 1 of 1

CO-ORDINATES

GROUND LEVEL (mOD)

DATE COMMENCED 31/07/2018

DATE COMPLETED 31/07/2018

CLIENT Kilmacredock Upper, Celbridge

ENGINEER Donnachadh O'Brien Consulting Engineers

SAMPLED BY C. Kavanagh

LOGGED BY K. Kinsella

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Depth of Sample Run (m)	Recovery (%)	Blowcount	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	Firm dark brown slightly sandy TOPSOIL with rootlets		0.15							
	Firm to stiff brown/light brown slightly sandy SILT with rare angular to subrounded gravel		0.55							
	Stiff to locally firm dark brownish grey sandy gravelly SILT with rare subangular to subrounded cobbles up to 90mm		0.90			0.00-0.90	100	Ref blows		
1.0	Final Depth 0.90m									
2.0										
3.0										
4.0										
5.0										

General Remarks

Installations

WINDOW SAMPLE RECORD

REPORT NUMBER	21145
CONTRACT	Celbridge Civic Amenity Centre
PROBE NO.	WS03
SHEET	Sheet 1 of 1
CO-ORDINATES	
GROUND LEVEL (mOD)	
DATE COMMENCED	31/07/2018
DATE COMPLETED	31/07/2018
CLIENT	Kilmacredock Upper, Celbridge
ENGINEER	Donnachadh O'Brien Consulting Engineers
SAMPLED BY	C. Kavanagh
LOGGED BY	K. Kinsella

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Depth of Sample Run (m)	Recovery (%)	Blowcount	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	Firm dark brown TOPSOIL with rootlets		0.20							
	Firm to stiff brown slightly sandy SILT with rare fine to medium angular to subangular gravel		0.95			0.00-1.00	100			
1.0	Stiff greyish brown sandy SILT with occasional angular to subrounded gravel, increase in gravel content with depth		1.50			1.00-1.50	100	Ref blows		
	Final Depth 1.50m									
2.0										
3.0										
4.0										
5.0										

General Remarks

Installations

WINDOW SAMPLE RECORD

IGSL

REPORT NUMBER	21145		
CONTRACT	Celbridge Civic Amenity Centre	PROBE NO.	WS04
		SHEET	Sheet 1 of 1
CO-ORDINATES		DATE COMMENCED	31/07/2018
GROUND LEVEL (mOD)		DATE COMPLETED	31/07/2018
CLIENT	Kilmacredock Upper, Celbridge	SAMPLED BY	C. Kavanagh
ENGINEER	Donnachadh O'Brien Consulting Engineers	LOGGED BY	K. Kinsella

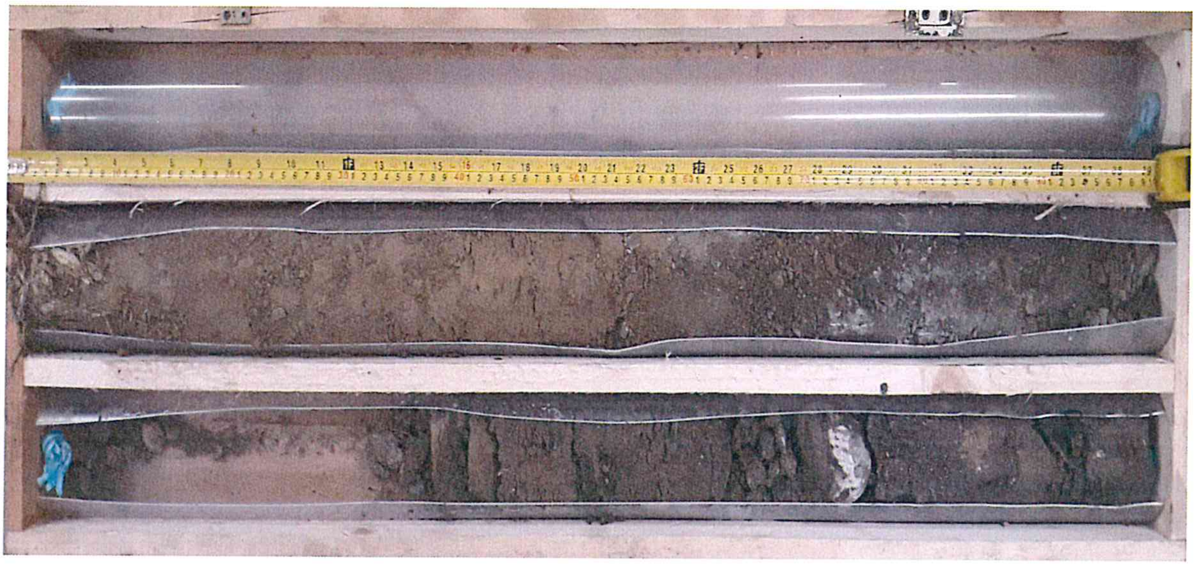
Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Depth of Sample Run (m)	Recovery (%)	Blowcount	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	Firm dark brown TOPSOIL with rootlets									
	Stiff brown/light brown slightly sandy SILT with rare angular to subangular gravel (possibly made ground)		0.18							
	Stiff dark greyish brown sandy SILT with occasional angular to subrounded gravel		0.70			0.00-1.00	100	215 blows		
1.0	Firm dark brownish grey sandy gravelly CLAY, gravel is angular to subrounded		1.20			1.00-1.80	90	Ref blows		
	Final Depth 1.80m		1.80							
2.0										
3.0										
4.0										
5.0										

General Remarks

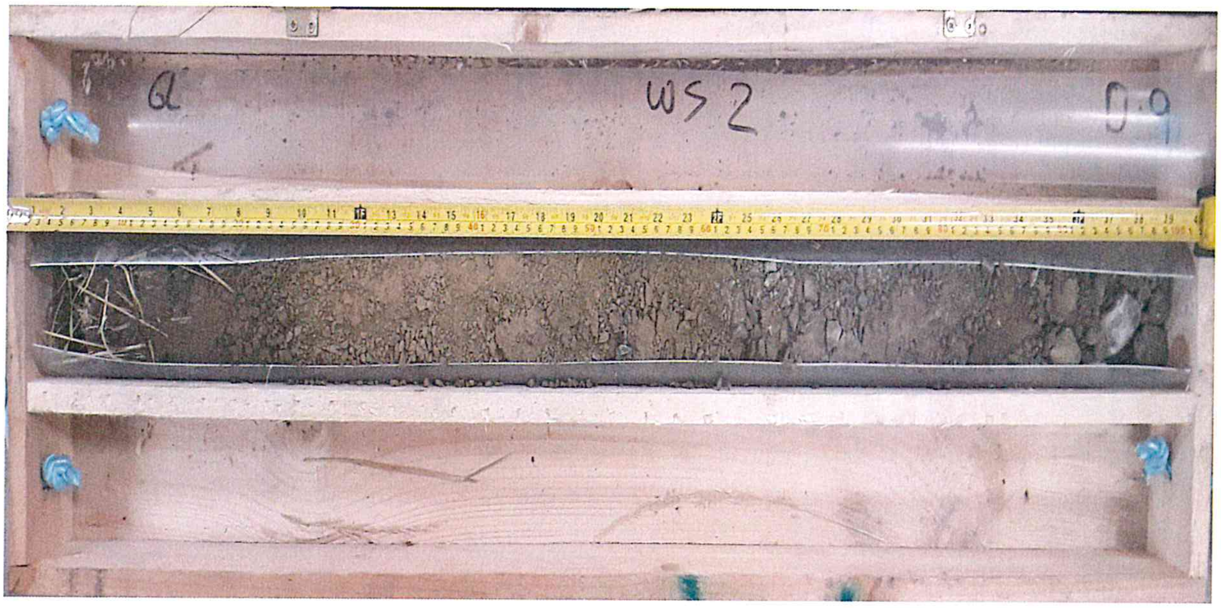
Installations

IGSL WS LOG 21145.GPJ IGSL.GDT 16/8/18

WS01 Box 1 of 1



WS02 Box 1 of 1



WS03 Box 1 of 1

WS04 Box 1 of 1

Appendix II Dynamic Probes

DYNAMIC PROBE RECORD

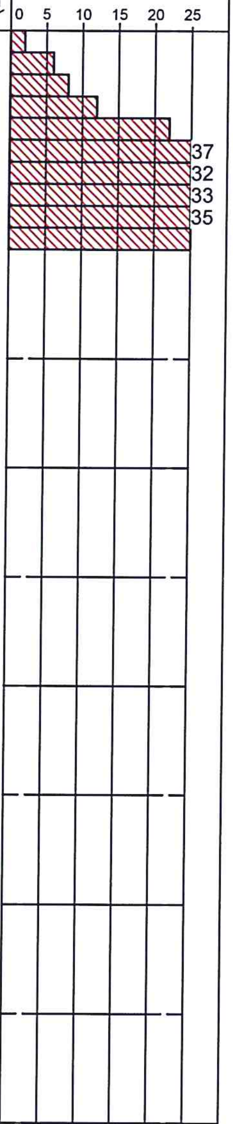
REPORT NUMBER 21145

CONTRACT Celbridge Civic Amenity Centre		**PROBE NO.**	**DP01**
		SHEET	Sheet 1 of 1
CO-ORDINATES		**DATE DRILLED**	31/07/2018
GROUND LEVEL (mOD)	**HAMMER MASS (kg)** 50	**DATE LOGGED**	31/07/2018
CLIENT	**INCREMENT SIZE (mm)** 100		
ENGINEER DOBA	**FALL HEIGHT (mm)** 500	**PROBE TYPE**	DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water
0.0					
1.0	End of Probe at 1.00 m				
2.0					
3.0					
4.0					

Depth (m)	Probe Readings (Blows/Increment)
0.00	2
0.10	6
0.20	8
0.30	12
0.40	22
0.50	37
0.60	32
0.70	33
0.80	35
0.90	25

Graphic Probe Record



GROUNDWATER OBSERVATIONS

REMARKS

DYNAMIC PROBE RECORD

REPORT NUMBER 21145

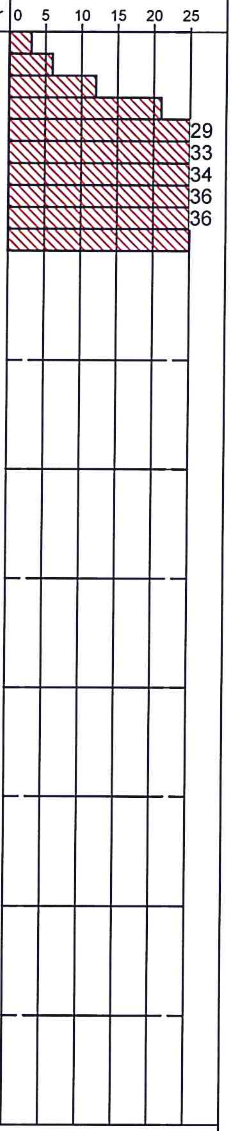
CONTRACT	Celbridge Civic Amenity Centre	**PROBE NO.**	**DP02**
		SHEET	Sheet 1 of 1
CO-ORDINATES		**DATE DRILLED**	31/07/2018
GROUND LEVEL (mOD)		**DATE LOGGED**	31/07/2018
CLIENT		**PROBE TYPE**	DPH
ENGINEER	DOBA		

HAMMER MASS (kg)	50
INCREMENT SIZE (mm)	100
FALL HEIGHT (mm)	500

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water
0.0	.				
1.0	End of Probe at 1.00 m				
2.0					
3.0					
4.0					

Depth (m)	Probe Readings (Blows/Increment)
0.00	3
0.10	6
0.20	12
0.30	21
0.40	29
0.50	33
0.60	34
0.70	36
0.80	36
0.90	25

Graphic Probe Record



GROUNDWATER OBSERVATIONS

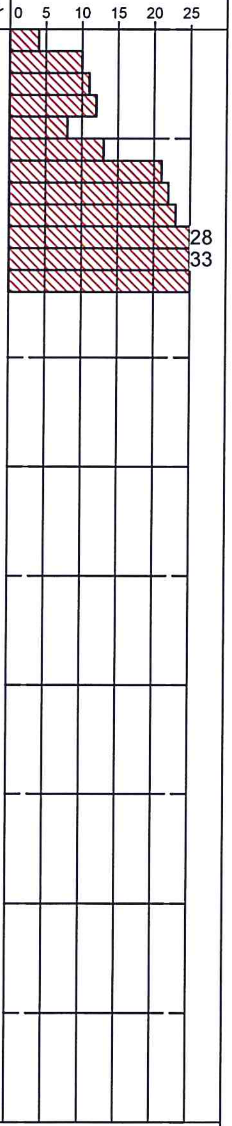
REMARKS

DYNAMIC PROBE RECORD

REPORT NUMBER	21145		
CONTRACT	Celbridge Civic Amenity Centre	PROBE NO.	DP03
		SHEET	Sheet 1 of 1
CO-ORDINATES		DATE DRILLED	31/07/2018
GROUND LEVEL (mOD)		DATE LOGGED	31/07/2018
HAMMER MASS (kg)	50		
INCREMENT SIZE (mm)	100	PROBE TYPE	DPH
FALL HEIGHT (mm)	500		
CLIENT			
ENGINEER	DOBA		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	4
						0.10	10
						0.20	11
						0.30	12
						0.40	8
						0.50	13
						0.60	21
						0.70	22
						0.80	23
						0.90	28
1.0						1.00	33
						1.10	25
	End of Probe at 1.20 m						
2.0							
3.0							
4.0							

Graphic Probe Record



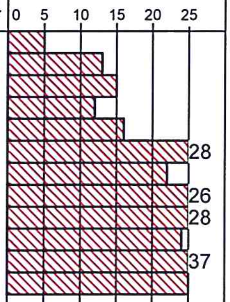
GROUNDWATER OBSERVATIONS

REMARKS

DYNAMIC PROBE RECORD

REPORT NUMBER	21145
CONTRACT	Celbridge Civic Amenity Centre
PROBE NO.	DP04
SHEET	Sheet 1 of 1
CO-ORDINATES	
GROUND LEVEL (mOD)	
CLIENT	
ENGINEER	DOBA
HAMMER MASS (kg)	50
INCREMENT SIZE (mm)	100
FALL HEIGHT (mm)	500
DATE DRILLED	31/07/2018
DATE LOGGED	31/07/2018
PROBE TYPE	DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	5
						0.10	13
						0.20	15
						0.30	12
						0.40	16
						0.50	28
						0.60	22
						0.70	26
						0.80	28
						0.90	24
1.0						1.00	37
						1.10	25
	End of Probe at 1.20 m						
2.0							
3.0							
4.0							



GROUNDWATER OBSERVATIONS

REMARKS

Appendix III Trial Pits

TRIAL PIT RECORD

REPORT NUMBER	21145
CONTRACT	Celbridge Civic Amenity Centre
TRIAL PIT NO.	TP02
SHEET	Sheet 1 of 1
LOGGED BY	K. Kinsella
CO-ORDINATES	
GROUND LEVEL (m)	
DATE STARTED	31/07/2018
DATE COMPLETED	31/07/2018
CLIENT	Kilmacredock Upper, Celbridge
ENGINEER	Donnachadh O'Brien Consulting Engineers
EXCAVATION METHOD	JCB

Scale	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	Firm brown slightly sandy TOPSOIL with rootlets		0.20							
	Stiff to firm brown sandy SILT with occasional gravel		0.80			AA98914	B	0.50-0.60		
1.0	Firm to stiff dark brownish grey sandy gravelly slightly cobbly SILT, cobbles are angular to subrounded and up to 170mm		2.00			AA98915	B	1.50-1.60		
2.0	End of Trial Pit at 2.00m									
3.0										
4.0										

Groundwater Conditions
Dry

Stability
Stable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER	21145
CONTRACT	Celbridge Civic Amenity Centre
TRIAL PIT NO.	TP/SA01
SHEET	Sheet 1 of 1
LOGGED BY	K. Kinsella
CO-ORDINATES	
GROUND LEVEL (m)	
DATE STARTED	31/07/2018
DATE COMPLETED	31/07/2018
CLIENT	Kilmacredock Upper, Celbridge
ENGINEER	Donnachadh O'Brien Consulting Engineers
EXCAVATION METHOD	JCB

Scale	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	Firm brown slightly sandy TOPSOIL with rootlets						Env	0.10-0.10		
	Firm light brown sandy slightly gravelly SILT with plastic and rootlets		0.20							
	Stiff to firm brown sandy gravelly slightly cobbly SILT, cobbles are subangular to subrounded and up to 120mm		0.45			AA98911	B	0.50-0.60		
1.0						AA98912	B	1.00-1.10		
	Firm to stiff dark brownish grey sandy gravelly slightly cobbly SILT, cobbles are angular to subrounded and up to 170mm		1.10			AA98913	B	1.90-2.00		
2.0	End of Trial Pit at 2.00m		2.00							
3.0										
4.0										

Groundwater Conditions
Dry

Stability
Stable

General Remarks
Soakaway test carried out

Appendix IV BRE Digest 365

Soakaway Design f -value from field tests IGSL

Contract: Celbridge Civic Amenity Centre — Contract No. 21145
Test No. SA01 (1st cycle)
Engineer Donnachadh O'Brien Consulting Engineers
Date: 21.07.2018

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Firm brown slightly sandy TOPSOIL with rootlets	No water
0.20	0.45	Firm light brown sandy slightly gravelly SILT with plastic and rootlets	
0.45	1.10	Stiff to firm brown sandy gravelly slightly cobbly SILT, cobbles up to 120mm	
1.10	2.00	Firm to stiff dark brownish grey sandy gravelly slightly cobbly SILT	

Field Data

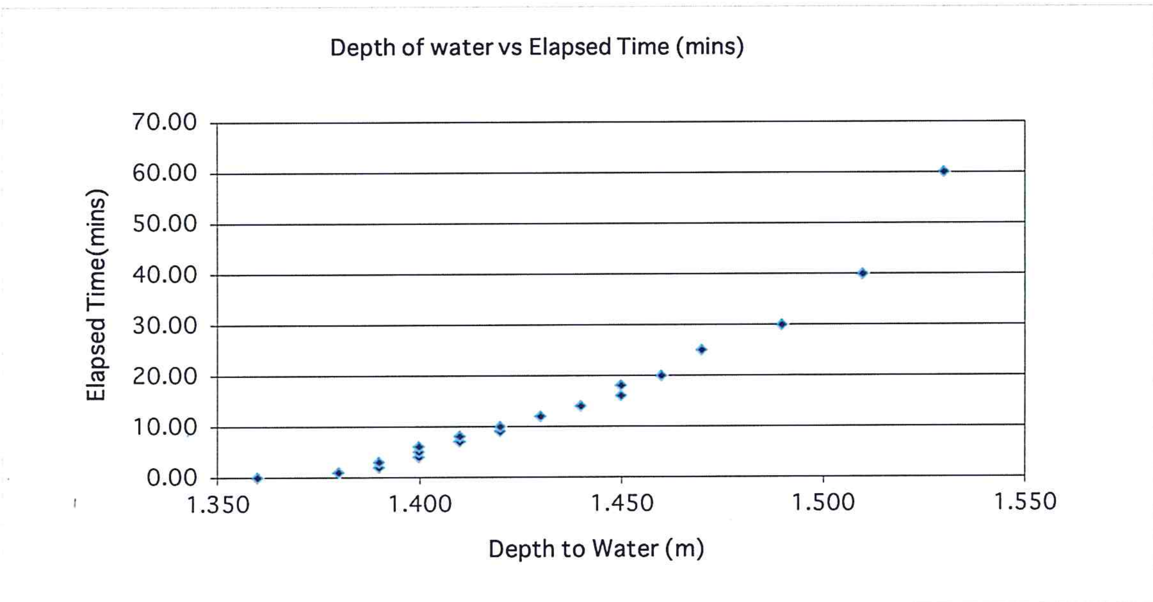
Depth to Water (m)	Elapsed Time (min)
1.360	0.00
1.380	1.00
1.390	2.00
1.390	3.00
1.400	4.00
1.400	5.00
1.400	6.00
1.410	7.00
1.410	8.00
1.420	9.00
1.420	10.00
1.430	12.00
1.440	14.00
1.450	16.00
1.450	18.00
1.460	20.00
1.470	25.00
1.490	30.00
1.510	40.00
1.530	60.00

Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	0.40	m
Length of Pit (L)	1.90	m
Initial depth to Water =	1.36	m
Final depth to water =	1.530	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.76	m2
*Av. side area of permeable stratum over test period	2.553	m2
Total Exposed area =	3.313	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.00065 m/min or 1.08327E-05 m/sec



Soakaway Design   f -value from field tests   IGSL

Contract: Celbridge Civic Amenity Centre   Contract No. 21145
Test No. SA01 (2nd cycle)
Engineer Donnachadh O'Brien Consulting Engineers
Date: 21.07.2018

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Firm brown slightly sandy TOPSOIL with rootlets	No water
0.20	0.45	Firm light brown sandy slightly gravelly SILT with plastic and rootlets	
0.45	1.10	Stiff to firm brown sandy gravelly slightly cobbly SILT, cobbles up to 120mm	
1.10	2.00	Firm to stiff dark brownish grey sandy gravelly slightly cobbly SILT	

Field Data

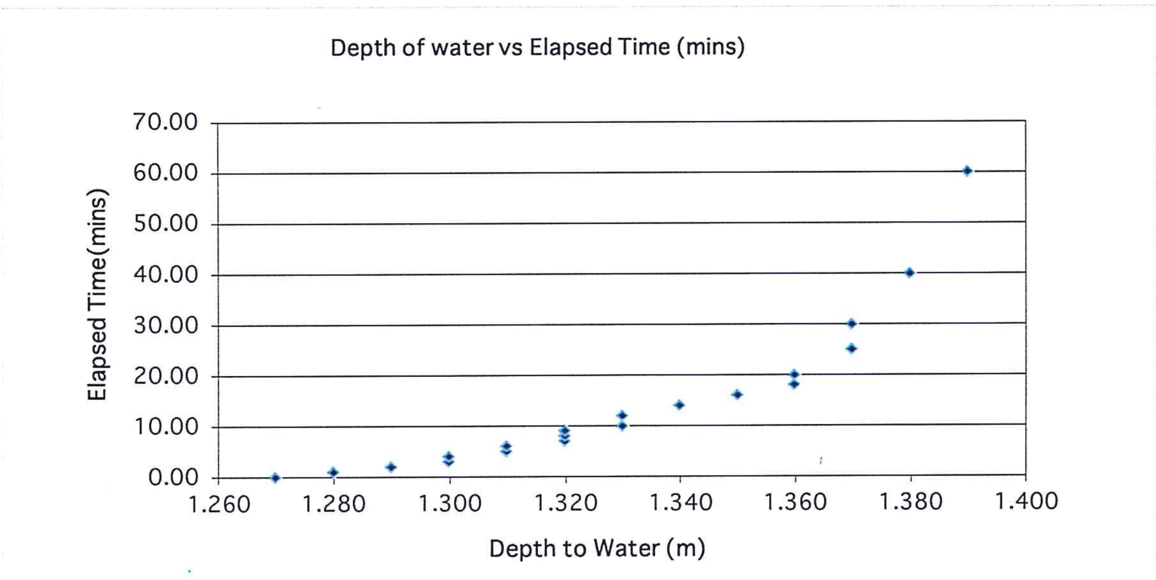
Depth to Water (m)	Elapsed Time (min)
1.270	0.00
1.280	1.00
1.290	2.00
1.300	3.00
1.300	4.00
1.310	5.00
1.310	6.00
1.320	7.00
1.320	8.00
1.320	9.00
1.330	10.00
1.330	12.00
1.340	14.00
1.350	16.00
1.360	18.00
1.360	20.00
1.370	25.00
1.370	30.00
1.380	40.00
1.390	60.00

Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	0.40	m
Length of Pit (L)	1.90	m
Initial depth to Water =	1.27	m
Final depth to water =	1.390	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.76	m2
*Av. side area of permeable stratum over test period	3.082	m2
Total Exposed area =	3.842	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.0004 m/min   or   6.59379E-06 m/sec



Appendix V Site Characterisation Test

APPENDIX B: SITE CHARACTERISATION FORM

File Reference: TEST LOCATION NO. 3 - SEE SITE LAYOUT PLAN

1.0 GENERAL DETAILS (From planning application)

Prefix: [ ] First Name: [ ] Surname: [ ]

Address:
CELBRIDGE CIVIC AMENITY CENTRE, M4 CELBRIDGE INTERCHANGE, CO. KILDARE

Site Location and Townland:
CELBRIDGE CIVIC AMENITY CENTRE, M4 CELBRIDGE INTERCHANGE, CO. KILDARE

Telephone No: [ ] Fax No: [ ]

E-Mail: [ ]

Maximum no. of Residents: 0 No. of Double Bedrooms: [ ] No. of Single Bedrooms: [ ]

Proposed Water Supply: Mains ✔ Private Well/Borehole [ ] Group Well/Borehole [ ]

2.0 GENERAL DETAILS (From planning application)

Soil Type, (Specify Type): TLs, Till derived chiefly from limestones

Aquifer Category: Regionally Important [ ] Locally Important LI Poor [ ]

Vulnerability: Extreme [ ] High [ ] Moderate ✔ Low [ ] High to Low [ ] Unknown [ ]

Bedrock Type: Lucan Formation. Dinantian Upper Impure Limestones.

Name of Public/Group Scheme Water Supply within 1 km: [ ]

Groundwater Protection Scheme (Y/N): No Source Protection Area: SI [ ] SO [ ]

Groundwater Protection Response: R1

Presence of Significant Sites (Archaeological, Natural & Historical): None Noted

Past experience in the area: NO

Comments:
(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, and/or any potential site restrictions).

THE GROUNDWATER IS A TARGET RISK.

Population Equivalent of 10 provided by DOBA Consulting Engineers.

Note: Only information available at the desk study stage should be used in this section.

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment

Landscape Position: FLAT

Slope: Steep (>1:5) ☐ Shallow (1:5-1:20) ☐ Relatively Flat (<1:20) ☑

Surface Features within a minimum of 250m (Distance To Features Should Be Noted In Metres)

Houses: NO RESIDENTIAL HOUSE WITHIN 250M.

Existing Land Use: KILDARE COUNTY COUNCIL DEPOT

Vegetation Indicators: NONE NOTED WITHIN 250M

Groundwater Flow Direction: UNKNOWN

Ground Condition: FIRM

Site Boundaries: >3M

Roads: >15M

Outcrops (Bedrock And/Or Subsoil): None Noted

Surface Water Ponding: None Noted within 250m

Lakes: None Noted within 250m

Beaches/Shellfish: None Noted within 250m

Areas/Wetlands: None Noted within 250m

Karst Features: None Noted within 250m

Watercourse/Stream*: None Noted within 250m

Drainage Ditches*: None Noted within 250m

Springs / Wells*: PROPOSED POLISHING FILTER TO BE >40M FROM ANY WELL

Comments:
(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, the suitability of the site to treat the wastewater and the location of the proposed system within the site).

THE GROUNDWATER IS A TARGET RISK.

***Note and record** water level

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 2.10

Depth from ground surface to bedrock (m) (if present): 2.10

Depth from ground surface to water table (m) (if present): 2.10

Depth of water ingress:

Rock type (if present):

Date and time of excavation: 31/07/2018 09:30

Date and time of examination: 02/08/2018 09:15

	Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m	P	TOPSOIL	Threads 2, 3, 3 Ribbon110,100,120 Not dilatant	Crumb	Firm	Brown	Random
0.2 m	P						
0.3 m	P						
0.4 m	P						
0.5 m	T						
0.6 m	T						
0.7 m	T	Sandy gravelly CLAY (mottled from 0.30m)	Threads 2, 3, 3 Ribbon110,120,100 Not dilatant	Structureless Massive	Firm	Grey mottled brown	Random
0.8 m	T						
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m							
1.6 m							
1.7 m		Very sandy very gravelly CLAY	Threads 3, 2, 4 Ribbon100,110,100 Not dilatant	Structureless Massive	Stiff	Grey brown	Random
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

3.2 Trial Hole (contd.) Evaluation:

Groundwater and bedrock were not encountered at the excavated depth of 2.10m.

3.3(a) Percolation ("T") Test for Deep Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm) (A)	500	500	500
Depth from ground surface to base of hole (mm) (B)	900	900	900
Depth of hole (mm) [B - A]	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	02/08/2018	09:25	02/08/2018	09:25	02/08/2018	09:25

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

Step 3: Measuring T_{100}

Percolation Test Hole No.	1	2	3
Date of test	03/08/2018	03/08/2018	03/08/2018
Time filled to 400 mm	09:45	09:45	09:45
Time water level at 300 mm	11:05	13:45	12:57
Time to drop 100 mm (T_{100})	80.00	240.00	192.00
Average T_{100}			170.67

If T_{100} > 300 minutes then T-value >90 – site unsuitable for discharge to ground
If $T_{100} \leq$ 210 minutes then go to Step 4;
If T_{100} > 210 minutes then go to Step 5;

Step 4: Standard Method (where $T_{100} \leq 210$ minutes)

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)
1	11:05	12:49	104.00	13:45	18:12	267.00	12:57	16:43	226.00
2	12:53	15:05	132.00	18:16	23:07	291.00	16:46	20:42	236.00
3	15:09	17:49	160.00	23:08	04:20	312.00	20:47	01:11	264.00
Average Δt Value			132.00			290.00			242.00
	Average Δt/4 = [Hole No.1]		33.00 (t_1)	Average Δt/4 = [Hole No.2]		72.50 (t_2)	Average Δt/4 = [Hole No.3]		60.50 (t_3)

Result of Test: T = 55.33 (min/25 mm)

Comments:

T = 55. T Test passed. Due to soil mottling at 0.30m, a P test was required.

Step 5: Modified Method (where $T_{100} > 210$ minutes)

Percolation Test Hole No.	1				2				3			
Fall of water in hole (mm)	Time Factor = T_f	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	T – Value = 4.45 / K_{fs}	Time Factor = T_f	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	T – Value = 4.45 / K_{fs}	Time Factor = T_f	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	T – Value = 4.45 / K_{fs}
300 - 250	8.1				8.1				8.1			
250 - 200	9.7				9.7				9.7			
200 - 150	11.9				11.9				11.9			
150 - 100	14.1				14.1				14.1			
Average T- Value	T- Value Hole 1= (t_1)			0.00	T- Value Hole 1= (t_2)			0.00	T- Value Hole 1= (t_3)			0.00

Result of Test: T = 0.00 (min/25 mm)

Comments:

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400.00	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 X 300	300 X 300	300 X 300

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	02/08/2018	09:25	02/08/2018	09:25	02/08/2018	09:25

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	03/08/2018	03/08/2018	03/08/2018
Time filled to 400 mm	09:45	09:45	09:45
Time water level at 300 mm	11:45	12:25	13:45
Time to drop 100 mm (P_{100})	120.00	160.00	240.00
Average P_{100}			173.33

If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground
If $P_{100} \leq$ 210 minutes then go to Step 4;
If P_{100} > 210 minutes then go to Step 5;

Step 4: Standard Method (where $P_{100} \leq 210$ minutes)

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δp (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δp (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δp (min)
1	11:45	14:01	136.00	12:25	15:25	180.00	13:45	18:05	260.00
2	14:05	16:41	156.00	15:29	18:53	204.00	18:08	22:52	284.00
3	16:45	19:49	184.00	18:57	22:49	232.00	22:56	04:08	312.00
Average Δp Value			158.67			205.33			285.33
	Average Δp/4 = [Hole No.1]		39.67 (p_1)	Average Δp/4 = [Hole No.2]		51.33 (p_2)	Average Δp/4 = [Hole No.3]		71.33 (p_3)

Result of Test: P = 54.11 (min/25 mm)

Comments:

P = 54 : P Test Passed. A raised polishing filter will be required due to the mottled soil at 0.30m.

Step 5: Modified Method (where $P_{100} > 210$ minutes)

Percolation Test Hole No.	1				2				3			
Fall of water in hole (mm)	Time Factor = T_f	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	P – Value = 4.45 / K_{fs}	Time Factor = T_f	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	P – Value = 4.45 / K_{fs}	Time Factor = T_f	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	P – Value = 4.45 / K_{fs}
300 - 250	8.1				8.1				8.1			
250 - 200	9.7				9.7				9.7			
200 - 150	11.9				11.9				11.9			
150 - 100	14.1				14.1				14.1			
Average P- Value	P- Value Hole 1= (p_1)			0.00	P- Value Hole 1= (p_2)			0.00	P- Value Hole 1= (p_3)			0.00

Result of Test: P = 0.00 (min/25 mm)

Comments:

4.0 CONCLUSION of SITE CHARACTERISATION

Integrate the information from the desk study and on-site assessment (i.e. visual assessment, trial hole and percolation tests) above and conclude the type of system(s) that is (are) appropriate. This information is also used to choose the optimum final disposal route of the treated wastewater.

Not Suitable for Development ☐

Suitable for [1]

1. Septic tank system (septic tank and percolation area) — No
2. Secondary Treatment System
   a. septic tank and filter system constructed on-site and polishing filter; or — Yes
   b. packaged wastewater treatment system and polishing filter — Yes

Discharge Route

Discharge to Ground Water

5.0 RECOMMENDATION

Propose to install: Packaged wastewater treatment system and polishing filter

and discharge to: Ground Water

Trench Invert level (m): -0.30

Site Specific Conditions (e.g. special works, site improvement works testing etc.

The area of distribution gravel below the sand filter (A1) is based on the following calculation:

A1 = 0.125 x T (m2 per P.E.)

A1= 0.125 x 55 = 6.875 x 10 (P.E)

A1 = 68.75m2, say 70m2

The area of the sand polishing filter (A2) is based on the following calculation :

A2 = 150L x P.E. / Loading Rate

A2 = 150L x 10/ 40L/m2/day

A2 = 37.5m2

A sand polishing filter is recommended and should be installed in accordance with Table 8.2, Table 10.2 and Figure 8.5, EPA CoP 2009 and Treatment Systems for Small Communities, Business, Leisure Centres and Hotels, under the supervision of a suitably qualified engineer. The sand filter should have a minimum thickness of 900mm of free-draining unsaturated soil between the point of infiltration of the effluent and the water table or bedrock.

Alternatively an Ecoflo Coco Filter® can be used laid on a 300mm 70m2 layer of vented distribution gravel.

All works must be supervised and certified by a suitably qualified Civil Engineer or similar qualified person approved by the Local Authority. Confirmation from the effluent treatment system suppliers that the system has been installed and is functioning correctly, should be obtained by the client.

The client must enter a maintenance contract and the system should be serviced periodically. The tank should be de-sludged periodically (a minimum of once a year) by a licensed contractor.

[1] note: more than one option may be suitable for a site and this should be recorded

[2] A discharge of sewage effluent to "waters" (definition includes any or any part of any river, stream, lake, canal, reservoir, aquifer, pond, watercourse or other inland waters, whether natural or artificial) will require a licence under the Water Pollution Acts 1977-90. Refer to Section 2.6.2.

6.0 TREATMENT SYSTEM DETAILS

SYSTEM TYPE: Septic Tank System

Tank Capacity (m^3):

Percolation Area		Mounded Percolation Area	
No. of Trenches		No. of Trenches	
Length of Trenches (m)		Length of Trenches (m)	
Invert Level (m)		Invert Level (m)	

SYSTEM TYPE: Secondary Treatment System

Filter Systems

Media Type	Area (m^2)*	Depth of Filter	Invert Level
Sand/Soil			
Soil			
Constructed Wetland			
Other			

Package Treatment Systems

Type: See Site Suitability Report

Capacity PE: 10.00

Sizing of Primary Compartment: 3.50 m^3

SYSTEM TYPE: Tertiary Treatment System

Polishing Filter: Surface Area (m^2)*: 37.50

or **Gravity Fed:**

No. of Trenches:

Length of Trenches (m):

Invert Level (m):

Package Treatment System: Capacity (pe): 10.00

Constructed Wetland: Surface Area (m^2)*:

DISCHARGE ROUTE:

Groundwater: ✔ — Hydraulic Loading Rate * ($l/m^2.d$): 40.00

Surface Water **: ☐ — Discharge Rate (m^3/hr):

TREATMENT STANDARDS:

Treatment System Performance Standard (mg/l)	BOD	SS	NH_4 - N	Total N	Total P
See Site Suitability Report & EPA CoP 2009 Table 5.1 page 9					

QUALITY ASSURANCE:

Installation & Commissioning

Installation should be supervised and certified by a suitably qualified Civil Engineer or similar qualified person approved by the Local Authority. Confirmation from the effluent treatment system suppliers that the system has been installed and is functioning correctly, should be obtained by the client.

On-going Maintenance

The client must enter a maintenance contract and the system should be serviced periodically. The tank should be de-sludged periodically (a minimum of once a year) by a licensed contractor.

* Hydraulic loading rate is determined by the percolation rate of subsoil

** Water Pollution Act discharge licence required

7.0 SITE ASSESSOR DETAILS

Company: DECLAN KEARNS & ASSOCIATES LTD.

Prefix: Mr. First Name: DECLAN Surname: KEARNS

Address: TULLYWEST, KILDARE, CO. KILDARE

Qualifications/Experience: B.Eng., NCEA Dip. Env. Eng., NCEA, Cert. Eng., MIEI, FETAC CERT EF 241859 722383

Date of Report: 04/08/2018

Phone: 0862111590 Fax: e-mail info@dkassociates.ie

Indemnity Insurance Number: PC006257T

Signature: Declan Kearns Digitally signed by Declan Kearns
DN: cn=Declan Kearns, o=DKAL, ou, email=info@dkassociates.ie, c=IE
Date: 2018.08.16 17:06:30 +01'00'

EPA Test No. 3 at Celbridge Civic Amenity Centre, Celbridge Interchange, Co. Kildare

Figure 1. Trial Pit

Figure 2. T- Test 1

Figure 3. T- Test 2

Figure 4. T- Test 3

Figure 5. P- Test 1

Figure 6. P- Test 2

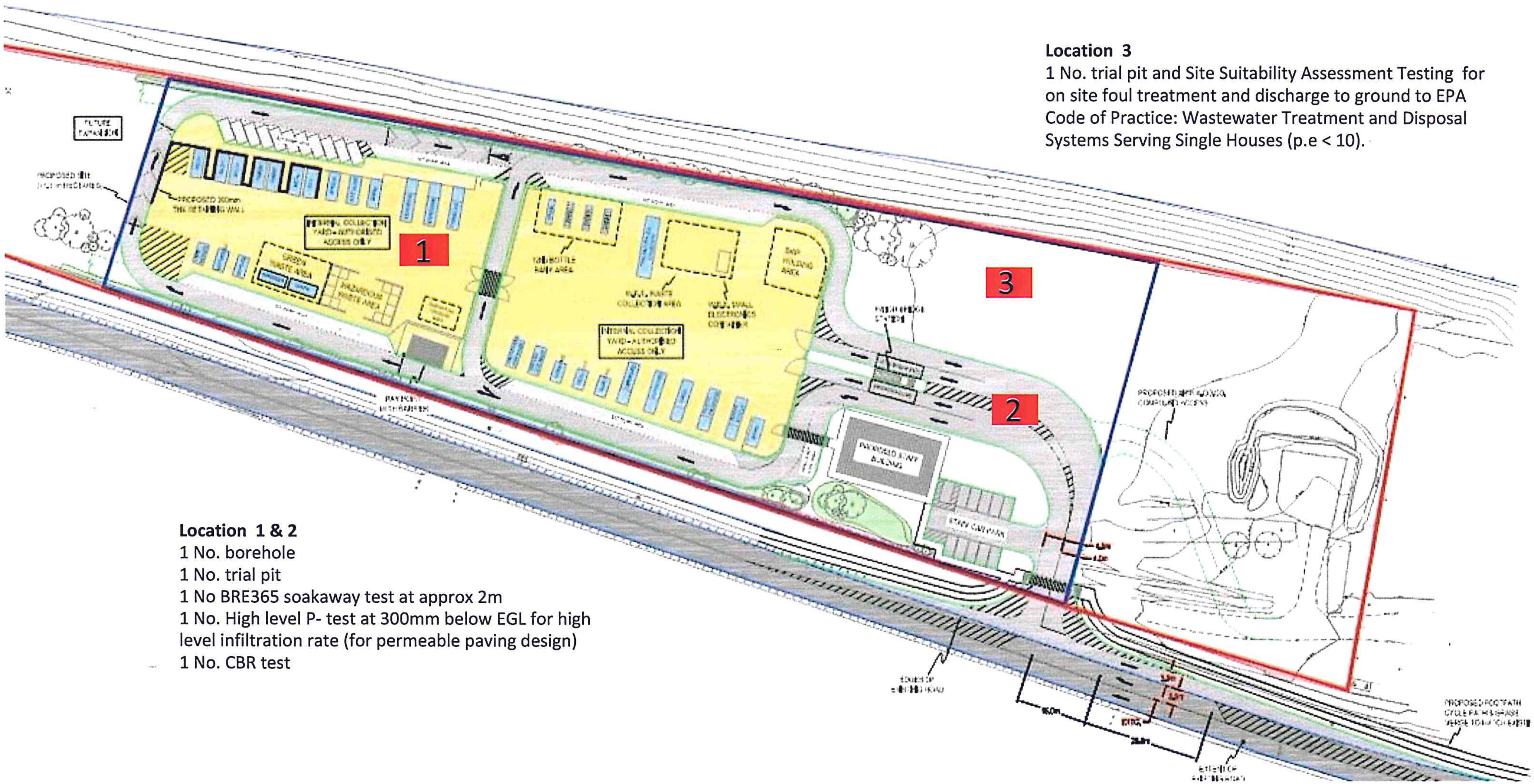
EPA Test No. 3 at Celbridge Civic Amenity Centre, Celbridge Interchange, Co. Kildare

Figure 7. P- Test 3

Figure 8. View of site

Option 1- Site Layout

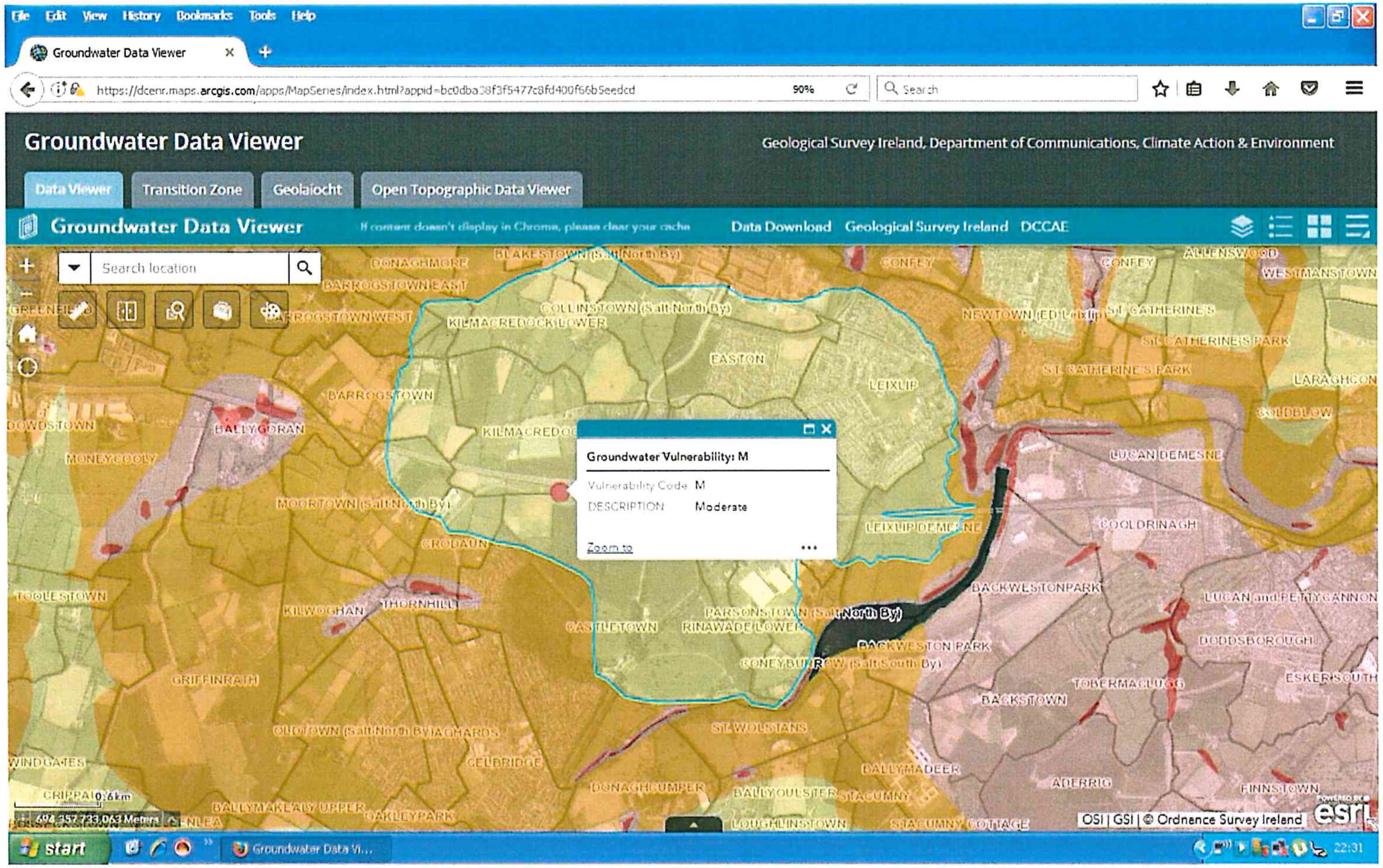
DONNACHADH O'BRIEN
& ASSOCIATES CONSULTING ENGINEERS



Location 3
1 No. trial pit and Site Suitability Assessment Testing for on site foul treatment and discharge to ground to EPA Code of Practice: Wastewater Treatment and Disposal Systems Serving Single Houses (p.e < 10).

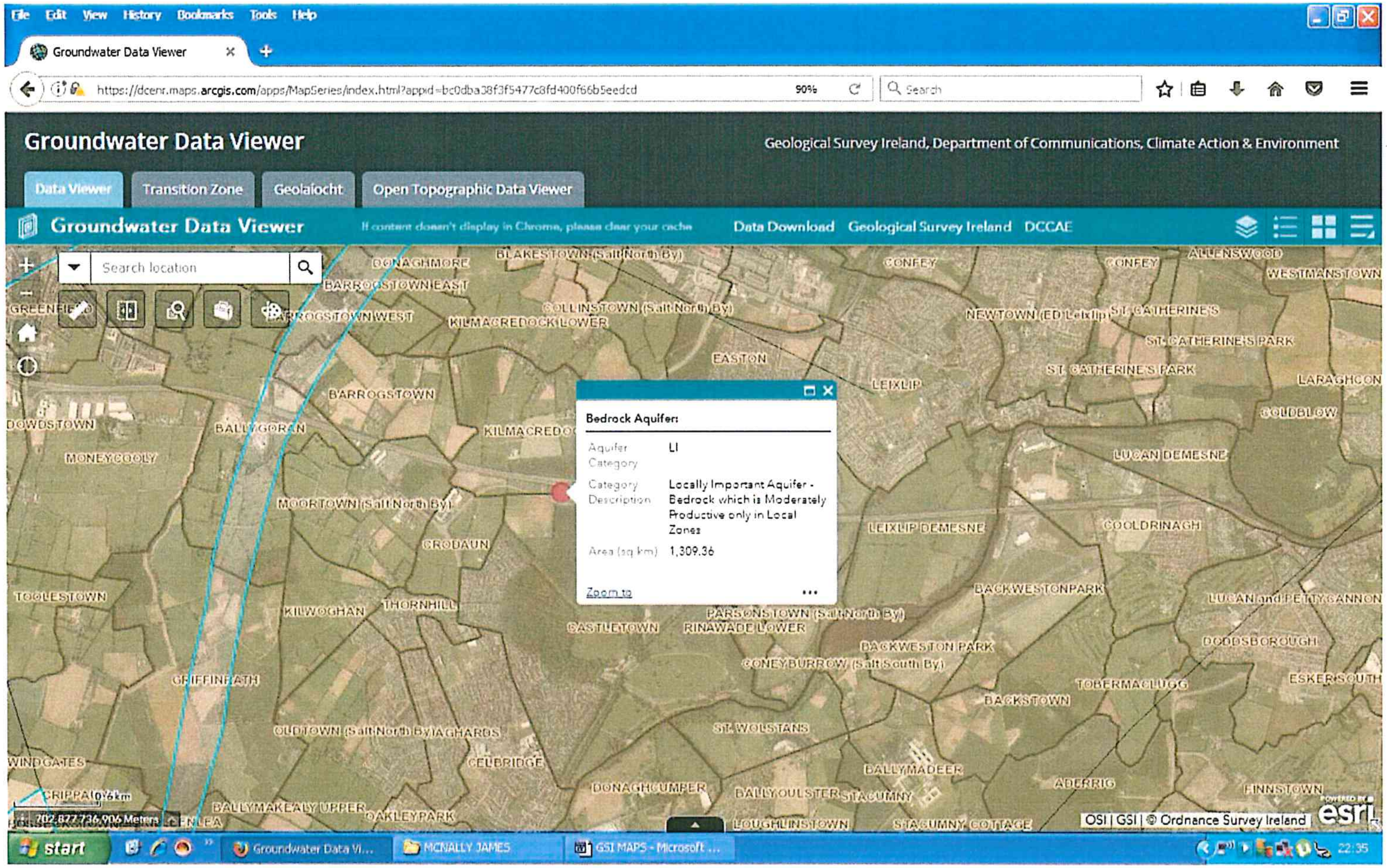
Location 1 & 2
1 No. borehole
1 No. trial pit
1 No BRE365 soakaway test at approx 2m
1 No. High level P- test at 300mm below EGL for high level infiltration rate (for permeable paving design)
1 No. CBR test

CELBRIDGE INTERCHANGE SITE



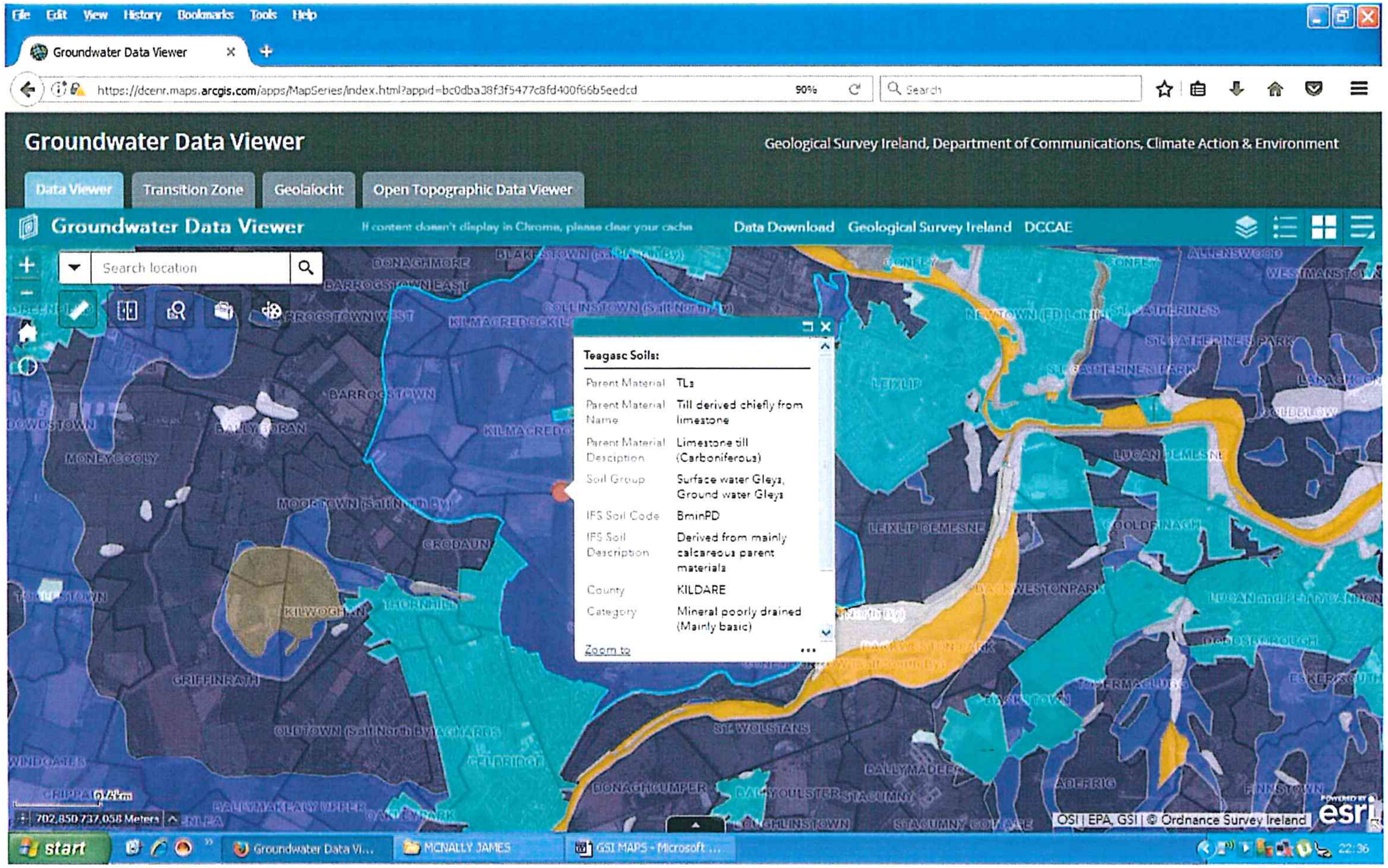
VULNERABILITY MAP

CELBRIDGE INTERCHANGE SITE



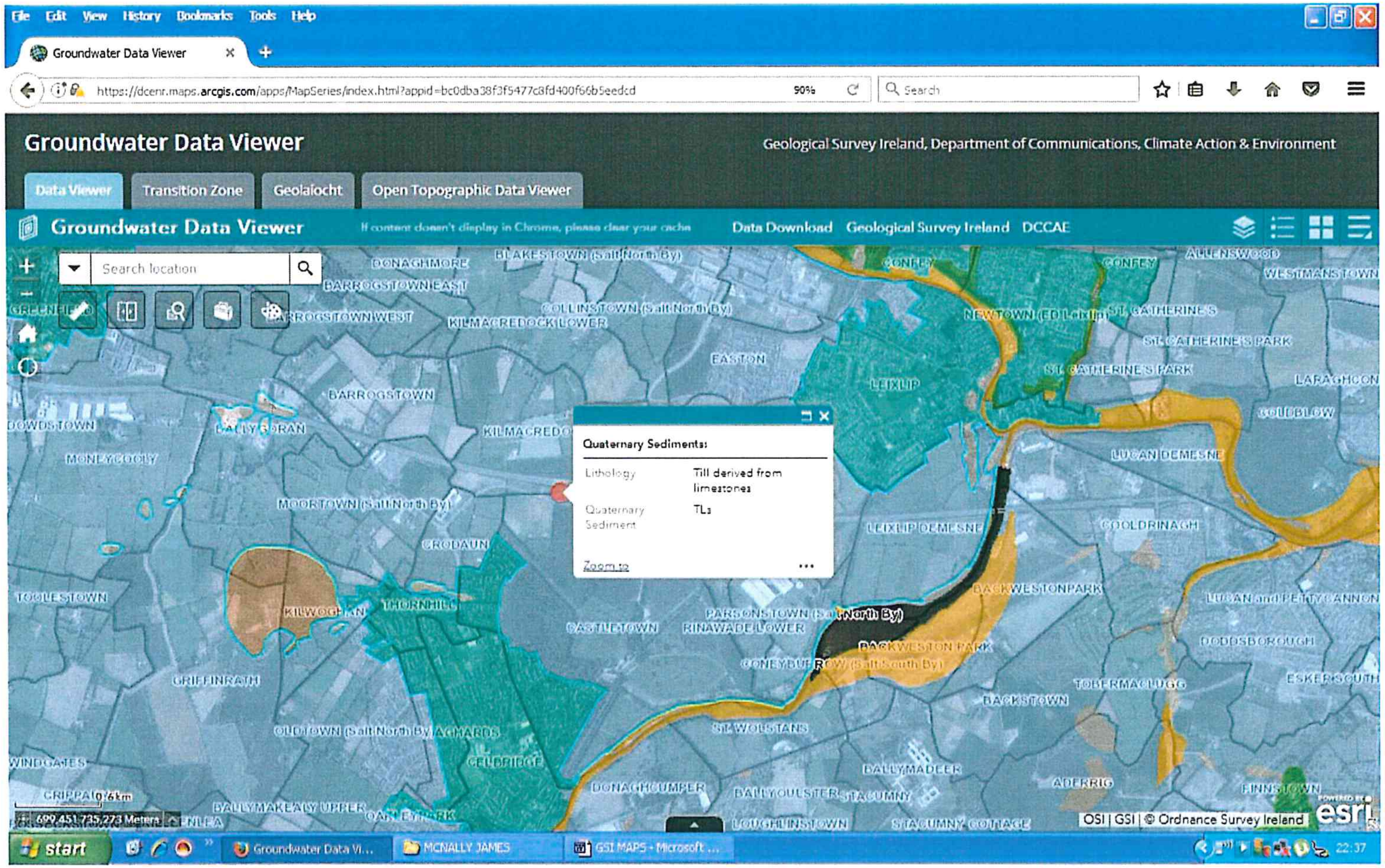
AQUIFER MAP

CELBRIDGE INTERCHANGE SITE



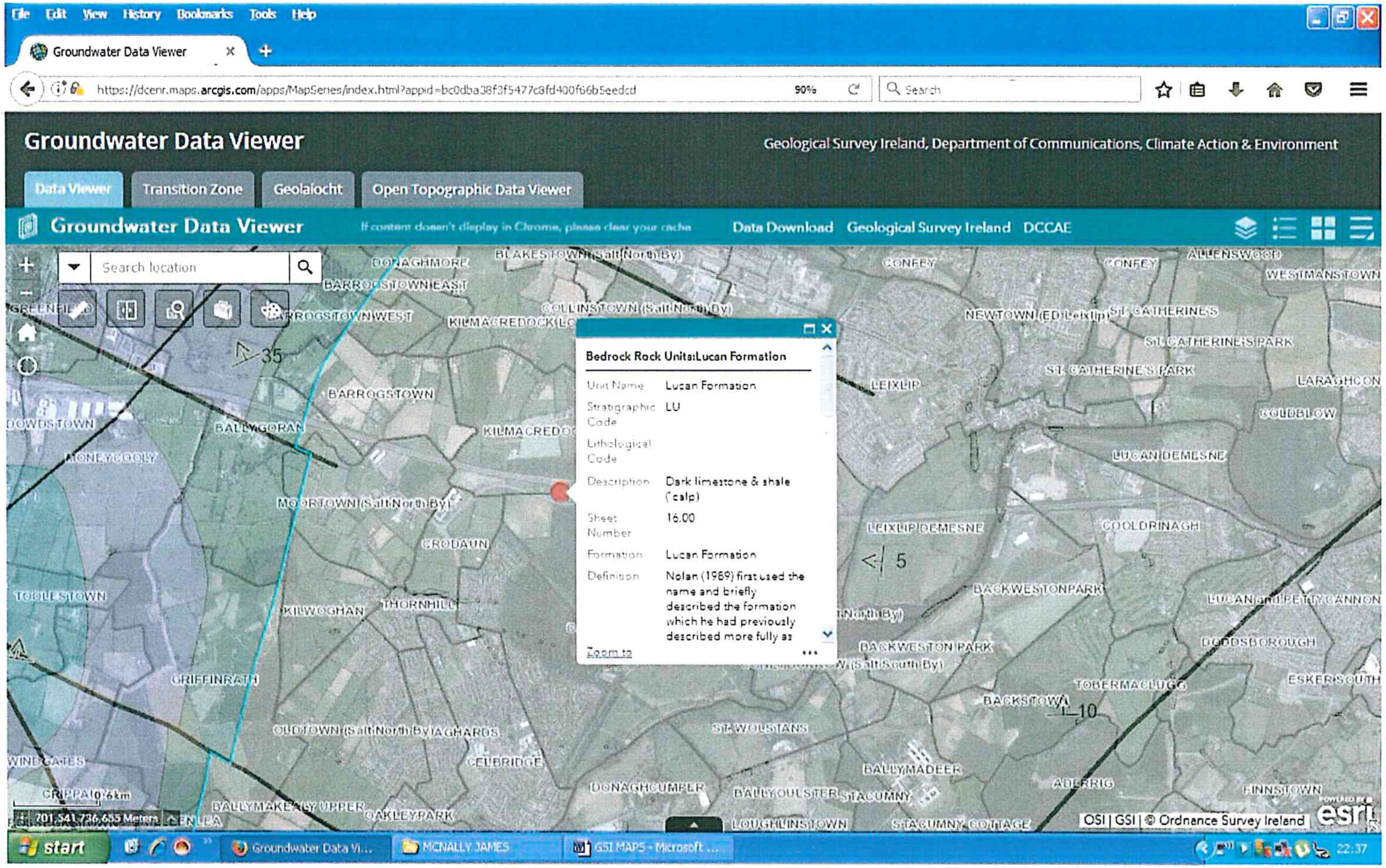
SOILS MAP

CELBRIDGE INTERCHANGE SITE



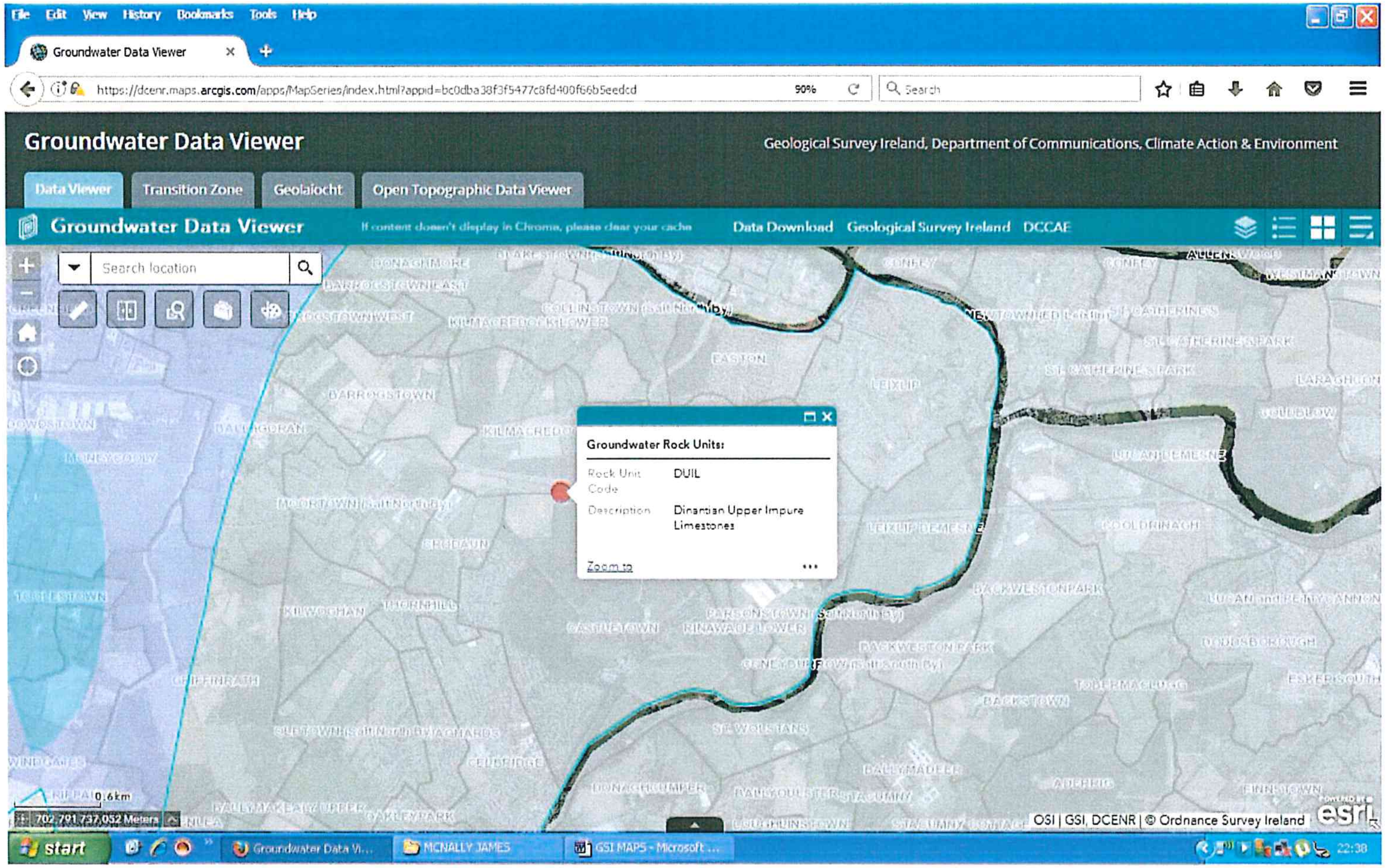
QUATERNARY SEDIMENTS MAP

CELBRIDGE INTERCHANGE SITE



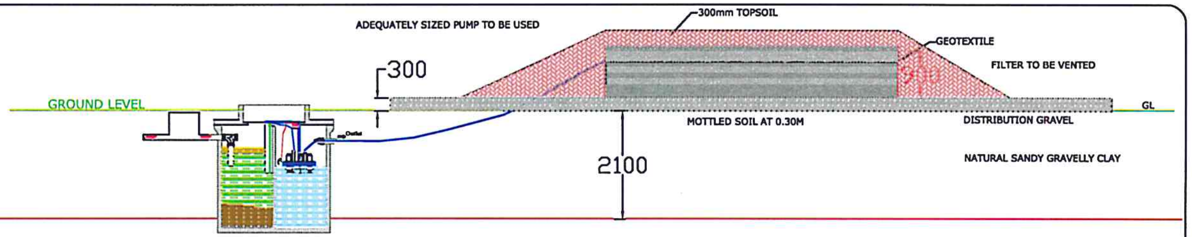
BEDROCK MAP

CELBRIDGE INTERCHANGE SITE



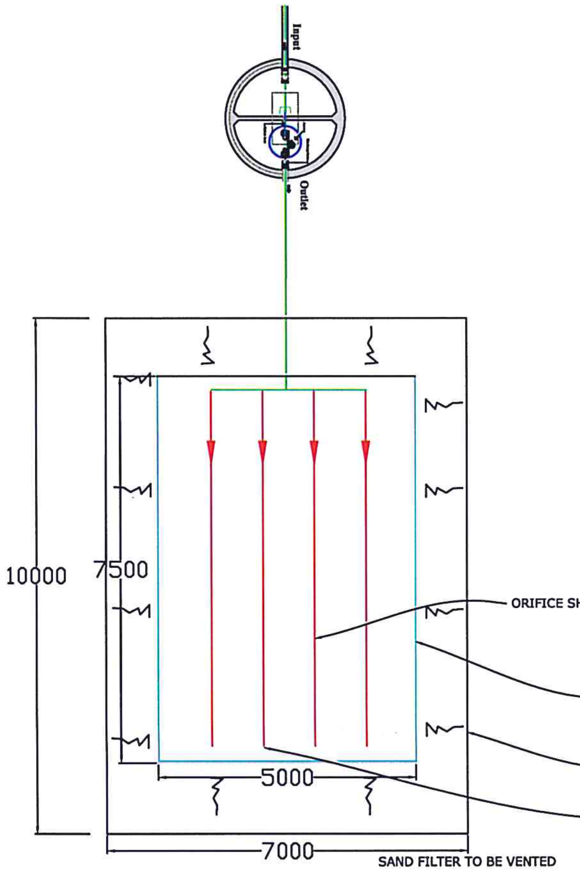
GROUNDWATER ROCK MAP

ALL WORKS TO BE SUPERVISED AND CERTIFIED BY A SUITABLY QUALIFIED ENGINEER



TYPICAL SECTION OF EFFLUENT TREATMENT SYSTEM & SAND POLISHING FILTER

SAND FILTER TO BE CONSTRUCTED IN ACCORDANCE WITH FIGURE 8.5 & TABLE 10.2 OF THE EPA CoP 2009



PLAN OF SAND FILTER

1. MINIMUM SOIL THICKNESS BENEATH INVERT OF DISTRIBUTION SYSTEM = 900MM
2. GRAVEL PROTECTION LAYER : 150MM OF 8 TO 32MM WASHED GRAVEL
3. INFILTRATION LATERALS : 25MM DIA. PVC WITH 6MM ORRICES.
   INFILTRATION LATERALS SHOULD BE LAID WITH THE HOLES FACING UPWARDS WITH ORIFACE SHIELDS FITTED
   INFILTRATION LATERALS SHOULD BE DESIGNED AND SUPPLIED BY A SPECIALIST COMPANY
4. GRAVEL DISTRIBUTION LAYER : 250MM OF 8 TO 32MM WASHED GRAVEL
5. EFFLUENT TREATMENT SYSTEM AND POLISHING FILTER TO BE INSTALLED AND CONSTRUCTED
   IN STRICT ACCORDANCE WITH EPA CoP 2009 and Treatment Systems for Small Communities, Business, Leisure Centres and Hotels, under the supervision of a suitably qualified civil engineer.

REFER TO POLISHING FILTER DESIGN REPORT
FOR PIPE DIAMETERS TO LATER DETAIL

Rev.	DESCRIPTION	DATE

Declan Kearns & Associates Ltd. DKA
Consulting Engineers
Tullywest, Kildare, Co. Kildare
Phone : 045 520642 / 086 2111590
Email: info@dkassociates.ie

Project: Proposed ETS & Raised Sand Polishing Filter at Celbridge Civic Amenity Centre, Co. Kildare

Client: KILDARE COUNTY COUNCIL

Drawing Title: SAND POLISHING FILTER DETAILS

Date	Scale (A3)	Drawn by
14/08/18	1:100	DK

Status: PLANNING ☒ TENDER ☐ FOR APPROVAL ☐ FOR CONSTRUCTION ☐ AS BUILT ☐

Dwg. No. RPF1

Site : Proposed Celbridge Civic Amenity Centre, Celbridge Interchange, Co. Kildare.
P Test No. 2 - See Site Layout Plan.

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400.00	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 X 300	300 X 300	X 300

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	02/08/2018	09:35	02/08/2018	09:35	02/08/2018	09:35

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	03/08/2018	03/08/2018	03/08/2018
Time filled to 400 mm	09:54	09:54	09:54
Time water level at 300 mm	11:58	11:18	14:02
Time to drop 100 mm (P_{100})	124.00	84.00	248.00
Average P_{100}			152.00

If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground
If $P_{100} \leq$ 210 minutes then go to Step 4;
If P_{100} > 210 minutes then go to Step 5;

Step 4: Standard Method (where $P_{100} \leq 210$ minutes)

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δp (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δp (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δp (min)
1	11:58	14:14	136.00	11:18	12:54	96.00	14:02	18:30	268.00
2	14:18	16:54	156.00	12:58	14:54	116.00	18:34	23:26	292.00
3	16:59	20:03	184.00	14:57	17:17	140.00	23:29	04:49	320.00
Average Δp Value			158.67			117.33			293.33
	Average Δp/4 = [Hole No.1]		39.67 (p_1)	Average Δp/4 = [Hole No.2]		29.33 (p_2)	Average Δp/4 = [Hole No.3]		73.33 (p_3)

Result of Test: P = 47.44 (min/25 mm)

Comments:

P Test result = 47

Step 5: Modified Method (where $P_{100} > 210$ minutes)

Percolation Test Hole No.	1				2				3			
Fall of water in hole (mm)	Time Factor $= T_f$	Time of fall (mins) $= T_m$	$K_{fs} = T_f / T_m$	P – Value $= 4.45 / K_{fs}$	Time Factor $= T_f$	Time of fall (mins) $= T_m$	$K_{fs} = T_f / T_m$	P – Value $= 4.45 / K_{fs}$	Time Factor $= T_f$	Time of fall (mins) $= T_m$	$K_{fs} = T_f / T_m$	P – Value $= 4.45 / K_{fs}$
300 - 250	8.1				8.1				8.1			
250 - 200	9.7				9.7				9.7			
200 - 150	11.9				11.9				11.9			
150 - 100	14.1				14.1				14.1			
Average P- Value	P- Value Hole 1= (p_1)			0.00	P- Value Hole 1= (p_2)			0.00	P- Value Hole 1= (p_3)			0.00

Result of Test: P = 0.00 (min/25 mm)

Comments:

P Tests No. 2 at Celbridge Civic Amenity Centre, Celbridge Interchange, Co. Kildare

Figure 1. T- Test 1

Figure 2. T- Test 2

Figure 3. T- Test 3

Site : Proposed Celbridge Civic Amenity Centre, Celbridge Interchange, Co. Kildare.
P Test No. 1 - See Site Layout Plan.

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400.00	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 X 300	300 X 300	X 300

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	02/08/2018	09:50	02/08/2018	09:50	02/08/2018	09:50

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	03/08/2018	03/08/2018	03/08/2018
Time filled to 400 mm	10:12	10:12	10:12
Time water level at 300 mm	11:48	11:36	11:28
Time to drop 100 mm (P_{100})	96.00	84.00	76.00
Average P_{100}			85.33

If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground
If $P_{100} \leq$ 210 minutes then go to Step 4;
If P_{100} > 210 minutes then go to Step 5;

Step 4: Standard Method (where $P_{100} \leq 210$ minutes)

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δp (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δp (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δp (min)
1	11:48	13:36	108.00	11:36	13:08	92.00	11:28	12:52	84.00
2	13:40	15:44	124.00	13:12	14:56	104.00	12:56	14:32	96.00
3	15:47	18:03	136.00	14:59	16:55	116.00	14:36	16:28	112.00
Average Δp Value			122.67			104.00			97.33
	Average Δp/4 = [Hole No.1]		30.67 (p_1)	Average Δp/4 = [Hole No.2]		26.00 (p_2)	Average Δp/4 = [Hole No.3]		24.33 (p_3)

Result of Test: P = 27.00 (min/25 mm)

Comments:

P Test result = 27

Step 5: Modified Method (where $P_{100} > 210$ minutes)

Percolation Test Hole No.	1				2				3			
Fall of water in hole (mm)	Time Factor = T_f	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	P – Value = 4.45 / K_{fs}	Time Factor = T_f	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	P – Value = 4.45 / K_{fs}	Time Factor = T_f	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	P – Value = 4.45 / K_{fs}
300 - 250	8.1				8.1				8.1			
250 - 200	9.7				9.7				9.7			
200 - 150	11.9				11.9				11.9			
150 - 100	14.1				14.1				14.1			
Average P- Value	P- Value Hole 1= (p_1)			0.00	P- Value Hole 1= (p_2)			0.00	P- Value Hole 1= (p_3)			0.00

Result of Test: P = 0.00 (min/25 mm)

Comments:

P Tests No. 1 at Celbridge Civic Amenity Centre, Celbridge Interchange, Co. Kildare

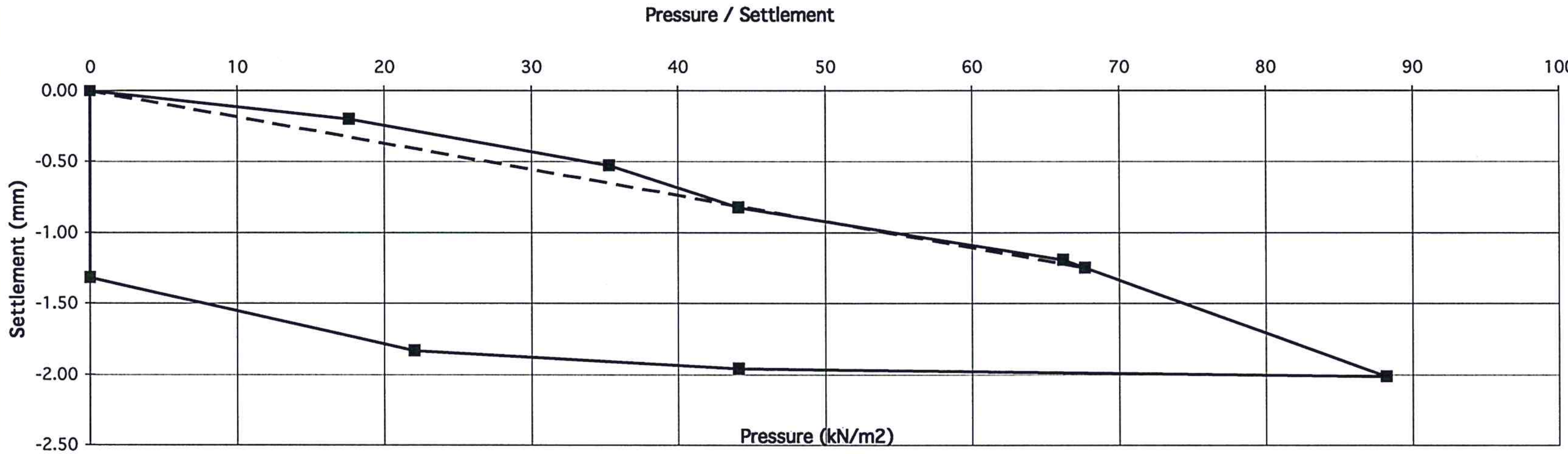
Figure 1. T- Test 1

Figure 2. T- Test 2

Figure 3. T- Test 3

Appendix VI CBR by Plate Test

PLATE TEST REPORT SHEET (F3.1)		Applied Pressure/Settlement Curve
Reference No.	R92019	Description of soil under test (natural soil, placed fill, sub-base)
Contract	Celbridge Civic Amenity Centre	Light brown sandy SILT with occasional gravel
Test No.	PBT 1 Load	
Location	Kilmacredock Upper, Celbridge	
Depth	0.60m	
Client	Donnachadh O'Brien Consulting Engineers	Easting (m)
Plate Diameter:	450 mm	Northing (m)
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test	Ground Level (mOD)
Technician	K. Kinsella	Sample Ref No. N/A
Authorised by		Depth 0.00 m bgl
Date	31/7/18	



Gradient at 1.25 mm settlement intersection = 54
Modulus of subgrade reaction = 35 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 4.5 %

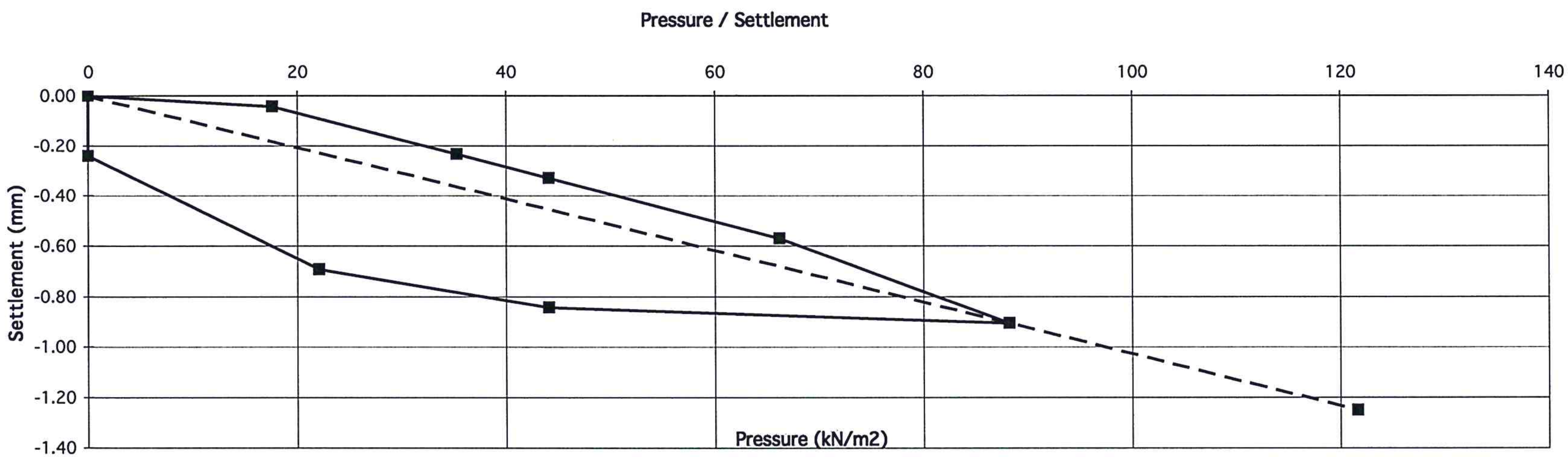
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R92019
Contract	Celbridge Civic Amenity Centre
Test No.	PBT 1 ReLoad
Location	Kilmacredock Upper, Celbridge
Depth	0.60m
Client	Donnachadh O'Brien Consulting Engineers
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	K. Kinsella
Authorised by	[signature]
Date	31/7/18

Description of soil under test
(natural soil, placed fill, sub-base)
Light brown sandy SILT with occasional gravel

Easting (m)	
Northing (m)	
Ground Level (mOD)	
Sample Ref No.	N/A
Depth	0.00 m bgl



Gradient at 1.25 mm settlement intersection = 97
Modulus of subgrade reaction = 63 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 12.5 %

PLATE TEST REPORT SHEET (F3.1)

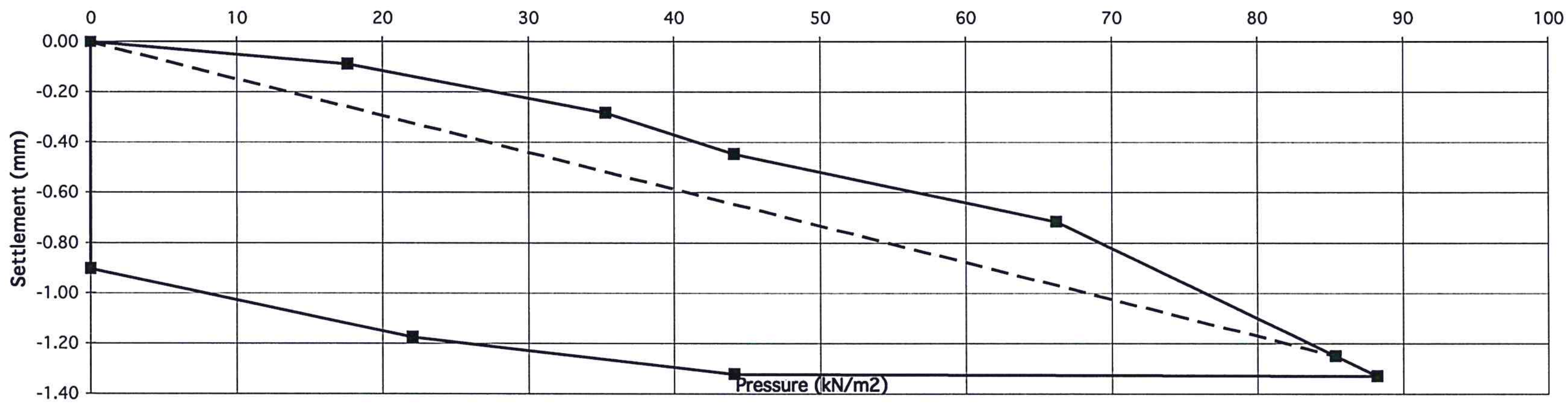
Applied Pressure/Settlement Curve

Reference No.	R92020
Contract	Celbridge Civic Amenity Centre
Test No.	PBT 2 Load
Location	Kilmacredock Upper, Celbridge
Depth	0.60m
Client	Donnachadh O'Brien Consulting Engineers
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	K. Kinsella
Authorised by	
Date	31/7/18

Description of soil under test
(natural soil, placed fill, sub-base)
Light brown sandy SILT with occasional gravel

Easting (m)	
Northing (m)	
Ground Level (mOD)	
Sample Ref No.	N/A
Depth	0.00 m bgl

Pressure / Settlement



Gradient at 1.25 mm settlement intersection = 68
Modulus of subgrade reaction = 44 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 6.8 %

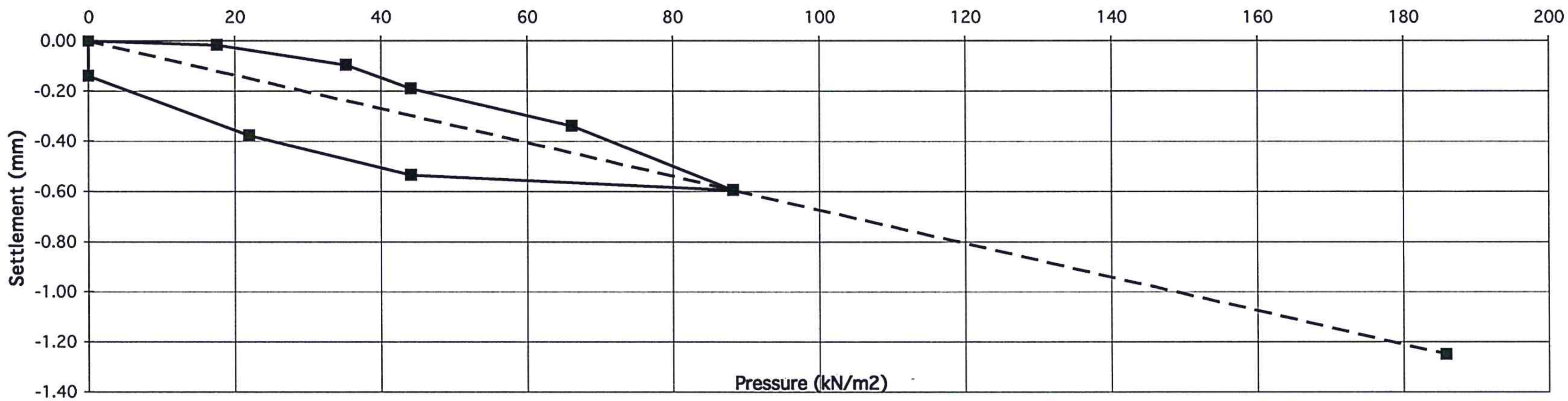
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R92020
Contract	Celbridge Civic Amenity Centre
Test No.	PBT 2 ReLoad
Location	Kilmacredock Upper, Celbridge
Depth	0.60m
Client	Donnachadh O'Brien Consulting Engineers
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	K. Kinsella
Authorised by	[signature]
Date	31/7/18

Description of soil under test
(natural soil, placed fill, sub-base)
Light brown sandy SILT with occasional gravel

Easting (m)	
Northing (m)	
Ground Level (mOD)	
Sample Ref No.	N/A
Depth	0.00 m bgl



Gradient at 1.25 mm settlement intersection = 149
Modulus of subgrade reaction = 96 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 26.1 %

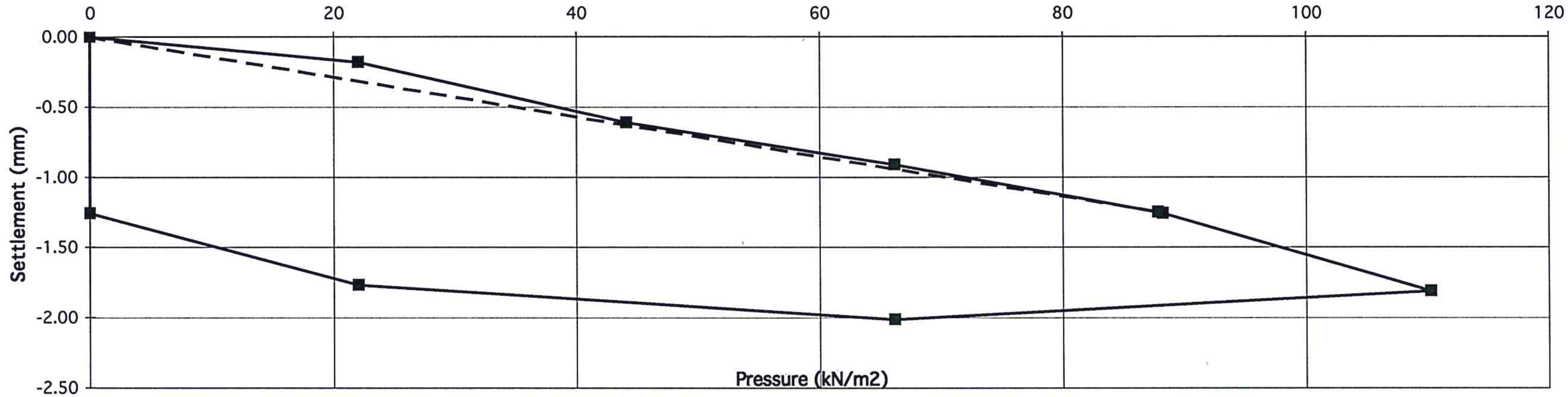
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R92021
Contract	Celbridge Civic Amenity Centre
Test No.	PBT 3 Load
Location	Kilmacredock Upper, Celbridge
Depth	0.60m
Client	Donnachadh O'Brien Consulting Engineers
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	K. Kinsella
Authorised by	[signature]
Date	31/7/18

Description of soil under test (natural soil, placed fill, sub-base)	Light brown sandy SILT with occasional gravel
Easting (m)	
Northing (m)	
Ground Level (mOD)	
Sample Ref No.	N/A
Depth	0.00 m bgl

Pressure / Settlement



Gradient at 1.25 mm settlement intersection = 70
Modulus of subgrade reaction = 45 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 7.1 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

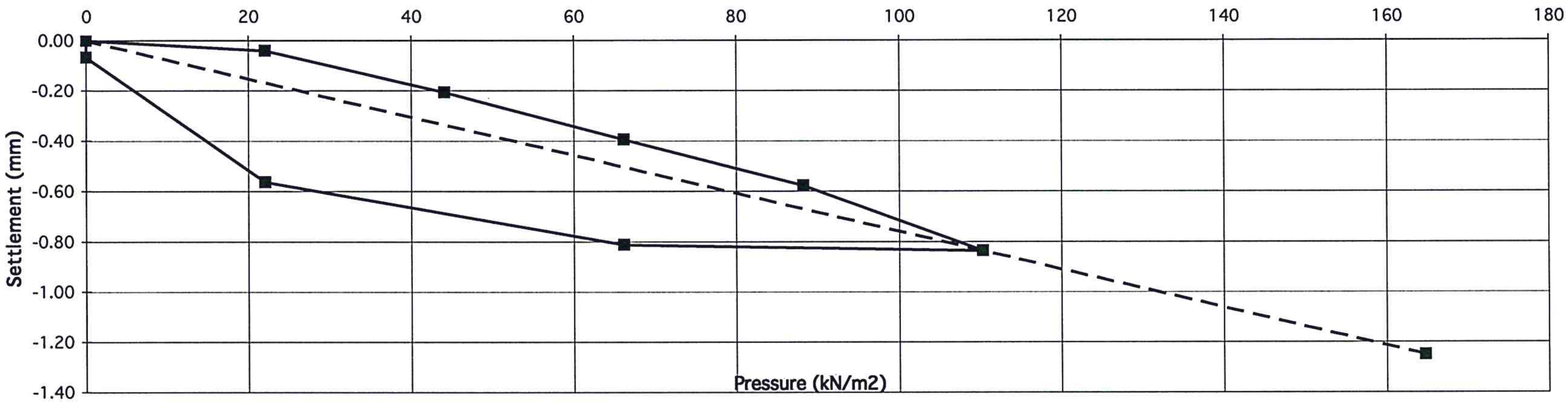
Reference No.	R92021
Contract	Celbridge Civic Amenity Centre
Test No.	PBT 3 ReLoad
Location	Kilmacredock Upper, Celbridge
Depth	0.60m
Client	Donnachadh O'Brien Consulting Engineers
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	K. Kinsella
Authorised by	[signature]
Date	31/7/18

Description of soil under test
(natural soil, placed fill, sub-base)

Light brown sandy SILT with occasional gravel

Easting (m)	
Northing (m)	
Ground Level (mOD)	
Sample Ref No.	N/A
Depth	0.00 m bgl

Pressure / Settlement



Gradient at 1.25 mm settlement intersection = 132
Modulus of subgrade reaction = 85 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 21.2 %

Appendix VII Laboratory Data

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3

INAB ISO 17025 ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No. **R92773** Contract No. 21145 Contract Name: Celbridge Civic Amenity Centre

Customer Donnachadh O'Brien & Associates, Unit 5C, Elm House, Millennium Park, Naas Co. Kildare.

Samples Received: 14/08/18 Date Tested: 22/8/18

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
TP01	AA98912	1.0	A18/7262	B	8.1	38	23	15	70	WS	4.4	C I	Brown slightly sandy, slightly gravelly, CLAY with some cobbles
TP02	AA98914	0.5	A18/7263	B	16	43	28	18	84	WS	4.4	C I	Brown sandy gravelly CLAY
TP02	AA98915	1.5	A18/7264	B	8.7	18	NP	NP	41	WS	4.4		Brown slightly sandy, gravelly, SILT with some cobbles

Notes:

Preparation: WS - Wet sieved; AR - As received; NP - Non plastic

Liquid Limit Clause: 4.3 Cone Penetrometer definitive method; 4.4 Cone Penetrometer one point method

Sample Type: B - Bulk Disturbed; U - Undisturbed

Remarks:

NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
Opinions and interpretations are outside the scope of accreditation.
The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory	Persons authorized to approve reports	Approved by	Date	Page
	H Byrne (Laboratory Manager)	H Byrne	24/8/18	1 of 1

TEST REPORT

Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

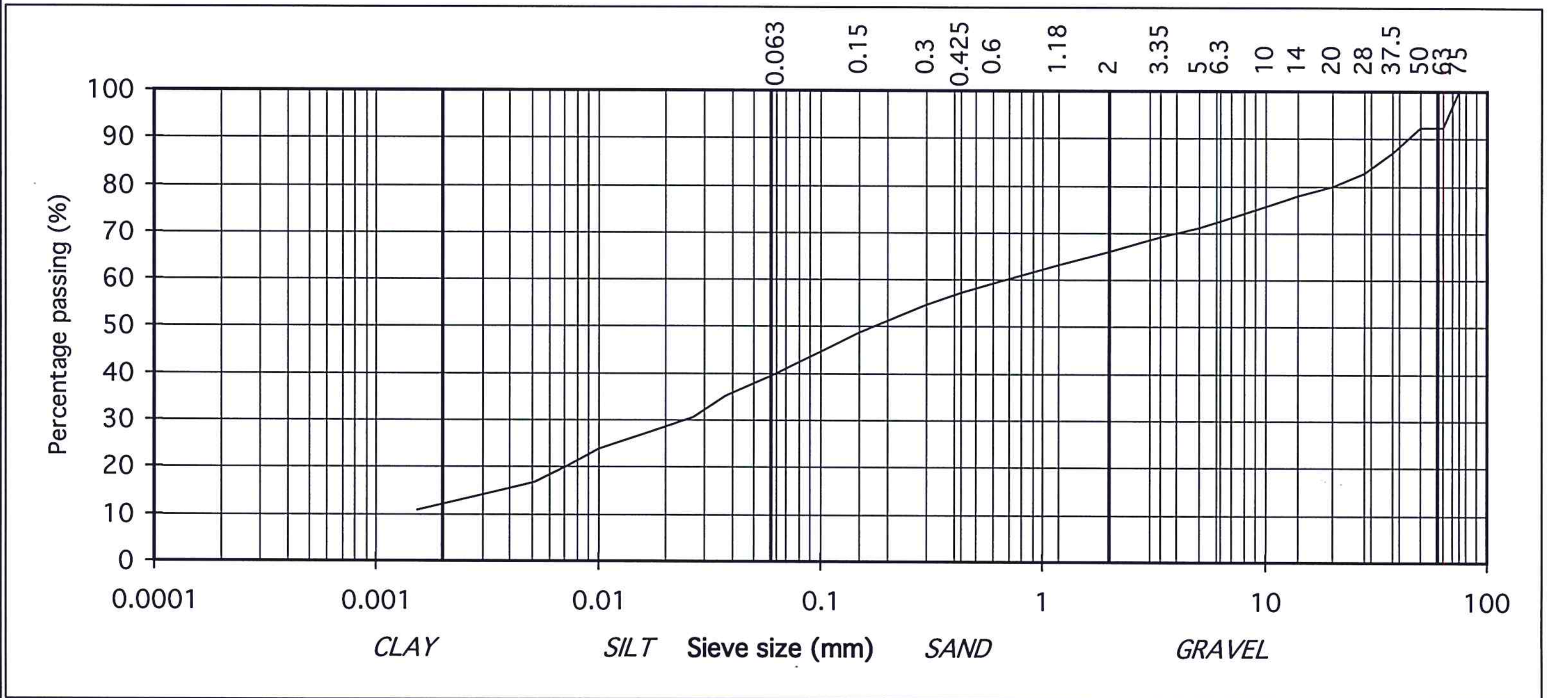
(note: Sedimentation stage not accredited)

Contract No:	21145	Report No.	R92930
Contract:	Celbridge Civic Amenity Centre		
BH/TP :	TP01		
Sample No.	AA98912	Lab. Sample No.	A18/7262
Sample Type:	B		
Depth (m)	1.00	Customer:	Donnachadh O'Brien & Associates, Unit 5C, Elm House, Millennium Park, Naas Co. Kildare.
Date Received	14/08/2018	Date Testing started	22/08/2018
Description:	Brown slightly sandy, slightly gravelly, CLAY with some cobbles		

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016

particle size	% passing	
75	100	COBBLES
63	92	
50	92	GRAVEL
37.5	87	
28	83	
20	80	
14	78	
10	76	
6.3	72	
5	71	
3.35	69	
2	66	
1.18	63	SAND
0.6	59	
0.425	57	
0.3	55	
0.15	49	
0.063	40	SILT/CLAY
0.037	35	
0.027	31	
0.017	28	
0.010	24	
0.007	20	
0.005	17	
0.002	11	



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne (signature)	29/08/18	1 of 1

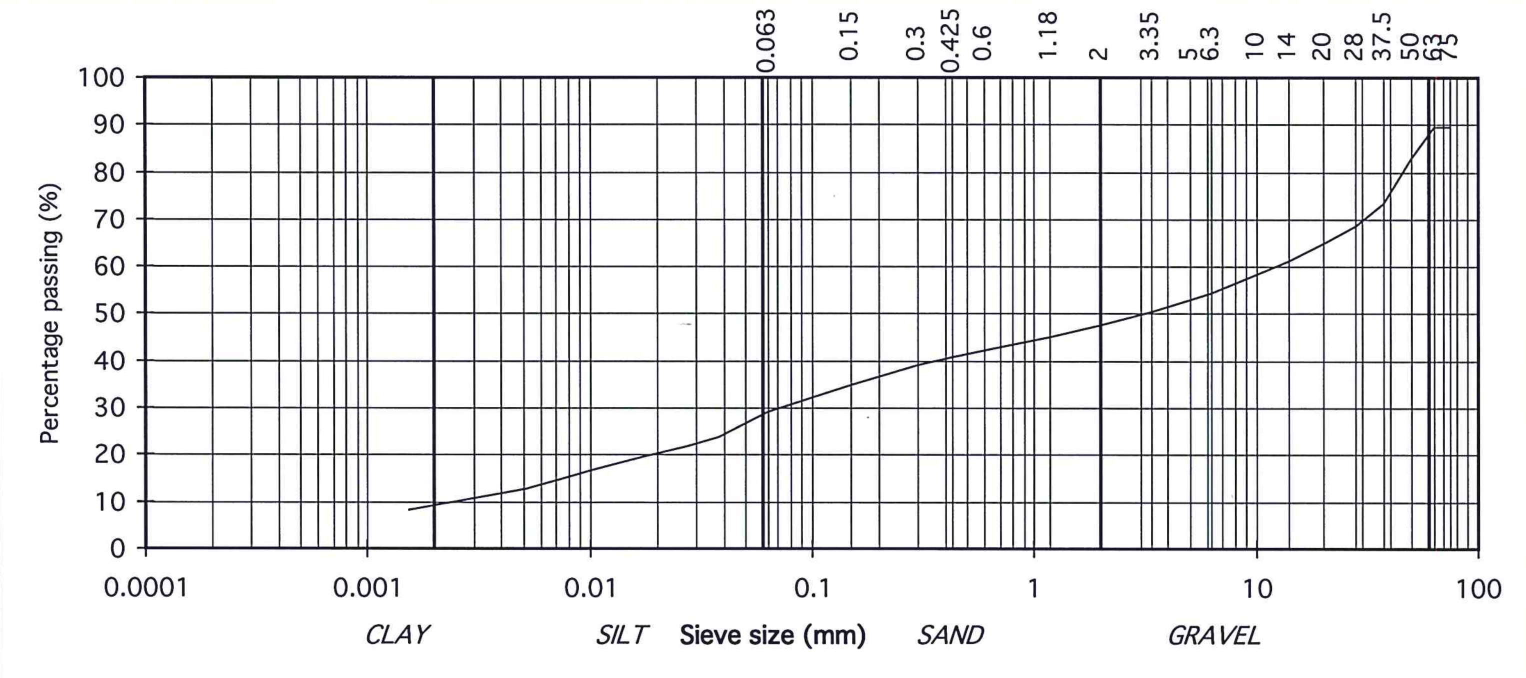
Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

particle size	% passing	
75	90	COBBLES
63	90	
50	83	GRAVEL
37.5	73	
28	69	
20	65	
14	61	
10	58	
6.3	54	
5	53	
3.35	51	
2	48	
1.18	45	SAND
0.6	42	
0.425	41	
0.3	39	
0.15	35	
0.063	29	SILT/CLAY
0.038	24	
0.027	22	
0.017	20	
0.010	17	
0.007	15	
0.005	13	
0.002	8	

Contract No: 21145 Report No. R92775
Contract: Celbridge Civic Amenity Centre
BH/TP : TP02
Sample No. AA98915 Lab. Sample No. A18/7264
Sample Type: B
Depth (m) 1.50 Customer: Donnachadh O'Brien & Associates, Unit 5C, Elm House, Millennium Park, Naas Co. Kildare.
Date Received 14/08/2018 Date Testing started 15/08/2018
Description: Brown slightly sandy, gravelly, SILT with some cobbles

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
[signature]	29/08/18	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

UKAS TESTING
2183

Final Report

Report No.:	18-24541-1
Initial Date of Issue:	23-Aug-2018
Client	IGSL
Client Address:	M7 Business Park Naas County Kildare Ireland
Contact(s):	Darren Keogh
Project	21145 Cellbridge

Quotation No.:		**Date Received:**	15-Aug-2018
Order No.:		**Date Instructed:**	15-Aug-2018
No. of Samples:	3		
Turnaround (Wkdays):	5	**Results Due:**	21-Aug-2018
Date Approved:	23-Aug-2018		

Approved By:

Details: Glynn Harvey, Laboratory Manager

Chemtest
The right chemistry to deliver results

Results - Leachate

Project: 21145 Cellbridge

Client: IGSL			**Chemtest Job No.:**		18-24541
Quotation No.:			**Chemtest Sample ID.:**		672188
Order No.:			Client Sample Ref.:		98911
			Client Sample ID.:		TP1
			Sample Type:		SOIL
			Top Depth (m):		0.50
			Bottom Depth (m):		0.60
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Ammonium	U	1220	mg/l	0.050	0.25
Ammonium	N	1220	mg/kg	0.10	2.5
Boron (Dissolved)	U	1450	µg/l	20	< 20
Boron (Dissolved)	U	1450	mg/kg	0.20	< 0.20

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 21145 Cellbridge

Client: IGSL				Chemtest Job No.:	18-24541	18-24541	18-24541
Quotation No.:				Chemtest Sample ID.:	672188	672189	672190
Order No.:				Client Sample Ref.:	98911	98912	98914
				Client Sample ID.:	TP1	TP1	TP2
				Sample Type:	SOIL	SOIL	SOIL
				Top Depth (m):	0.50	1.00	0.50
				Bottom Depth (m):	0.60		1.00
				Asbestos Lab:	COVENTRY		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-		
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected		
Moisture	N	2030	%	0.020	8.8	10	15
pH	U	2010		N/A		[A] 8.1	[A] 8.4
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	< 0.40		
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010		< 0.010	< 0.010
Sulphur (Elemental)	U	2180	mg/kg	1.0	[A] < 1.0		
Cyanide (Total)	U	2300	mg/kg	0.50	[A] < 0.50		
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	[A] 5.2		
Sulphate (Acid Soluble)	U	2430	%	0.010	[A] 0.020		
Arsenic	U	2450	mg/kg	1.0	23		
Barium	U	2450	mg/kg	10	68		
Cadmium	U	2450	mg/kg	0.10	1.4		
Chromium	U	2450	mg/kg	1.0	20		
Molybdenum	U	2450	mg/kg	2.0	3.2		
Antimony	N	2450	mg/kg	2.0	< 2.0		
Copper	U	2450	mg/kg	0.50	21		
Mercury	U	2450	mg/kg	0.10	0.11		
Nickel	U	2450	mg/kg	0.50	57		
Lead	U	2450	mg/kg	0.50	20		
Selenium	U	2450	mg/kg	0.20	0.38		
Zinc	U	2450	mg/kg	0.50	94		
Chromium (Trivalent)	N	2490	mg/kg	1.0	20		
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50		
Total Organic Carbon	U	2625	%	0.20	[A] 0.78		
Mineral Oil	N	2670	mg/kg	10	< 10		
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	[A] < 1.0		
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	[A] < 1.0		
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	[A] < 1.0		
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	[A] < 1.0		
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	[A] < 1.0		
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	[A] < 1.0		
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	[A] < 1.0		
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0		
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0		
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	[A] < 1.0		
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	[A] < 1.0		

Results - Soil

Project: 21145 Cellbridge

Client: IGSL				**Chemtest Job No.:**	18-24541	18-24541	18-24541
Quotation No.:				**Chemtest Sample ID.:**	672188	672189	672190
Order No.:				Client Sample Ref.:	98911	98912	98914
				Client Sample ID.:	TP1	TP1	TP2
				Sample Type:	SOIL	SOIL	SOIL
				Top Depth (m):	0.50	1.00	0.50
				Bottom Depth (m):	0.60		1.00
				Asbestos Lab:	COVENTRY		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	[A] < 1.0		
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	[A] < 1.0		
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	[A] < 1.0		
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	[A] < 1.0		
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	[A] < 1.0		
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0		
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0		
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	[A] < 10		
Benzene	U	2760	µg/kg	1.0	[A] < 1.0		
Toluene	U	2760	µg/kg	1.0	[A] < 1.0		
Ethylbenzene	U	2760	µg/kg	1.0	[A] < 1.0		
m & p-Xylene	U	2760	µg/kg	1.0	[A] < 1.0		
o-Xylene	U	2760	µg/kg	1.0	[A] < 1.0		
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	[A] < 1.0		
Naphthalene	U	2800	mg/kg	0.10	< 0.10		
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10		
Acenaphthene	U	2800	mg/kg	0.10	< 0.10		
Fluorene	U	2800	mg/kg	0.10	< 0.10		
Phenanthrene	U	2800	mg/kg	0.10	< 0.10		
Anthracene	U	2800	mg/kg	0.10	< 0.10		
Fluoranthene	U	2800	mg/kg	0.10	< 0.10		
Pyrene	U	2800	mg/kg	0.10	< 0.10		
Benzo[a]anthracene	U	2800	mg/kg	0.10	< 0.10		
Chrysene	U	2800	mg/kg	0.10	< 0.10		
Benzo[b]fluoranthene	U	2800	mg/kg	0.10	< 0.10		
Benzo[k]fluoranthene	U	2800	mg/kg	0.10	< 0.10		
Benzo[a]pyrene	U	2800	mg/kg	0.10	< 0.10		
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10	< 0.10		
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10		
Benzo[g,h,i]perylene	U	2800	mg/kg	0.10	< 0.10		
Coronene	N	2800	mg/kg	0.10	< 0.10		
Total Of 17 PAH's	N	2800	mg/kg	2.0	< 2.0		
PCB 28	U	2815	mg/kg	0.010	[A] < 0.010		
PCB 52	U	2815	mg/kg	0.010	[A] < 0.010		
PCB 90+101	U	2815	mg/kg	0.010	[A] < 0.010		
PCB 118	U	2815	mg/kg	0.010	[A] < 0.010		
PCB 153	U	2815	mg/kg	0.010	[A] < 0.010		
PCB 138	U	2815	mg/kg	0.010	[A] < 0.010		

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Results - Soil

Project: 21145 Cellbridge

Client: IGSL	Chemtest Job No.:				18-24541	18-24541	18-24541
Quotation No.:	Chemtest Sample ID.:				672188	672189	672190
Order No.:	Client Sample Ref.:				98911	98912	98914
	Client Sample ID.:				TP1	TP1	TP2
	Sample Type:				SOIL	SOIL	SOIL
	Top Depth (m):				0.50	1.00	0.50
	Bottom Depth (m):				0.60		1.00
	Asbestos Lab:				COVENTRY		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
PCB 180	U	2815	mg/kg	0.010	[A] < 0.010		
Total PCBs (7 Congeners)	N	2815	mg/kg	0.10	[A] < 0.10		
Total Phenols	U	2920	mg/kg	0.30	< 0.30		

Chemtest
The right chemistry to deliver results

Results - Single Stage WAC

Project: 21145 Cellbridge

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-24541						
Chemtest Sample ID:	672188						
Sample Ref:	98911						
Sample ID:	TP1						
Top Depth(m):	0.50						
Bottom Depth(m):	0.60						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	[A] 0.78	3	5	6
Loss On Ignition	2610	U	%	2.7	--	--	10
Total BTEX	2760	U	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.050	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0063	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0015	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0058	0.058	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	3.4	34	800	15000	25000
Fluoride	1220	U	0.52	5.2	10	150	500
Sulphate	1220	U	7.1	71	1000	20000	50000
Total Dissolved Solids	1020	N	95	950	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	23	230	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.8

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample ID:	Sample Ref:	Sample ID:	Sampled Date:	Deviation Code(s):	Containers Received:
672188	98911	TP1		A	Amber Glass 250ml
672188	98911	TP1		A	Amber Glass 60ml
672189	98912	TP1		A	Amber Glass 250ml
672190	98914	TP2		A	Amber Glass 250ml

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Test Methods

SOP	Title	Parameters included	Method summary
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2180	Sulphur (Elemental) in Soils by HPLC	Sulphur	Dichloromethane extraction / HPLC with UV detection
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection

Test Methods

SOP	Title	Parameters included	Method summary
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
640	Characterisation of Waste (Leaching)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

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Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

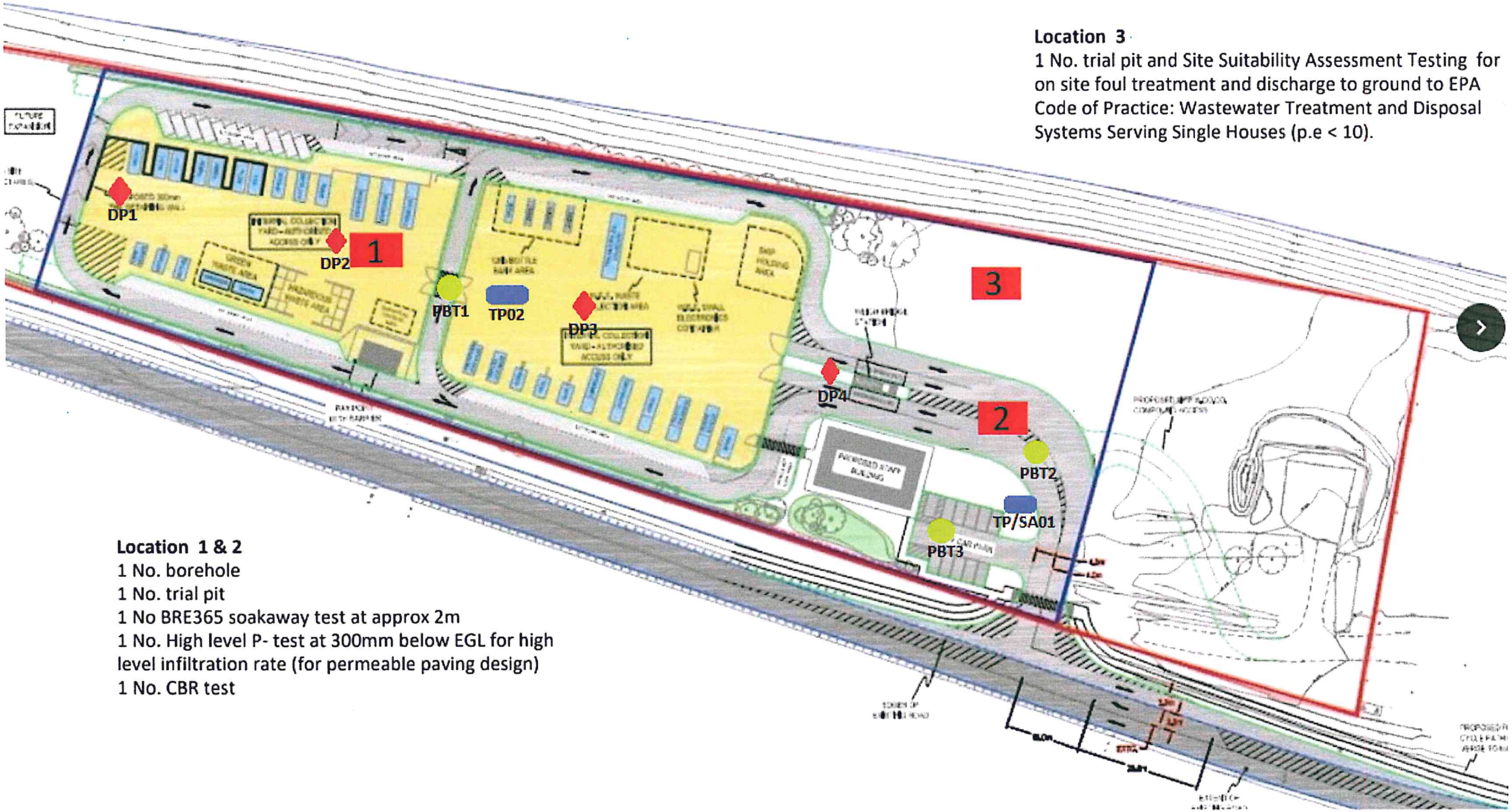
Appendix VIII Site Plan

DONNACHADH O'BRIEN

& ASSOCIATES CONSULTING ENGINEERS

Option 1- Site Layout

& ASSOCIATES CONSULTING ENGINEE



Location 3
1 No. trial pit and Site Suitability Assessment Testing for on site foul treatment and discharge to ground to EPA Code of Practice: Wastewater Treatment and Disposal Systems Serving Single Houses (p.e < 10).

Location 1 & 2
1 No. borehole
1 No. trial pit
1 No BRE365 soakaway test at approx 2m
1 No. High level P- test at 300mm below EGL for high level infiltration rate (for permeable paving design)
1 No. CBR test

Appendix C Surface Water Network Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	5	Add Flow / Climate Change (%)	20
M5-60 (mm)	15.900	Minimum Backdrop Height (m)	0.200
Ratio R	0.277	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Inverts

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	39.094	0.195	200.5	0.060	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	46.108	0.231	199.6	0.019	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	40.558	0.203	199.8	0.038	5.00	0.0	0.600	o	300	Pipe/Conduit	
2.001	8.715	0.044	198.1	0.045	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.002	28.986	0.145	199.9	0.029	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.002	22.958	0.115	199.6	0.044	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.003	4.075	0.020	203.7	0.034	0.00	0.0	0.600	o	375	Pipe/Conduit	
3.000	34.959	0.175	199.8	0.148	5.00	0.0	0.600	o	300	Pipe/Conduit	
4.000	16.433	0.082	200.4	0.034	5.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.59	65.046	0.060	0.0	0.0	1.6	1.11	78.2	9.7
1.001	50.00	6.28	64.851	0.079	0.0	0.0	2.1	1.11	78.4	12.8
2.000	50.00	5.61	65.012	0.038	0.0	0.0	1.0	1.11	78.4	6.2
2.001	50.00	5.74	64.809	0.083	0.0	0.0	2.2	1.11	78.7	13.5
2.002	50.00	6.12	64.765	0.112	0.0	0.0	3.0	1.28	141.1	18.2
1.002	50.00	6.58	64.620	0.235	0.0	0.0	6.4	1.28	141.2	38.2
1.003	50.00	6.63	64.505	0.269	0.0	0.0	7.3	1.27	139.8	43.7
3.000	50.00	5.53	65.041	0.148	0.0	0.0	4.0	1.11	78.4	24.0
4.000	50.00	5.25	64.948	0.034	0.0	0.0	0.9	1.11	78.2	5.5

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
3.001	53.649	0.268	200.2	0.047	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
5.000	49.458	0.247	200.2	0.223	5.00	0.0	0.600	o	375	Pipe/Conduit	🔒
3.002	22.654	0.113	200.5	0.047	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
1.004	9.065	0.145	62.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.001	50.00	6.23	64.866	0.229	0.0	0.0	6.2	1.28	141.0	37.2
5.000	50.00	5.65	64.845	0.223	0.0	0.0	6.0	1.28	141.0	36.2
3.002	50.00	6.52	64.598	0.499	0.0	0.0	13.5	1.28	140.9	81.1
1.004	50.00	6.70	64.485	0.768	0.0	0.0	20.8	2.29	253.5	124.8

Simulation Criteria for Surface Network 1

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	20.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	5	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	15.900	Storm Duration (mins)	30
Ratio R	0.277		

Online Controls for Surface Network 1

Hydro-Brake Optimum® Manhole: S7, DS/PN: 1.004, Volume (m³): 5.3

Unit Reference	MD-SHE-0077-2900-1280-2900
Design Head (m)	1.280
Design Flow (l/s)	2.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	77
Invert Level (m)	64.485
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.280	2.9
Flush-Flo™	0.337	2.7
Kick-Flo®	0.685	2.2
Mean Flow over Head Range	-	2.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	2.2	1.200	2.8	3.000	4.3	7.000	6.4
0.200	2.6	1.400	3.0	3.500	4.6	7.500	6.6
0.300	2.7	1.600	3.2	4.000	4.9	8.000	6.8
0.400	2.7	1.800	3.4	4.500	5.2	8.500	7.0
0.500	2.6	2.000	3.6	5.000	5.5	9.000	7.2
0.600	2.5	2.200	3.7	5.500	5.7	9.500	7.4
0.800	2.3	2.400	3.9	6.000	6.0		
1.000	2.6	2.600	4.0	6.500	6.2		

Storage Structures for Surface Network 1

Tank or Pond Manhole: S3, DS/PN: 2.002

Invert Level (m) 64.765

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	525.0	1.000	525.0	1.001	0.0

Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	20.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.277
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	15.900	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	0.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S14	15 Winter	100	+0%	30/15 Summer				65.574
1.001	S15	15 Winter	100	+0%	30/15 Summer				65.543
2.000	S1	1440 Winter	100	+0%	100/240 Winter				65.497
2.001	S2	1440 Winter	100	+0%	30/120 Winter				65.497
2.002	S3	1440 Winter	100	+0%	30/240 Winter				65.497
1.002	S5	1440 Winter	100	+0%	1/15 Winter				65.536
1.003	S6	15 Winter	100	+0%	1/15 Summer				65.702
3.000	S12	15 Winter	100	+0%	30/15 Summer				66.065
4.000	S9	15 Winter	100	+0%	30/15 Summer				65.981
3.001	S10	15 Winter	100	+0%	30/15 Summer				65.975
5.000	S13	15 Winter	100	+0%	30/15 Summer				65.986
3.002	S11	15 Winter	100	+0%	1/15 Summer				65.918
1.004	S7	15 Winter	100	+0%	1/15 Summer				65.799

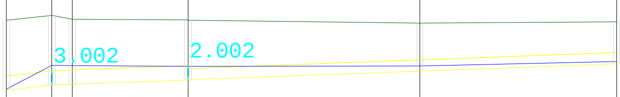
PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S14	0.228	0.000	0.26		19.1	SURCHARGED	

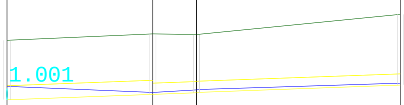
Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	S15	0.392	0.000	0.33		24.2	SURCHARGED	
2.000	S1	0.185	0.000	0.01		0.9	SURCHARGED	
2.001	S2	0.388	0.000	0.03		1.9	SURCHARGED	
2.002	S3	0.357	0.000	0.08		9.8	SURCHARGED	
1.002	S5	0.541	0.000	0.05		6.5	SURCHARGED	
1.003	S6	0.822	0.000	0.03		2.4	SURCHARGED	
3.000	S12	0.724	0.000	0.63		45.6	SURCHARGED	
4.000	S9	0.733	0.000	0.16		10.4	SURCHARGED	
3.001	S10	0.734	0.000	0.48		63.5	SURCHARGED	
5.000	S13	0.766	0.000	0.52		67.6	SURCHARGED	
3.002	S11	0.945	0.000	1.14		137.6	SURCHARGED	
1.004	S7	0.939	0.000	0.02		2.9	SURCHARGED	

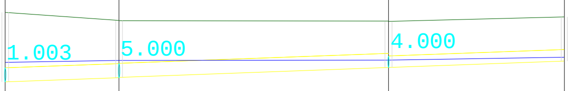
Appendix D Surface Water Longitudinal Sections

Donnachadh O'Brien & Associates		Page 1
Unit W9 E&F Ladytown BP Newhall Naas Co Kildare	Civic Amenity Centre Kilmacredock Co Kildare	
Date 11/12/2018 File CIVIC AMENITY CENTRE 12...	Designed by P. Doyle Checked by D. O'Brien	
XP Solutions	Network 2016.1	

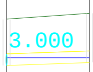
MH Name	S8		S5	S15	S14
Hor Scale 1500 Ver Scale 200 Datum (m)61.000					
PN			1.002	1.001	1.000
Dia (mm)			375	300	300
Slope (1:X)			199.6	199.6	200.5
Cover Level (m)	66.195	66.325	66.203	66.119	66.158
Invert Level (m)	64.485	64.505	64.620 / 64.620	64.851 / 64.851	65.046
Length (m)			22.958	46.108	39.094

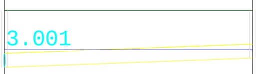
MH Name	S5	S3		S1
Hor Scale 1500 Ver Scale 200 Datum (m)61.000				
PN		2.002		2.000
Dia (mm)		375		300
Slope (1:X)		199.9		199.8
Cover Level (m)	66.203	66.373	66.353	66.890
Invert Level (m)	64.620	64.765	64.809 / 64.809	65.012
Length (m)		28.986		40.558

MH Name	S7		S11		S10		S12
Hor Scale 1500 Ver Scale 200 Datum (m)61.000							
PN		3.002		3.001		3.000	
Dia (mm)		375		375		300	
Slope (1:X)		200.5		200.2		199.8	
Cover Level (m)	66.325		66.106		66.091		66.210
Invert Level (m)	64.485		64.598 64.598		64.866 64.866		65.041
Length (m)		22.654		53.649		34.959	



MH Name	S10		
Hor Scale 1500 Ver Scale 200 Datum (m)61.000			
PN			
Dia (mm)			
Slope (1:X)			
Cover Level (m)	66.091		66.248
Invert Level (m)	64.866		64.948
Length (m)			





MH Name	S11		S13
Hor Scale 1500 Ver Scale 200 Datum (m)61.000			
PN		5.000	
Dia (mm)		375	
Slope (1:X)		200.2	
Cover Level (m)	66.106		66.108
Invert Level (m)	64.598		64.845
Length (m)		49.458	

Appendix E Surface Water Attenuation Calculations

DONNACHADH O'BRIEN
& ASSOCIATES CONSULTING ENGINEERS

Project **Celbridge - Amenity Centre**
Project No. **DOBA 1701**
Title: **Total Site**
Calcs By **MC** Date: 07-01-19

PRELIMINARY SURFACE WATER STORAGE ESTIMATE (NO LONG TERM STORAGE)

Catchment Characteristics **Greenfield Runoff Flows (Sites < 50 Ha)** denotes Input Value

Standard Average Annual Rainfal (SAAR) =	792	mm
Soil Index =	0.35	
Total Site Area =	0.9900	Hectares (ha)
Storm Return Period =	100	Years
Permissible Outflow per hectare, QBAR =	2.9	l/s/ha
* Total Permissible Outflow=	2.91	l/s
Proposed Impermeable Area:		
Hardstanding	0.5920	ha
Roofs	0.0347	ha
Proposed Open Space	0.3633	ha

Soil Classification for Runoff Potential
Based on FSR Maps

Soil 1	0	%
Soil 2	50	%
Soil 3	50	%
Soil 4	0	%
Soil 5	0	%

Infiltration

Hardstanding	..............@ 80	% Impermeable
Roofs	..............@ 95	% Impermeable
Proposed Open Space	..............@ 10	% Impermeable

Rainfall Intensity from Met Eireann
1 hectare = 10,000m²

return period	*grow curve factor*
1	0.85
10	1.7
30	2.1
100	2.6
200	2.9

Duration (min)	Rainfall 1/100 Dublin (mm)	Intensity (mm/hr)	Factored Intensity *** (mm/hr)	Factored Rainfall *** (mm)	Rainfall (m^3/ha)	Volume (m^3)	Permissable Outflow (m^3)	Storage Required (m^3)
5	15.3	183.6	220.3	18.4	183.6	100	1	99
10	21.4	128.4	154.1	25.7	256.8	139	2	138
15	25.2	100.8	121.0	30.2	302.4	164	3	162
30	31.1	62.2	74.6	37.3	373.2	203	5	197
60	38.5	38.5	46.2	46.2	462.0	251	10	240
120	47.6	23.8	28.6	57.1	571.2	310	21	289
180	58.8	19.6	23.5	70.6	705.6	383	31	352
240	66.6	16.7	20.0	79.9	799.2	434	42	392
360	75.4	12.6	15.1	90.5	904.8	491	63	428
540	82.3	9.1	11.0	98.8	987.6	536	94	442
720	93.2	7.8	9.3	111.8	1118.4	607	126	481
1080	101.8	5.7	6.8	122.2	1221.6	663	189	474
1440	111.7	4.7	5.6	134.0	1340.4	728	252	476
2880	120.5	2.5	3.0	144.6	1446.0	785	503	282
4320	128.5	1.8	2.1	154.2	1542.0	837	755	82

Value of storage required = 481 m^3 h 1.5 area 320.89 L1 20.00 L2

Notes
*Total Permissible Outflow calculated in accordance with GDSDS - Regional Drainage Policies (Volume 2 - Chapter 6)
**Permissable Outflow per Hectare multiplied by growth factors
i.e. $QBAR(m^3/s)=0.00108x(Area)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$
SOIL : Soil Index Values in range 0.15-0.5 of Catchment values Available from the FSR. The Index derived from:
$\frac{0.15Soil\,1+ 0.30Soil\,2 + 0.40Soil\,3+ 0.45Soil\,4+ 0.50Soil\,5}{Soil\,1+ Soil\,2+ Soil\,3+ Soil\,4+Soil\,5}$
*** Rainfall Intensity increased by 20% to comply with global warming effects as described in the GDSDS - Regional Drainage Policies (Volume 2 - Section 6.3.2.4 - Table 6.2)

Oversized Pipe Requirements for On-line Storage

Pipe dia. (mm)	Length (m)
2100	139
1500	272
1200	426
1050	556
900	757

Appendix F Irish Water Pre-Connection Application

Pre-connection enquiry form

Industrial and commercial developments, mixed use developments, housing developments, business developments

UISCE ÉIREANN : IRISH WATER

This form is to be filled out by applicants enquiring about the feasibility of a water and/or wastewater connection to Irish Water infrastructure. If completing this form by hand, please use BLOCK CAPITALS and black ink.

Please refer to the **Guide to completing the pre-connection enquiry form** on page 12 of this document when completing the form.

Section A | Applicant details

1 WPRN number (where available): N/A

2 Applicant details:

Registered company name (if applicable): KILDARE COUNTY COUNCIL

Trading name (if applicable): N/A

Company registration number (if applicable): N/A

If you are not a registered company/business, please provide the applicant's name:

Contact name: JOE BOLAND

Postal address: DEVOY PARK, NAAS, COUNTY KILDARE

Eircode: W91X77F

Telephone: 045 980200

Mobile: 045 980200

Email: joeboland@kildarecoco.ie

3 Agent details (if applicable):

Contact name: PAUL DOYLE

Company name (if applicable): DONNACHADH O'BRIEN

Postal address: UNIT 5C, ELM HOUSE, MILLENNIUM PARK, NAAS, CO. KILDARE

Eircode: W91P9P8

Telephone: 045 984042

Email: paul@dobrien-engineers.ie

4 Please indicate whether it is the applicant or agent who should receive future correspondence in relation to the enquiry:

Applicant ☐ Agent ☑

Section B | Site details

5 Site address: KILMACREDOCK, COUNTY KILDARE

6 Irish Grid co-ordinates of site: E(X) 297235 N(Y) 235402

Eg. co-ordinates of GPO, O'Connell St., Dublin: E(X) 315,878 N(Y) 234,619

7 Local Authority:

Local Authority that granted planning permission (if applicable):

N/A

8 Has full planning permission been granted? Yes ☐ No ☑

If 'Yes', please provide the current or previous planning reference number:

9 Previous use of this site (if applicable): N/A

10 Date that previous development was last occupied (if applicable): __ / __ / ____

11 Are there poor ground conditions on-site? Yes ☐ No ☑

If 'Yes', please include site investigation report and a detailed site-specific report on the approach being taken to deal with ground conditions specifically with regard to pipe support and trenching.

12 Are there potential contaminated land issues? Yes ☐ No ☑

If 'Yes', please include a detailed site-specific report on the approach being taken to deal with contaminated land and the measures being taken to mitigate the impact on infrastructure.

13 Is the development compliant with the local area development plan? Yes ☑ No ☐

Section C | Water connection and demand details

14 **Is there an existing connection to public water mains at the site?** Yes ☐ No ☑

15 **Is this enquiry for an additional connection to the one already installed?** Yes ☐ No ☑

16 **Is this enquiry to increase the size of an existing water connection?** Yes ☐ No ☑

17 **Is this enquiry for a new water connection?** Yes ☑ No ☐

18 **Approximate date water connection is required:** 05 / 11 / 2019

19 **Please indicate pre-development water demand (if applicable):**

Pre-development peak hour water demand	N/A	**l/s**
Pre-development average hour water demand	N/A	**l/s**

Pre-development refers to brownfield sites only. Please include calculations on the attached sheet provided.

20 **Please indicate the domestic water demand (housing developments only):**

Post-development peak hour water demand	N/A	**l/s**
Post-development average hour water demand	N/A	**l/s**

Please include calculations on the attached sheet provided.

21 **Please indicate the business water demand (shops, offices, schools, hotels, restaurants, etc.):**

Post-development peak hour water demand	N/A	**l/s**
Post-development average hour water demand	N/A	**l/s**

Please include calculations on the attached sheet provided. Where there will be a daily/weekly/seasonal variation in the water demand profile, please provide all such details.

22 **Please indicate the industrial water demand (industry-specific water requirements):**

Post-development peak hour water demand	0.1	**l/s**
Post-development average hour water demand	0.02	**l/s**

Please include calculations on the attached sheet provided. Where there will be a daily/weekly/seasonal variation in the water demand profile, please provide all such details.

23 **What is the existing ground level at the property boundary at connection point (if known) above Malin Head Ordnance Datum?**

66.00 m

24 **What is the highest finished floor level of the proposed development above Malin Head Ordnance Datum?**

66.30 m

25 **Is on-site water storage being provided?** Yes ☑ No ☐

Please include calculations (details and capacity) of all water storage provided on-site on the attached sheet provided.

26 **Are there fire flow requirements?** Yes ☐ No ☑

Additional fire flow requirements over and above those identified in Q20, Q21 and Q22 above	N/A	**l/s**

Please include calculations on the attached sheet provided, and include confirmation of requirements from the Fire Authority.

27 **Do you propose to supplement your potable water supply from other sources?** Yes ☐ No ☑

If 'Yes', please indicate how you propose to supplement your potable water supply from other sources (see **Guide to completing the application form** on page 12 of this document for further details):

Section D | Wastewater connection and discharge details

28 **Is there an existing connection to a public sewer at the site?** Yes ☐ No ☑

29 **Is this enquiry for an additional connection to one already installed?** Yes ☐ No ☑

30 **Is this enquiry to increase the size of an existing connection?** Yes ☐ No ☑

31 **Is this enquiry for a new wastewater connection?** Yes ☐ No ☑

32 **Approximate date that wastewater connection is required:** 05 / __ / ____

33 **Please indicate pre-development wastewater discharge (if applicable):**

Pre-development peak discharge	N/A	**l/s**
Pre-development average discharge	N/A	**l/s**

Pre-development refers to brownfield sites only. Please include calculations on the attached sheet provided.

34 **Please indicate the domestic wastewater hydraulic load (housing developments only):**

Post-development peak discharge	N/A	**l/s**
Post-development average discharge	N/A	**l/s**

Please include calculations on the attached sheet provided.

35 **Please indicate the commercial wastewater hydraulic load (shops, offices, schools, hotels, restaurants, etc.):**

Post-development peak discharge	N/A	**l/s**
Post-development average discharge	N/A	**l/s**

Please include calculations on the attached sheet provided.

36 **Please indicate the industrial wastewater hydraulic load (industry-specific discharge requirements):**

Post-development peak discharge	N/A	**l/s**
Post-development average discharge	N/A	**l/s**

Please include calculations on the attached sheet provided.

37 **Wastewater organic load:**

Characteristic	**Max concentration (mg/l)**	**Average concentration (mg/l)**	**Maximum daily load (kg/day)**
Biochemical oxygen demand (BOD)			
Chemical oxygen demand (COD)			
Suspended solids (SS)			
Total nitrogen (N)			
Total phosphorus (P)			
Other			

Temperature range	
pH range	

38 **Storm water run-off will only be accepted from brownfield sites that already have a storm/surface water connection to a combined sewer. In the case of such brownfield sites, please indicate if the development intends discharging surface water to the combined wastewater collection system:**

Yes ☐ No ☑

If 'Yes', please give reason for discharge and comment on adequacy of SUDS/attenuation measures proposed.

Please submit detailed calculations on discharge volumes, peak flows and attenuation volumes with this application.

39 **Do you propose to pump the wastewater?** Yes ☐ No ☑

If 'Yes', please include justification for your pumped solution with this application.

40 **What is the existing ground level at the property boundary at connection point (if known) above Malin Head Ordnance Datum?**

m

41 **What is the lowest finished floor level on-site above Malin Head Ordnance Datum?** m

Section E | Development details

42 Please outline the domestic and/or industry/business use proposed:

Property type	Total number of units for this application
Domestic	
Office	
Residential care home	
Hotel	
Factory	
School	
Institution	
Retail unit	
Industrial unit	
Other (please specify)	CENTRE WITH 4 BUILDINGS (1) SATFF BUILDING (2) PAY POINT BUILDING (3) WEIGHBRIDGE BUILDING (4) HAZARDOUS W

43 Approximate start date of proposed development: 05/06/2019

44 Is the development multi-phased? Yes ☐ No ☑

If 'Yes', application must include a master-plan identifying the development phases and the current phase number.

If 'Yes', please provide details of variations in water demand volumes and wastewater discharge loads due to phasing requirements.

Section F | Supporting documentation

Please provide the following additional information:

> Site location map: A site location map to a scale of 1:1000, which clearly identifies the land or structure to which the enquiry relates. The map shall include the following details:

a) The scale shall be clearly indicated on the map.

b) The boundaries shall be delineated in red.

c) The site co-ordinates shall be marked on the site location map.

> Details of planning and development exemptions (if applicable).

> Calculations (calculation sheets provided below).

> Site layout map to a scale of 1:500 showing layout of proposed development, water network and wastewater network layouts, additional water/wastewater infrastructure if proposed, connection points to Irish Water infrastructure (if known).

> All design submissions as outlined in the Irish Water Codes of Practice for Water Infrastructure and the Irish Water Codes of Practice for Wastewater Infrastructure, including the layout of all other services to be provided within the site (for example: gas, electricity, telecommunications).

> Any other information that might help Irish Water assess this pre-connection enquiry.

Section G | Declaration

I/We hereby make this application to Irish Water for a water and/or wastewater connection as detailed on this form.

I/We understand that any alterations made to this application must be declared to Irish Water.

The details that I/we have given with this application are accurate.

I/We have enclosed all the necessary supporting documentation.

Signature: Paul Doyle Digitally signed by Paul Doyle DN: C=IE, E=mcoffy@dobrien-engineers.ie, O=DOBA, OU=C&S, CN=Paul Doyle Date: 2018.12.04 17:37:32Z00'00'

Date: 04 / 12 / 2018

Your full name (in BLOCK CAPITALS):

PAUL DOYLE

Irish Water will carry out a formal assessment based on the information provided on this form.
Any future connection offer made by Irish Water will be based on the information that has been provided here.

Please submit the completed form to **newconnections@water.ie** or alternatively, post to:

Irish Water
PO Box 860
South City Delivery Office
Cork City

For office use only:

Input customer number:

Calculations

Water demand

AMENITY CENTRE DEMAND

- UNITS = 4
- OCCUPANCY = 10 PERSONS
- CONSUMPTION = 150 LITRES/ PERSON/ DAY x 10 PERSONS = 1,500 LITRES/ DAY

AVERAGE HOUR DAILY DEMAND
- 1,500 LITRES/ DAY x 1.25 = 1,875 LITRES/ DAY
- 1,875/ (24 x 60 x 60) = 0.02 LITRES/ SECOND

PEAK HOUR DAILY DEMAND
- 0.02 x 5 = 0.1 LITRES/ SECOND

Kildare County Council c/o Paul Doyle
UNIT 5C
Elm House
Millenium Park
Naas
Co. Kildare

Uisce Éireann
Bosca OP 6000
Baile Átha Cliath 1
Éire

Irish Water
PO Box 6000
Dublin 1
Ireland

T: +353 1 89 25000
F: +353 1 89 25001
www.water.ie

07 January 2019

Dear Sir/Madam,

Re: Customer Reference No 6703943751 pre-connection enquiry - Subject to contract | Contract denied
Connection for Civic Amenity Centre at Kilmacredock, County Kildare.

Irish Water has reviewed your pre-connection enquiry in relation to a water connection at KILMACREDOCK, COUNTY KILDARE. Based upon the details that you have provided with your pre-connection enquiry and on the capacity currently available in the network(s), as assessed by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place, your proposed connection to the Irish Water network(s) can be facilitated.

The confirmation of feasibility to connect to the Irish Water infrastructure does not extend to your fire flow requirements. While flows in excess of your required demand may be achieved in the Irish Water network and could be utilised in the event of a fire, Irish Water cannot guarantee a flow rate to meet your fire flow requirement. To guarantee a flow to meet the Fire Authority requirements you should provide adequate fire storage capacity within your development.

All infrastructure should be designed and installed in accordance with the Irish Water Codes of Practice and Standard Details. A design proposal for the water infrastructure should be submitted to Irish Water for assessment.

You are advised that this correspondence does not constitute an offer in whole or in part to provide a connection to any Irish Water infrastructure and is provided subject to a connection agreement being signed at a later date.

A connection agreement can be applied for by completing the connection application form available at **www.water.ie/connections**. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities.

If you have any further questions, please contact us on 1850 278 278 or +353 1 707 2828, 8.00am-4.30pm, Mon-Fri or email **newconnections@water.ie**. For further information, visit www.water.ie/connections

Yours sincerely,

Maria O'Dwyer
Connections and Developer Services

Appendix G Foul Drainage Network Calculations

FOUL SEWERAGE DESIGN

Design Criteria for Foul Network 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.200
Flow Per Person (l/per/day)	200.00	Maximum Backdrop Height (m)	1.500
Persons per House	3.00	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Network Design Table for Foul Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	57.813	0.289	200.0	0.000	1	0.0	1.500	o	225	Pipe/Conduit	🔒
1.001	26.928	0.135	200.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	🔒
1.002	49.793	0.249	200.0	0.000	2	0.0	1.500	o	225	Pipe/Conduit	🔒
1.003	30.555	0.153	199.7	0.000	0	0.0	1.500	o	225	Pipe/Conduit	🔒
1.004	1.953	0.010	195.3	0.000	0	0.0	1.500	o	225	Pipe/Conduit	🔒

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	64.200	0.000	0.0	1	0.0	6	0.81	32.2	0.0
1.001	63.911	0.000	0.0	1	0.0	6	0.81	32.2	0.0
1.002	63.776	0.000	0.0	3	0.0	11	0.81	32.2	0.1
1.003	63.527	0.000	0.0	3	0.0	11	0.81	32.2	0.1
1.004	63.374	0.000	0.0	3	0.0	10	0.82	32.6	0.1

Simulation Criteria for Foul Network 1

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	20.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

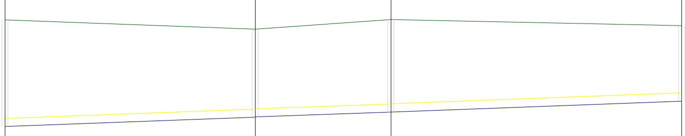
Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

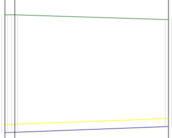
Synthetic Rainfall Details

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	5	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	15.900	Storm Duration (mins)	30
Ratio R	0.277		

Appendix H Foul Drainage Longitudinal Sections

MH Name	F5		F4		F3		F1
Hor Scale 1500 Ver Scale 200 Datum (m)60.000							
PN		1.002		1.001		1.000	
Dia (mm)		225		225		225	
Slope (1:X)		200.0		200.0		200.0	
Cover Level (m)	66.370		66.118		66.380		66.214
Invert Level (m)	63.527		63.776 63.776		63.911 63.911		64.200
Length (m)		49.793		26.928		57.813	

MH Name	F7		F5
Hor Scale 1500 Ver Scale 200 Datum (m)60.000			
PN		1.003	
Dia (mm)		225	
Slope (1:X)		199.7	
Cover Level (m)	66.500		66.370
Invert Level (m)	63.374		63.527
Length (m)		30.555	

DONNACHADH O'BRIEN
& ASSOCIATES CONSULTING ENGINEERS

Appendix I Traffic & Transport Assessment

Kildare Civic Amenity Centre, Celbridge, Co. Kildare

Traffic and Transport Assessment

Kildare County Council

Project number: 60583150
Traffic and Transport Assessment

26th November 2018

Quality information

Prepared by	Checked by	Verified by	Approved by
Theodore Jones Graduate Consultant	Caroline Brooks Senior Consultant	Mary Kennedy Principal Consultant	Michael Dunne Associate Director

Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	24.08.18	Working Draft	MK	Mary Kennedy	Principal
1	26.11.18	Planning	MK	Mary Kennedy	Principal

Distribution List

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Figures

Tables

1. Introduction

Background

AECOM has been commissioned by Kildare County Council (KCC) to prepare a Traffic and Transport Assessment to accompany a planning application for a Civic Amenity Centre (CAC) at a site to the north of the R449, Celbridge, County Kildare.

The proposed development comprises of a CAC site of approximately 1.0 hectares to serve the north of County Kildare. Access to the proposed development will be via the R449, with on-site parking provision.

Planning Policy

In order to complete this report, AECOM has made reference to the following documents:

- The Traffic Management Guidelines 2003 (jointly published by the DOELG, DTO, DOT);
- Design Manual for Urban Roads and Streets, March 2013 (Dept. of Transport, Tourism and Sport/Dept. of Environment, Community & Local Government);
- DTO Advice Note Mobility Management Plans;
- Transport Infrastructure Ireland "Traffic and Transport Assessment Guidelines" May 2014;
- Transport Infrastructure Ireland "Geometric Design of Junctions" April 2017;
- Kildare County Development Plan 2017 – 2023;
- Greater Dublin Area Transport Strategy 2016 – 2035; and
- The National Transport Authority's Greater Dublin Area Cycle Network Plan 2013

Objectives

The main objective of this report is to examine the traffic and transport impact of the proposed development and the access to the local area road network. The net change in traffic on the network due to the additional traffic has been calculated and its influence on the local road network has been investigated.

Pre-application consultation

Pre-application consultation took place with Kildare County Council as part of the wider project pre-application consultation. Further to this, a scope was submitted to George Willoughby of Kildare County Council on 17th August 2018. This is appended to this report, in Appendix A.

Study Methodology

The methodology adopted for this report can be summarised as follows:

- A review of existing conditions in terms of site accessibility has been undertaken;
- Traffic surveys to identify existing traffic levels have been undertaken;
- A percentage change assessment to identify the impact of the proposed development at the junctions within the study area during the AM and PM weekday peak hours has been carried out.

Structure of Report

The remainder of the report is divided into the following sections:

- Section 2 considers the location of the site and existing conditions;
- Section 3 discusses the proposed development;
- Section 4 considers the traffic generation and potential impacts of the development;
- Section 5 contains an analysis of capacity of the key junctions of the proposed development;
- Section 6 discusses the development's mobility management plan;
- Section 7 reviews the construction management requirements; and
- Section 8 provides a summary and conclusion.

2. Receiving Environment

Introduction

This section of the TTA reviews the existing transport conditions in the vicinity of the proposed development. The chapter will provide a description of the existing site operation and location, a review of the existing walking, cycling and public transport facilities in the vicinity of the proposed development and a description of the existing highway network.

Existing Site

The proposed development is located approximately 2.2km north of Celbridge and 3.2km west of Leixlip, on a parcel of land between the R449 and the M4, approximately 0.3km from Junction 6 of the M4. Celbridge is the nearest town, with a population of 20,288 (2016).

The majority of the site is undeveloped. It is bounded by a field to the west, the M4 to the north, the existing KCC roads compound to the east, and by the R449 to the south. The topography is reasonably flat and there is no proximate residential development.

Restricted vehicular access into the site is possible off the R449. An electronic gate prevents unauthorised access into the site, and it also provides access for the KCC roads compound immediately to the east of the site.

The site location is shown indicatively in **Figure 1** below.

Figure 1. Indicative Site Location (source: Google Maps)

Existing Road Network

The site is located to the north of the R449, a regional road connecting R405 to the south with R148 to the north, and intersecting at M4 Junction 6. In the vicinity of the site, the road is single carriageway with lane markings. The speed limit fronting the site is 60kph.

On both sides of the road, there is a parallel footway and cycle lane, see **Photo 1**.

Photo 1

To the east, the R449 leads to a large five-arm two-lane roundabout. From this roundabout, the M4 can be accessed both eastbound and westbound directions via slip roads. In addition, there are further exits for the R449 northbound towards Collinstown Industrial Estate and Barnhall Road eastbound towards Hewlett Packard Enterprises. The M4 is a two lane motorway linking to the M50 Dublin Ring Road via a section of the N4 dual carriageway to the east and linking to the M6 and the N4 dual carriageway to the west.

To the west, the R449 leads to a three-arm roundabout. From here, the R405 can be taken northwest towards Maynooth or southeast towards Celbridge.

Existing Traffic Flows

Relevant traffic flows were sourced from submitted planning applications in the vicinity of the area at the following junctions:

1. M4 Junction 6 Five-arm Roundabout; and
2. R449 / R406 Three-arm Roundabout

The data gathered confirm that the peak hours occur between 08:00 and 09:00 and between 18:00 and 19:00. The level of traffic travelling through each junction is considered to be representative of a normal weekday in this area of County Kildare. The resulting traffic flows are illustrated in **Appendix B**.

Public Transport

There are no bus stops or bus routes on the R449. The closest bus stop to the site is located on the R405, approximately 1.1km from the site. The Salesian College (Celbridge) bus stop is served by Bus Routes 67, 67-N and 67x, detailed in **Table 1** below.

Table 1 – Public Transport

Location	Route No.	Route Description	Frequency Monday to Friday	Frequency Saturday	Frequency Sunday	Operator
Celbridge, Salesian College	67	Merrion Square, Dublin - Maynooth	Every 30 minutes	Every 30 minutes	Every 30 minutes	Dublin Bus
Celbridge, Salesian College	67n	Westmoreland Street, Dublin – Maynooth (outbound only)	No Service Mon-Thurs. Fri: 4x overnight	4x overnight	No Service	Dublin Bus
Celbridge, Salesian College	67	University College Dublin (UCD)Belfield – Celbridge (Salesian College)	6x a day. Morning - to UCD; evening - from UCD	No Service	No Service	Dublin Bus

Table 1 demonstrates that the bus stop nearest to the proposed development is served regularly by buses.

The closest railway station to the site is Leixlip (Louisa Bridge), 3.0km to the northeast. The station provides services eastward to Dublin Connolly and Dublin Pearse; and westward to Maynooth.

Walking and Cycling Facilities

The R449 has a footway and a cycle lane on both sides of the carriageway. The footway links with the Celbridge urban footpath network to the south and the Leixlip urban footpath network to the northeast. There are no controlled crossing points along the length of the R449. The nearest controlled crossing is approximately 800m from the site, in the form of a light-controlled pedestrian crossing across the R405, adjacent to the R449 / R405 Three-arm Roundabout.

The cycle lanes adjacent to the R449 carriageway on either side continue for the length of the R449 and into neighbouring roads. The cycle lanes continue towards: Salesian College and Celbridge to the west and south; Hewlett Packard Enterprise to the east; and Collinstown Industrial Park and Leixlip to the north and northeast. At the side road accesses and all junctions, the cycle lanes give way to the road.

Potential / Committed Infrastructure

The Kildare County Development Plan 2017 – 2023 is the adopted development plan relevant to this site. The site is part of the Dublin Metropolitan Area, centred between the Large Growth Towns of Maynooth and Leixlip, and the Moderate Sustainable Growth Town of Celbridge. A Large Growth Town is strategically positioned to make the most of their connectivity and high quality connections to Dublin City Centre, whilst also supporting and servicing a wider local economy. They are important centres for delivery of public services.

The Greater Dublin Area Transport Strategy 2016-2035 highlights proposed infrastructure improvements for the wider Greater Dublin Area. The Dublin Area Rapid Transit (DART) has an expansion programme, to include the current heavy rail line between Dublin and Maynooth. This would bring fast, high-frequency electrified services to the nearest rail station to the site, Leixlip (Louisa Bridge). This document also highlights the R449 as a road identified for improvement along its entire length.

The National Transport Authority's Greater Dublin Area Cycle Network Plan 2013 highlights potential cycle routes in the Greater Dublin area. These routes in the vicinity of the site are proposed to be implemented:

- C6 R405 Maynooth Road
- C7 R449 Celbridge to Leixlip Link Road (across M4 Junction 6)
- C8/C8a/C8b Castletown Demesne Greenways to Barnhall Road, Leixlip and links to C6 and C7.

Additionally, Intel has committed development to the north of the M4.

Planning History

There are no directly applicable planning permissions or applications within the site or in the immediate vicinity of the subject site.

Road Collisions

An analysis was completed of the injury collision data for Ireland contained in the Road Safety Authority's online map. The analysis area and collision locations are shown in **Figure 2** below:

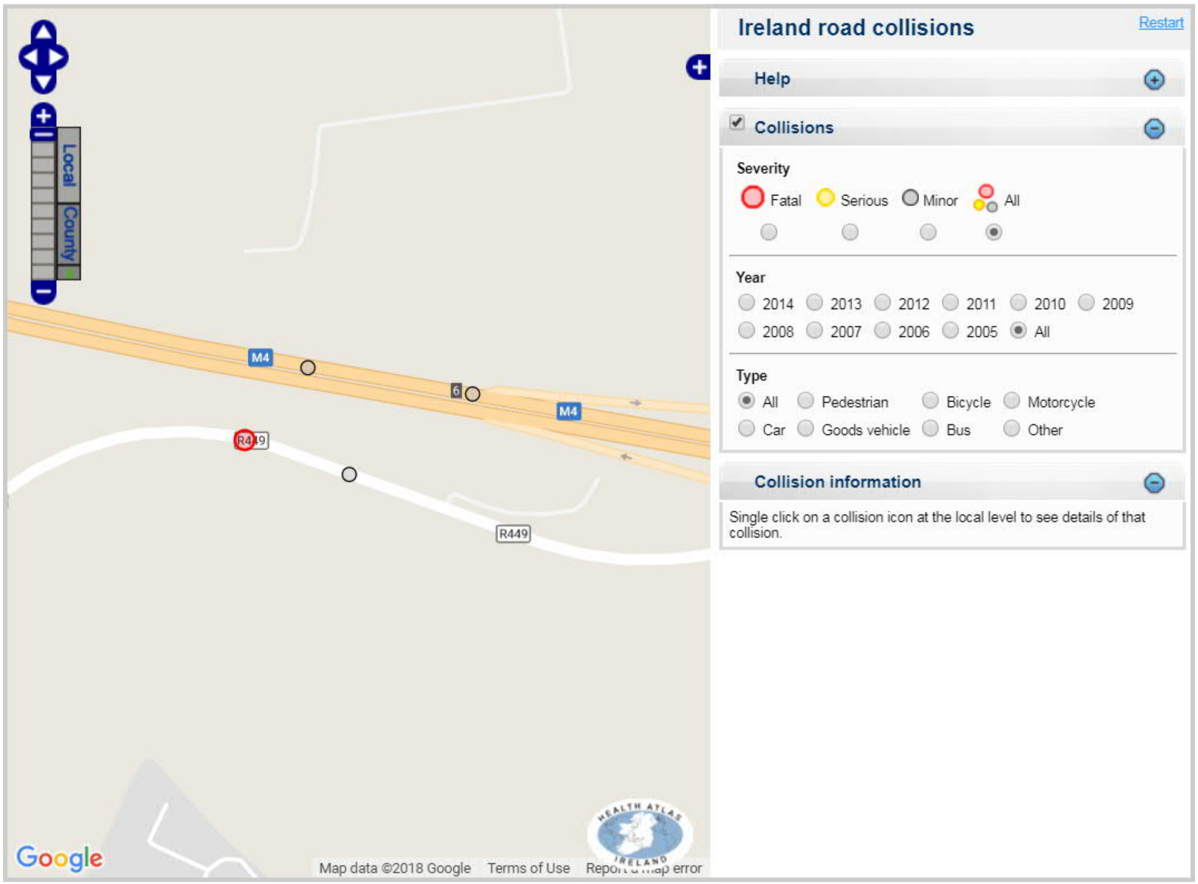

Figure 2. Road Safety Analysis (source: Road Safety Authority)

Four collisions took place in the vicinity of the proposed development in the period between 2005 and 2014, inclusive. These are summarised in **Table 2** below:

Table 2 – Road Safety Analysis

Year	Severity	Location	No. of casualties	Circumstance
2011	Minor	M4, north of subject site	1	Car, Other
2012	Minor	R449, south of subject site	1	Car, Single Vehicle
2013	Fatal	R449, south of subject site	1	Car, Head-on conflict
2014	Minor	M4, north of subject site	1	Rear end, straight

The fatality happened on the R449 adjacent to the site, on a Wednesday daytime between the hours of 10am and 4pm. It happened on a section of road with a gradual curve, a 60kph speed limit and long sightlines and no junctions. In addition, the small sample size and different circumstances of the other collisions mean that no trends can be asserted.

It is not evident that there are road safety issues that would be exacerbated by the proposed development.

3. Proposed Development

Development Details

The proposed development consists of a Civic Amenity Centre (CAC) to serve the north of County Kildare, 1 hectare in size.

The CAC will be split into two parts. The eastern part will be for the non-chargeable waste stream, for the disposal of: glass bottles, paper and cardboard, plastic bottles and plastic packaging, aluminium cans and metal cans, Tetra Pak, textiles, polystyrene and white goods, electrical goods and electronic goods. The western part will be for the chargeable waste stream, for the disposal of green waste, bulky waste, DIY and plasterboard, household hazardous, timber waste, flat glass, metal and residual household waste.

The proposed layout is shown in **Figure 3** below.

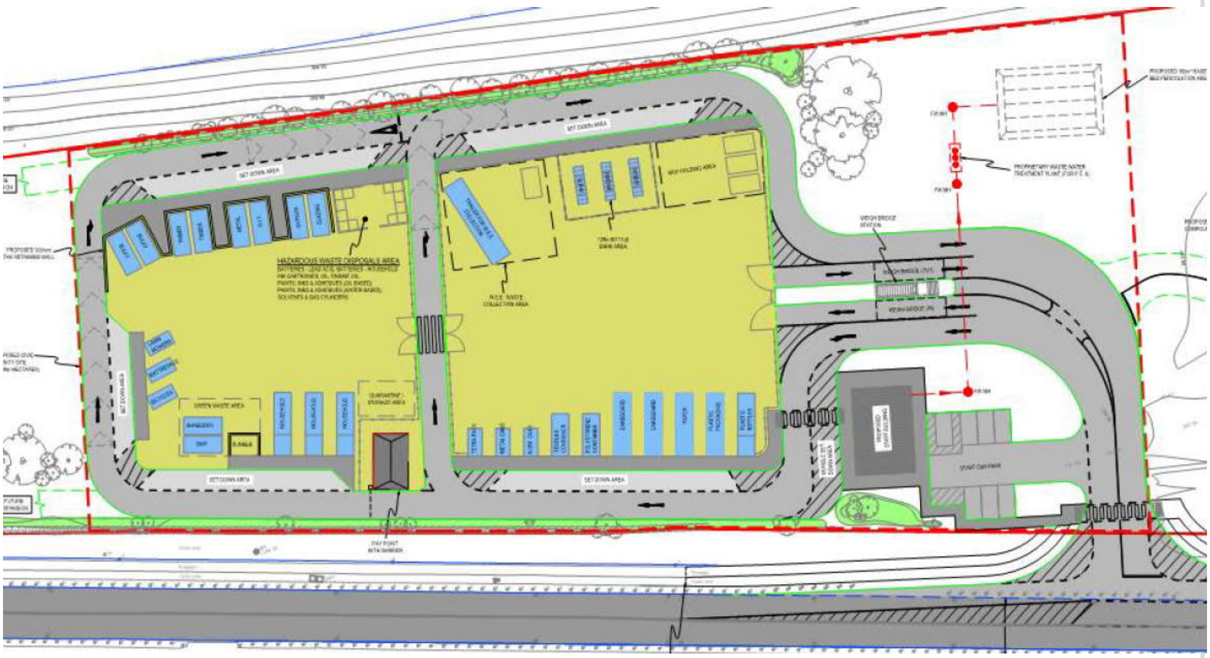

Figure 3. Proposed Development (source: Design Team)

Site Access

One site access to the public road network is proposed. The site will be accessed via a priority junction on the R449. The R449 will be widened at the site access, with the provision of a dedicated right turn lane. An internal road will provide access into the site, with a secondary road off this road constructed to access the existing KCC roads compound to the east.

The pedestrian and cycle lanes on the north of the R449 will also be realigned. At the site access, there will be provision of dropped kerbs, tactile paving and zebra crossing road marks. Pedestrians can also enter the site here.

Visibility Requirements

Sightlines for the proposed junction onto the R449 have been assessed in line with the requirements of TII's Geometric Design of Junctions (April 2017), replicated in **Figure 4** below.

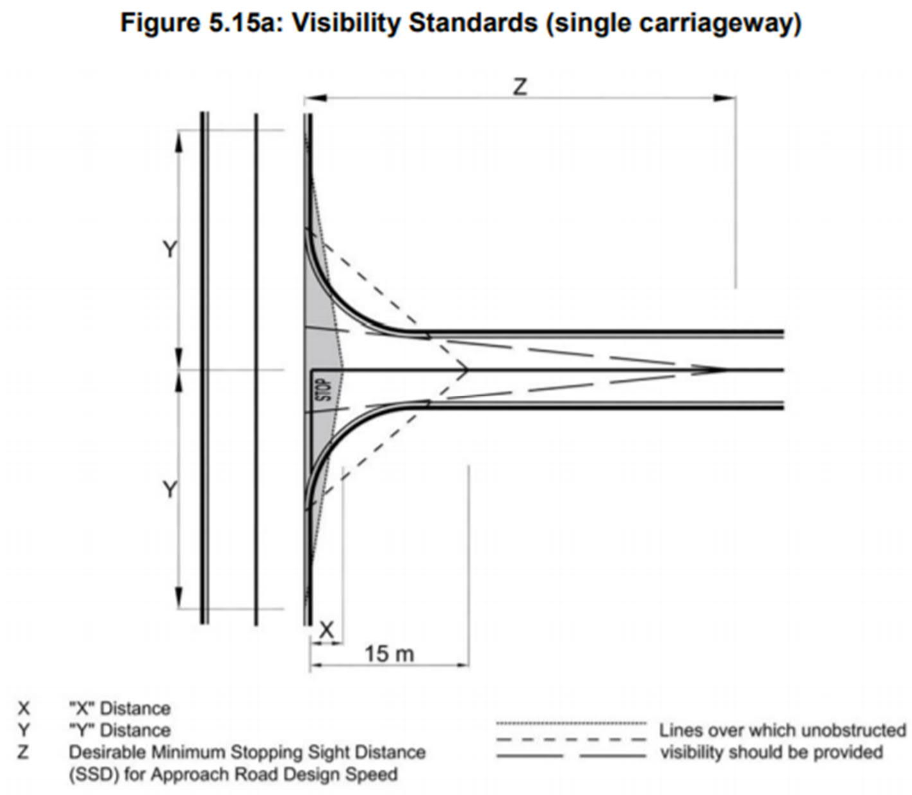

Figure 4. Visibility Standards (source: TII DN-GEO-03060, Page 43)

The visibility requirements for the speed limit of the major road of 60kph (design speed of 70kph) have been tested at the R449 access to the site. The desirable minimums are as follows:

X = 2.4m (desirable minimum)

Y = 120m

It has been confirmed that the access can achieve the required visibility splays.

Servicing

The proposed access junction and internal road network has been designed with road widths and radii of sufficient dimensions to enable manoeuvring by all vehicles that will use the site. A swept path has been undertaken in AutoCad (Autotrack) to demonstrate that a refuse vehicle and fire tender will be able to turn into and out of the access and also travel through the site and turn to exit in a forward direction, as illustrated in the drawings package submitted as part of this application.

Parking

It is proposed to provide a total of 7 staff car parking spaces, including one disabled parking space. The car park is to be located on site, adjacent to the staff building. No bicycle parking provision is proposed. These numbers are as agreed with KCC.

Proposed Internal Pedestrian Layout

Pedestrian access into the site will be provided at the western side of the proposed priority junction access from the R449. A footway is to be provided to lead to the proposed staff building. From the staff building, the eastern part of the civic amenity can then be accessed. Two crossing points, in the form of dropped kerbs, tactile paving, and zebra crossing marks are provided. Footway widths are minimum 1.8m in width as per DMURS guidance.

4. Trip Generation and Distribution

General

The purpose of this section is to determine the overall number of trips that will be generated by the proposed development. The traffic generated by the proposed development has been distributed onto the adjacent road network to allow a traffic assessment of future conditions in line with Transport Infrastructure Ireland (TII) guidance. **Figure 5** below shows the relevant junctions in relation to the subject site:

Figure 5. Junctions Assessed (source: Google Maps)

Extant Trip Generation

The site currently comprises of a field, with access to an adjacent compound via the site. The access is gated. The level of trips generated using the gated access has not been ascertained via a traffic survey and therefore the exact number of trips generated during the local road network peak hours cannot be derived. For robustness, it has been assumed that there are no trips generated by the existing site, and all generated trips are new to the network.

Proposed Development Trip Rates and Generation

A trip generation assessment was completed with reference to peer Civic Amenity sites, and also with reference to the Trip Rate Information Computer System (TRICS V. 7.5.2). This trip generation assessment is included in **Appendix C**.

The trip rates and the resulting trip generations for the peak periods are illustrated in **Table 3** and **Table 4** below.

Table 3 – Proposed Trip Rates Per Hectare

Development	TRICs Land Use	AM Peak Hour (08:00 – 09:00)		PM Peak Hour (18:00 – 19:00)	
		Arrivals	Departures	Arrivals	Departures
Civic Amenity Centre	07 V - Library	57.792	58.442	14.563	21.359

Table 4 – Proposed Trip Generation

Development	Development Size	AM Peak Hour (08:00 – 09:00)		PM Peak Hour (18:00 – 19:00)	
		Arrivals	Departures	Arrivals	Departures
Civic Amenity Centre	1 hectare	58	58	15	21
Peak Hour Totals		116		36	

Table 4 demonstrates that the anticipated trip generations associated with the development are 116 and 36 trips respectively during the morning (08:00 – 09:00) and evening (18:00 – 19:00) peak hour periods.

Trip Distribution

Development trips have been distributed across the network proportionally using the catchment population – shown in **Figure 6** below.

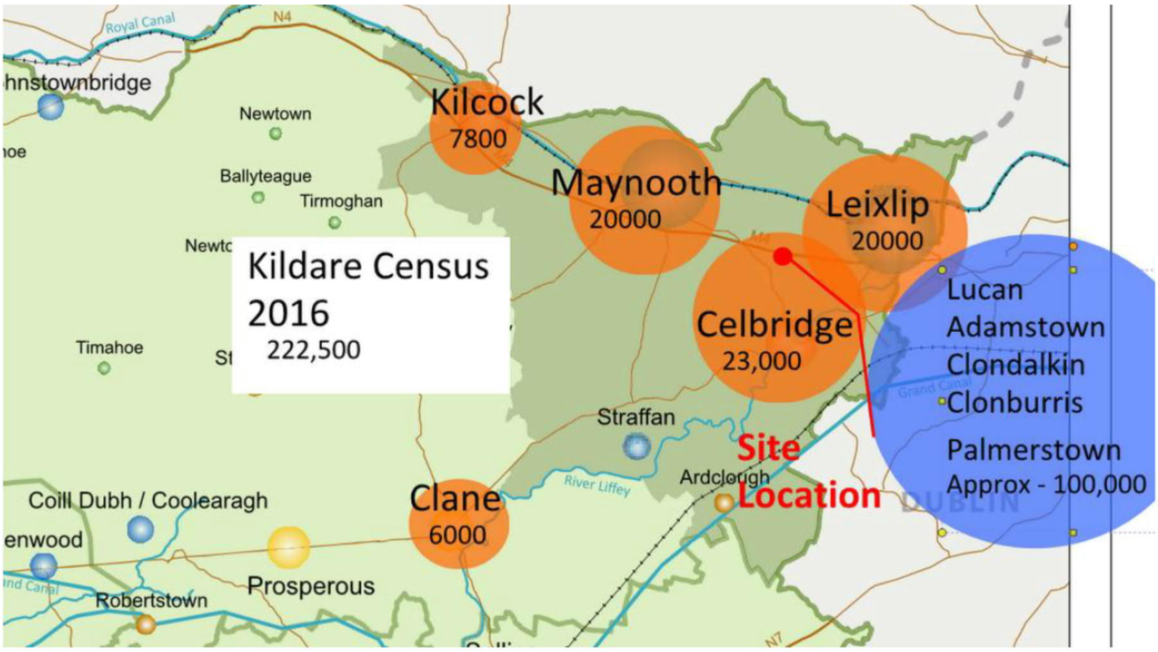

Figure 6. Catchment Population (source: Donnachadh O'Brien and Associates)

Trip distribution was calculated using the Directions feature in Google Maps, and routes were chosen based on which route allowed for the quickest trip time at the morning peak of 8am. This time was chosen as it was assumed that this was when the maximum congestion would be found on the network, and so it would be the time mostly applicable to both the peak hours. The same distribution pattern has been applied to both the AM and PM peak hours.

5. Development Impact

Introduction

This section of the TTA provides details regarding the operation of the existing highway network in the vicinity of the site, taking into account how trips associated with the proposed development will be distributed onto the local highway network and any potential implications. The scope of the assessment set out in the following paragraphs is considered comprehensive.

Considered Scope of Assessment

Study Area for Highway Network Assessment

An assessment of the level of increase in traffic flows associated with the proposed development has been undertaken at the following junctions:

- Junction 1: M4 Junction 6 Five-arm Roundabout; and
- Junction 2: R449 / R405 Three-arm Roundabout

Peak hours

Based on the 2016 traffic data at Junction 1, as included in nearby planning applications, the peak hours for the local highway network are identified as follows:

- AM Peak: 08:00 to 09:00 hours; and
- PM Peak: 18:00 to 19:00 hours.

Assessment Years and Scenarios

A number of scenarios have been considered to ascertain the impact of the proposed development on the local road network. The assessment scenarios are as follows:

- Baseline 2018 – AM and PM peak hours;
- Opening Year 2020 Without and With Development – AM and PM peak hours;
- Future Year 2025 Without and With Development – AM and PM peak hours; and
- Future Year 2035 Without and With Development – AM and PM peak hours.

Junction Turning Counts

The base Junction Turning Counts (JTCs) for the assessment junctions have been extracted from data as follows:

- Junction 1: 2016 data, from RFI response to Planning Ref 16/1229.
- Junction 2: 2011 data, from Intel Planning Application Ref 12725.
- Junction 3: 2016 data, from RFI response to Planning Ref 16/1229.

Initial Traffic Growth for Junction 2: R449 / R405 Three-arm Roundabout

Using the 2016 flow entering and exiting the R449 at Junction 1 as a reference point, the 2011 data at Junction 2 was adjusted to provide a 2016 baseline in line with the 2016 data at Junction 1. Eastbound and westbound factors were calculated and applied to the eastbound and the westbound JTCs at Junction 2 for both the AM and

PM peak hours. The JTCs that do not enter or exit the R449 have an overall growth factor applied in line with the overall increase in traffic at the junction.

Table 5 below shows the flows involved, the calculation made, and the resulting factors.

Table 5 – Traffic Growth Calculation

Time	Flow	2016 Base (1 hour) Junction 1	2011 Base (3 hour) Junction 2	Calculation	Factor applied to 2011 3-hour traffic at Junction 2 to bring to 2016 1-hour peak levels
AM	R449 Eastbound	553	1810	553÷1810	0.305524862
	R449 Westbound	188	544	188÷544	0.345588235
	Total	741	2354	741÷2354	0.314783347
PM	R449 Eastbound	652	1372	652÷1372	0.475218659
	R449 Westbound	757	2136	757÷2136	0.354400749
	Total	1409	3508	1409÷3508	0.401653364

Application of the relevant factors in **Table 6** above gives the result that the traffic entering and exiting the R449 at Junction 2 is equal to the traffic exiting and entering the R449 at Junction 1 respectively.

The overall percentage applied to the 2011 Base (3 hour) data to adjust it to a 2016 Base (1 hour) may be expected to be around or above 33.3% due to: 1 hour being one third of 3 hours; the hour being the peak hour out of the three and any growth in traffic over 5 years between 2011 and 2016. The results of this calculation give a factor of 31.5% in the AM and a factor of 47.5% in the PM. These percentages are in line with expectations, and are considered robust.

Traffic Growth

The TII Project Appraisal Guidelines for National Roads Unit 5.3 sets out growth rates for forecasting future year traffic. The central growth rates for the period 2013 to 2030 and 2030 to 2050 for the Mid-East region were used. As the JTC data extracted did not differentiate between Light Vehicles and Heavy Vehicles, the Light Vehicles growth rate was the one applied to showcase the worst case scenario. The growth rates applied are provided in **Table 7** below.

Table 6 – Growth Rates

	Time Length	Growth Rate (Light Vehicles)
2016 – 2018	2 Years	1.028196
2018 – 2020	2 Years	1.028196
2020 – 2025	5 Years	1.071988
2025 – 2035	10 Years	1.096219

Traffic flow diagrams illustrating the resulting traffic flows for the assessment scenarios set out above are included in **Appendix A**.

Threshold Analysis

The TII Guidelines for Transport Assessments state that the thresholds for junction analysis in Transport Assessments are as follows:

- ‘Traffic to and from the development exceeds 10% of the existing two-way traffic flow on the adjoining highway.’
- ‘Traffic to and from the development exceeds 5% of the existing two-way flow on the adjoining highway, where traffic congestion exists or will exist within the assessment period or in other sensitive locations.’

Percentage Change Assessment

A percentage change assessment has been undertaken. The results of the assessment are set out in **Table 7** below, which illustrates that there is a minimal change in traffic at both existing junctions in the baseline or opening year scenarios.

Table 7 – Percentage Change Assessment

		AM	PM				
Junctions	Arm	2020 Base / 2020 With Development	2025 Base / 2025 With Development	2035 Base / 2035 With Development	2020 Base / 2020 With Development	2025 Base / 2025 With Development	2035 Base / 2035 With Development
1. M4 Junction 6	R449 N	0%	0%	0%	0%	0%	0%
	M4 Slip E	6%	6%	5%	1%	1%	1%
	Barnhall Road SE	0%	0%	0%	0%	0%	0%
	R449 SW	7%	7%	6%	2%	2%	2%
	M4 Slip W	2%	2%	2%	1%	1%	1%
	ALL	4%	4%	3%	1%	1%	1%
2. R449 / R405 Roundabout	R449 NE	5%	5%	4%	0%	0%	0%
	R449 SE	1%	1%	1%	0%	0%	0%
	R405 NW	2%	2%	2%	0%	0%	0%
	ALL	2%	2%	2%	0%	0%	0%

The change at the junctions analysed confirms that the increase in traffic at both existing junctions do not exceed 10%, and therefore there is no requirement to assess them in terms of capacity.

However, the R449 / R405 Roundabout has been assessed to identify any potential existing issues with the junction that may be exacerbated by the development. It is being included for robustness.

Also, the site access priority junction has been assessed to ascertain its residual capacity.

Capacity Assessment Junction Models

In order to assess the traffic impact of the development on the site access priority junction, it has been necessary to build individual junction models. Therefore, the modelling work has been undertaken using nationally recognised modelling software Junctions 9 for priority junctions and roundabouts.

The following sections discuss the outcome of the capacity assessments undertaken for the junctions in all of the scenarios. Within these sections a number of acronyms are used. The meaning of these acronyms within the capacity assessment results are discussed below.

- RFC Ratio to Flow to Capacity (for priority junctions and roundabouts)
- Q Queue length (vehicles)

It is generally accepted that RFC values of 0.85 or less are indicators that a junction is operating within capacity. Although a junction would be said to be operating at capacity at a value of 1, the use of 0.85 allows for a margin of error and fluctuations in traffic flows. Junctions are therefore only identified as operating over capacity if these values are exceeded.

Junction Modelling Results

The results of the junction modelling are set out in the following paragraphs. To allow validation of the scenarios assessed, capacity assessments have also been carried out for the 2018 baseline scenario. The results are set out in the following sections with a copy of the outputs included at **Appendix D**.

R449 / R405 Roundabout

A capacity analysis has been undertaken and demonstrates that there is spare capacity at this junction, in all scenarios. **Table 8** below outlines the results.

Table 8 – Summary of Junction Performance

Junction Approach	Without Development				With Development			
	AM Peak		PM Peak		AM Peak		PM Peak	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
			2018 Base					
1 - R449 NE	0.16	0.2	0.68	2.1				
2 - R405 SE	0.43	0.8	0.55	1.2				
3 - R405 NW	0.13	0.1	0.26	0.4				
			2020 Opening Year					
1 - R449 NE	0.16	0.2	0.70	2.3	0.18	0.2	0.76	3.0
2 - R405 SE	0.45	0.8	0.56	1.3	0.49	0.9	0.60	1.5
3 - R405 NW	0.13	0.2	0.27	0.4	0.15	0.2	0.30	0.4
			2025 Future Year					
1 - R449 NE	0.17	0.2	0.70	2.3	0.19	0.2	0.84	4.8
2 - R405 SE	0.45	0.8	0.56	1.3	0.53	1.1	0.66	2.0
3 - R405 NW	0.14	0.2	0.27	0.4	0.17	0.2	0.34	0.5
			2035 Future Year					
1 - R449 NE	0.18	0.2	0.75	3.0	0.20	0.3	0.84	5.0
2 - R405 SE	0.48	0.9	0.60	1.5	0.53	1.1	0.67	2.0
3 - R405 NW	0.15	0.2	0.30	0.4	0.17	0.2	0.34	0.5

The results show that there are no existing capacity issues with the junction all the way to 2035 and with the development operational. The junction is currently operating within capacity and will continue to do so in the future years. Therefore, it is not considered necessary to consider mitigation at this junction.

R449 / Site Access Junction

A capacity analysis has been undertaken and demonstrates that there is considerable spare capacity at this junction, in all scenarios. **Table 9** below outlines the results.

Table 9 – Summary of Junction Performance

Junction Approach	Without Development				With Development			
	AM Peak		PM Peak		AM Peak		PM Peak	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
			2018 Base					
2 - Proposed Access N	0.00	0.0	0.00	0.0				
3 - R449 E	0.00	0.0	0.00	0.0				
			2020 Opening Year					
2 - Proposed Access N	0.00	0.0	0.00	0.0	0.13	0.2	0.06	0.1
3 - R449 E	0.00	0.0	0.00	0.0	0.09	0.1	0.03	0.0
			2025 Future Year					
2 - Proposed Access N	0.00	0.0	0.00	0.0	0.14	0.2	0.06	0.1
3 - R449 E	0.00	0.0	0.00	0.0	0.10	0.1	0.03	0.0
			2035 Future Year					

Junction Approach	Without Development				With Development			
	AM Peak		PM Peak		AM Peak		PM Peak	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
2 - Proposed Access N	0.00	0.0	0.00	0.0	0.14	0.2	0.07	0.1
3 - R449 E	0.00	0.0	0.00	0.0	0.10	0.1	0.03	0.0

The results show that the proposed junction will have minimal impact on traffic flow once operational.

6. Mobility Management

Introduction

This section will present an overview of the Mobility Management Measures for the proposed development.

Objectives

The objectives of this section are as follows:

- To discourage private car as a means of travel to and from the development;
- To increase and facilitate the number of people choosing to walk, cycle or travel by public transport to the development;
- To work with KCC, the National Transport Authority and public transport providers to support and encourage staff and visitor up take; and,
- To develop an integrated and unified public transport, private vehicle, business fleet management and suppliers of commercial services to the development.

To achieve the above targets, measures have been proposed for the specific modes of transport. These are based on existing infrastructure and public transport systems. These measures are preliminary and will be further developed in the light of ongoing monitoring as the proposed development is occupied and information becomes available on future travel behaviour of residents and staff.

It is recommended that an Action Plan Coordinator is appointed, as someone who will take ownership of implementing the measures. **Table 10** overleaf presents a list of sample measures and actions.

Table 10 – Sample Mobility Management Measures and Actions

Walking		
Sample initiatives	**Responsibility / Ownership**	**Typical timescale**
Provision of details on how to access the site on foot. Details would include safe walking routes and location of the nearest bus stops / rail station. Promote walking events / lunchtime walks for employees. Annual Team Walking Events for employees e.g. Pedometer Challenge.	The Action Plan Co-ordinator	Within 3 months of occupation.
Cycling		
Sample initiatives	**Responsibility / Ownership**	**Typical timescale**
Establish a Employee Bicycle User Group. Encourage establishment of a cycling club / society. Provision for cyclist equipment i.e. pump, allen keys, lights, puncture repairs. Display maps of local cycle network on notice boards.	The Action Plan Co-ordinator	Within 3 months of occupation.

Public Transport		
Sample initiatives	**Responsibility / Ownership**	**Typical timescale**
Provision of public transport maps and timetables in prominent locations on site. Information should be kept up to date. This information could also be available online. Provision of information to employees on savings that can be made by using Leap Card and details on where Leap Cards can be purchased. Re-advertise and promote the Tax saver monthly and annual commuter tickets for public transport to staff of the development. Include a one month trial ticket for public transport and timetable information. Display a local area map with public transport stops / route numbers marked. Publicise door-to-door multi modal journey planner website.	The Action Plan Co-ordinator	Within 3 months of occupation.
Car Sharing		
Sample initiatives	**Responsibility / Ownership**	**Typical timescale**
Encouragement of employees and visitors of the development to use other modes of travel other than private car. Where it is necessary for car use to travel to and from work, employees to be made aware of other people who are either within close proximity of their route into work. Hold a coffee morning / launch event for potential car sharers.	The Action Plan Co-ordinator	Within 3 months of occupation.
Construction Phase		
Sample initiatives	**Responsibility / Ownership**	**Typical timescale**
Provide a preliminary Construction Traffic Management Plan to provide detailed mitigation of construction traffic associated with the proposed development.	The Contractor / KCC Roads & Traffic Department	Agreed prior to construction.
Other Measures		
Sample initiatives	**Responsibility / Ownership**	**Typical timescale**
Employees to be informed of the health and fitness benefits of cycling and walking through posters and notice boards. Include travel information in employee induction packs. Distribute travel maps, leaflets and timetables, ensuring consistent accessible formats, health information for walking routes, signposting to website / apps. Provide quarterly ‘How to Travel’ newsletter via email to employees. Example parking policies to ensure access to parking for those most in need, and for those who could use alternative modes.	The Action Plan Co-ordinator	Within 3 months of occupation.

7. Construction Management Plan

This chapter of the report deals directly with the impacts of construction of the subject development. As with any construction project, the contractor will be required to prepare a comprehensive traffic management plan for the construction phase. The purpose of such a plan is to outline measures to manage the expected construction traffic activity during the construction period.

This chapter will provide an overview of the likely routing of construction vehicles, based on a most likely scenario of construction. It should be noted that the impacts of the construction will be temporary and it will be the contractor's responsibility to prepare a Construction Traffic Management Plan for approval in advance of any works.

Policy Guidance

Guidance for the temporary control of traffic at road works to facilitate the safety of the public during the works is provided below:

- Traffic Signs Manual Chapter 8 Temporary Traffic Measures and Sign Roadworks (2008);
- Addendum Transport Chapter 8, Temporary Traffic Measures and Sign Roadworks (2008); and
- Traffic Management Guidelines, Department of Transport (2003).

Likely Construction Programme / Phasing

The site as proposed would be expected to require some 16 – 18 months (approximately) to complete from occupation of the site.

Construction Route

It is recommended that construction traffic both accesses and departs the site from the M4 Junction 6 junction along the R449. This will ensure that construction vehicles travel the shortest distance from the motorway network, with minimal need to travel on local roads to access the site.

Parking

It is proposed that all construction vehicles will be accommodated within the subject site.

Mitigation Measures

A construction management plan will be developed and prepared by the contractor prior to the commencement of work on site. This will include any relevant mitigation measures to be implemented. For example, construction debris particularly site clearance, spoil removal and dirty water run off can have a significant impact on footpaths and roads adjoining a construction site if not adequately dealt with.

Hours of Operation

Site development and building works shall be carried out between the hours of operation suggested below. The typical hours of operation are as follows, to be confirmed with Kildare County Council:

- Monday to Friday: 08:00 – 19:00;
- Saturdays: 08:00 – 15:00; and
- Sundays or public holidays: No works.

Traffic Management Measures

Below is a list of the proposed traffic management measures to be adopted during the construction works. Please note that this is not an exhaustive list, and that it will be the appointed contractor's responsibility to prepare a detailed construction management plan.

- Warning signs / Advanced warning signs will be installed at appropriate locations in advance of the construction access locations;
- Construction and delivery vehicles will be instructed to use only the approved and agreed means of access; and movement of construction vehicles will be restricted to these designated routes;
- Appropriate vehicles will be used to minimise environmental impacts from transporting construction material, for example the use of dust covers on trucks carrying dust producing material;
- Speed limits of construction vehicles to be managed by appropriate signage, to promote low vehicular speeds within the site;
- Parking of site vehicles will be managed and will not be permitted on public road, unless proposed within a designated area that is subject to traffic management measures;
- A road sweeper will be employed to clean the public roads adjacent to the site of any residual debris that may be deposited on the public roads leading away from the construction works;
- On site wheel washing will be undertaken for construction trucks and vehicles to remove any debris prior to leaving the site, to remove any potential debris on the local roads;
- All vehicles will be suitably serviced and maintained to avoid any leaks or spillage of oil, petrol or diesel. Spill kits will be available on site. All scheduled maintenance carried out off-site will not be carried out on the public highway; and
- Safe and secure pedestrian facilities are to be provided where construction works obscure any existing pedestrian footways. Alternative pedestrian facilities will be provided in these instances, supported by physical barriers to segregate traffic and pedestrian movements, and to be identified by appropriate signage. Pedestrian facilities will cater for vulnerable users including mobility impaired persons.

The mitigation measures will therefore ensure that the presence of construction traffic will minimise any significant environmental degradation or safety concerns in the vicinity of the proposed works. Furthermore, it is in the interests of the construction programme that deliveries, particularly concrete deliveries are not unduly hampered by traffic congestion, and as a result continuous review of haulage routes, delivery timings and access arrangements will be undertaken as construction progresses to ensure smooth operation.

8. Summary and Conclusions

Summary

This report has been prepared for Kildare County Council to present the findings of a Traffic and Transport Assessment (TTA) undertaken to accompany the planning application for the development of land adjacent to the R449 in Celbridge, County Kildare.

The proposed development will be a Civic Amenity Centre, 1ha in size, serving northern County Kildare. Access to the proposed development will be via a new priority junction on the R449, with on-site parking provision.

The principal findings of the Assessment are summarised in the following paragraphs.

It has been demonstrated that the proposed development is compliant with relevant national, county and local transport policies, through the preparation of this document.

A review of the existing conditions in the vicinity of the proposed development confirms that the site is well situated, adjacent to the R449 and between the existing towns of Celbridge, Maynooth and Leixlip, as well as being near to West Dublin. It is situated just off the motorway system; with access onto the M4 approximately 300 metres to the northeast, via Junction 6. The nearest bus stop is approximately 1.1km from the site, located on the R405, with services into Celbridge and onwards to Dublin.

Accident data was obtained from the Road Safety Authority for the last 10 year period up to the end of 2014 which illustrates that four collisions have occurred within the study area, with one fatal collision. The data suggests that there are no existing safety issues which are likely to be exacerbated by the proposed development.

Access to the site for all modes will be provided via a priority junction on the R449. There will be a footway into the site provided and there will be provision for 7 car parking spaces.

In order to determine the level of trips generated by the proposed development, the Trip Rate Information Computer System (TRICS) database has been utilised. This identified that 116 two-way vehicular trips would occur in the AM peak, and 36 two-way vehicular trips would occur in the PM peak.

Traffic data was gathered at the M4 Junction 6 Five-arm roundabout and the R449 / R405 Three-arm roundabout. A percentage increase assessment was then undertaken for these junctions. Base scenarios and With Development scenarios were created and compared for the years of 2020, 2025, and 2035.

The results of the assessment confirm that there would not be an increase of 10% at either of the junctions. However, for robustness, a capacity assessment for the R449 / R405 Three-arm roundabout has been carried out, along with the R449 / Site Access Priority Junction.

The modelling results illustrate that the R449 / R405 Three-arm roundabout and the R449 / Site Access Priority Junction both operate within capacity in all modelled scenarios, and therefore no mitigation measures are required.

Conclusions

In conclusion, it is considered that the impact of the development is acceptable and therefore it is considered that Kildare County Council should be able to provide a positive recommendation for approval of the application.

Appendix A – Pre-application Scoping

From: George Willoughby <gwilloug@kildarecoco.ie>

Sent: 14 September 2018 16:41

To: Kennedy, Mary E.

Cc: Siobhan O'Dwyer

Subject: Re: Scope of transportation assessment - Kildare Civic Amenity Centre

Follow Up Flag: Follow up

Flag Status: Flagged

Mary,

I wish to confirm that the KCC Roads Section has no objection to the scope of the TTA as submitted.

Regards,

George

George Willoughby
BA/BAI CEng MIEI
Chartered Engineer
Senior Executive Engineer
Kildare County Council
Roads, Transportation & Public Safety Department

From: "Kennedy, Mary E." <MaryE.Kennedy@aecom.com>
To: "gwilloughby@kildarecoco.ie" <gwilloughby@kildarecoco.ie>
Date: 17/08/2018 17:04
Subject: Scope of transportation assessment - Kildare Civic Amenity Centre

Hi George,

Hope you are well.

By way of an introduction, I work with AECOM; we have been engaged by Donnachadh O'Brien Engineers to provide transportation assistance for a planning submission for a proposed Civic Amenity Centre at Celbridge, Co. Kildare, on land to the north of the R449 in Celbridge, Co. Kildare. In order to assess the impact of the proposed development, AECOM will prepare a Traffic and Transport Assessment (TTA).

The information set out below identifies the scope of the TTA proposed and we would be grateful for any queries or comments which you may have.

We understand that comprehensive pre-application consultation has been undertaken separate by Donnachadh O'Brien also.

Existing conditions

The site located to the north of the R449 is currently undeveloped and therefore is assumed not to generate any trips.

A review of the existing conditions, including pedestrian and cyclist facilities, public transport user facilities, the highway network and the development site will be set out. Public transport facilities including nearby bus stops and services will be reviewed and discussed. Any potential / committed infrastructure will also be set out.

An initial review of accident data available from the Road Safety Authority's online map shows that four collisions took place between 2005 and 2014 on the R449 in the vicinity of the site. The findings of this review will be further set out in the TTA.

In order to establish existing traffic conditions, traffic count data has been sourced from publicly available previously submitted Traffic and Transport Assessments for separate developments in the vicinity of the site – namely, Intel development applications. Traffic data has been sourced for the following junctions, and has been growthed up to a 2018 baseline:

- M4 Junction 6 Five-arm Roundabout; and,
- R449 / R405 Three-arm Roundabout

Proposed Development

The development proposals comprise the provision of a Civic Amenity Centre of approximately 1 hectare on land off the R449 in Celbridge, Co. Kildare. The operational details of the development will be detailed within the TTA.

A total of 7 car parking spaces are proposed. Further detail on the car and cycle parking will be included in the TTA.

Access to the development is proposed from the southern boundary, via a new priority junction on the R449. The access proposals will be described within the TTA and a swept path assessment of the access and the internal layout for servicing vehicles and a fire tender will be carried out to ensure that vehicles can enter, manoeuvre within and exit the site without conflict.

Trip Generation

In order to establish the level of trips the development is likely to generate, an indepth review of the Trip Rate Information Computer System (TRICS) database version 7.5.2 has been carried out, as well as a high level review of data from peer sites in Dublin and Kildare. This identified that the greatest number of trips would occur during the off-peak when background traffic movements are lower.

The level of trips generated by the proposed development has been compared to the TII thresholds for junction assessments, i.e. '*Traffic to and from the development exceeds 10% of the traffic flow on the adjoining road*.'

Trip distribution and traffic growth will be set out in the TTA. The trip distribution is proposed to be developed from the population centres identified as being serviced by the proposed Civic Amenity Centre. This identifies that the majority of trips are generated to/from the east where the majority of the population catchment is located.

Development Impact

From our initial assessment, it is identified that the percentage impact does not trigger junction modelling when compared to TII thresholds, however, for robustness, a Junctions 9 model has been prepared for the site access priority junction and for the R449 / R405 Roundabout. These identify that these junctions operates within theoretical capacity through to future year 2035.

As mentioned, if you have any comments on the above scope, we would be delighted to discuss.

Kindest regards,

Mary Kennedy, BE CEng MIEI MCIHT
Principal Consultant, Transportation, Ireland
D +353-021-436-5006
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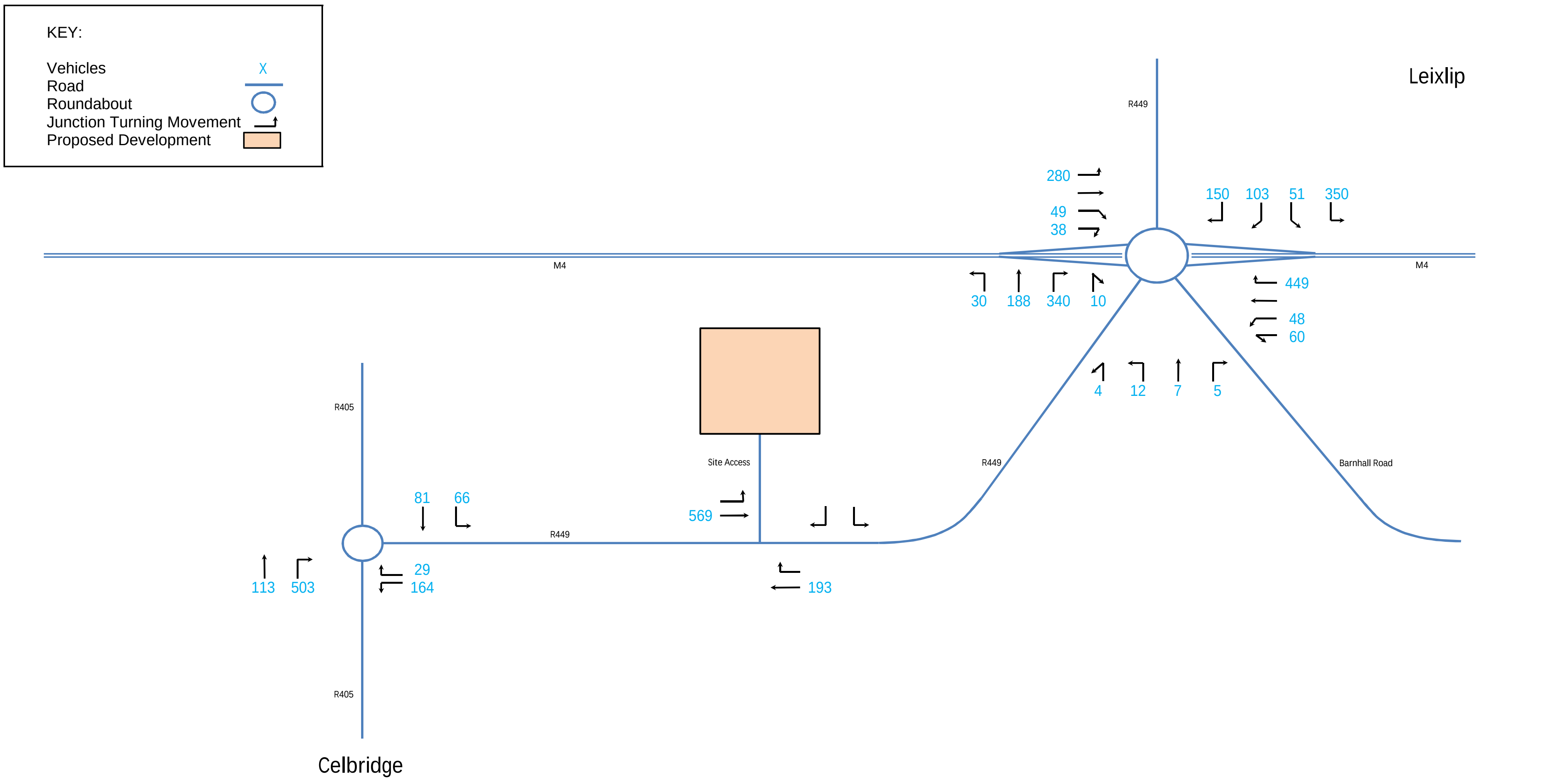
Appendix B – Flow Diagrams



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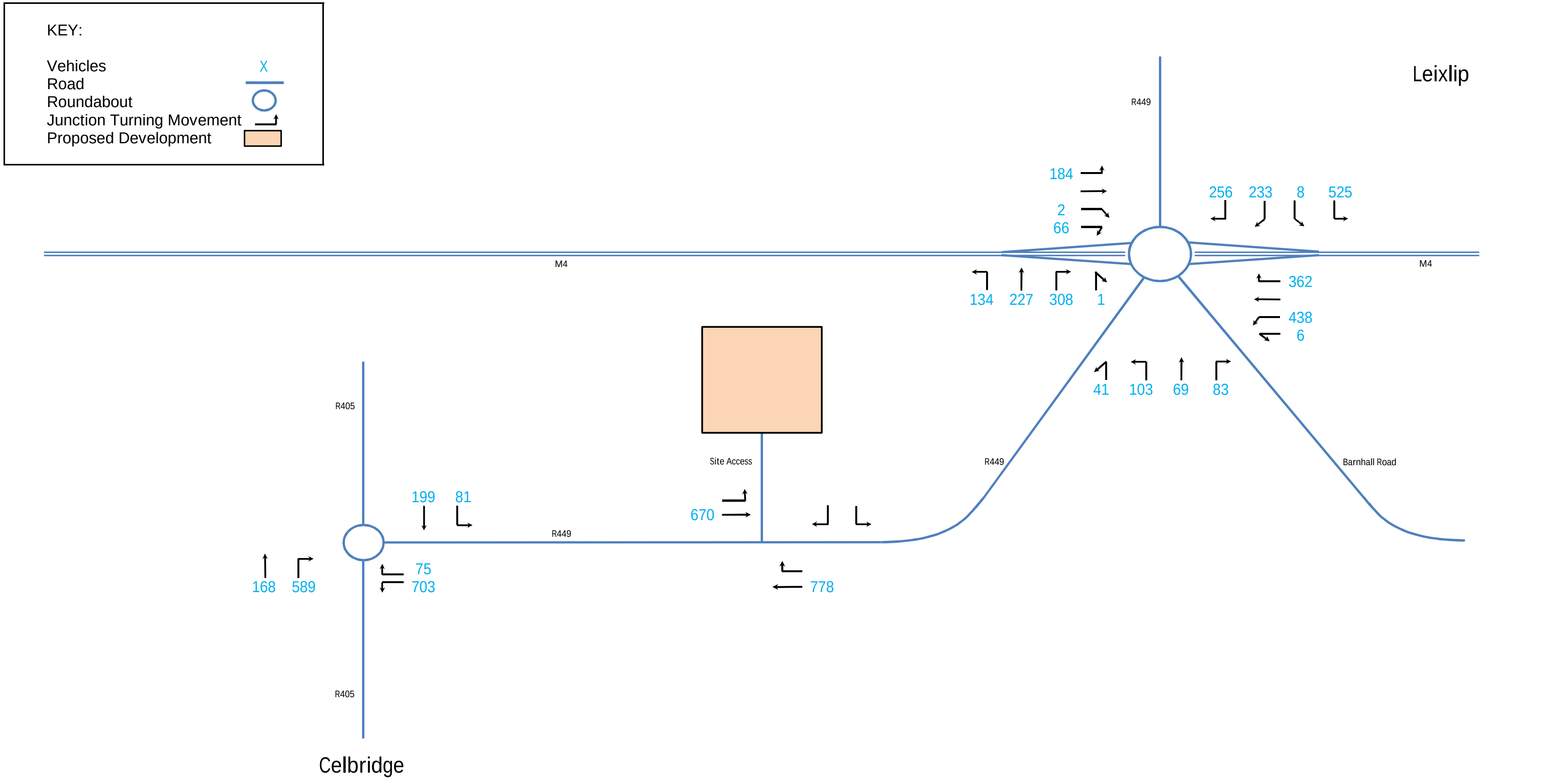

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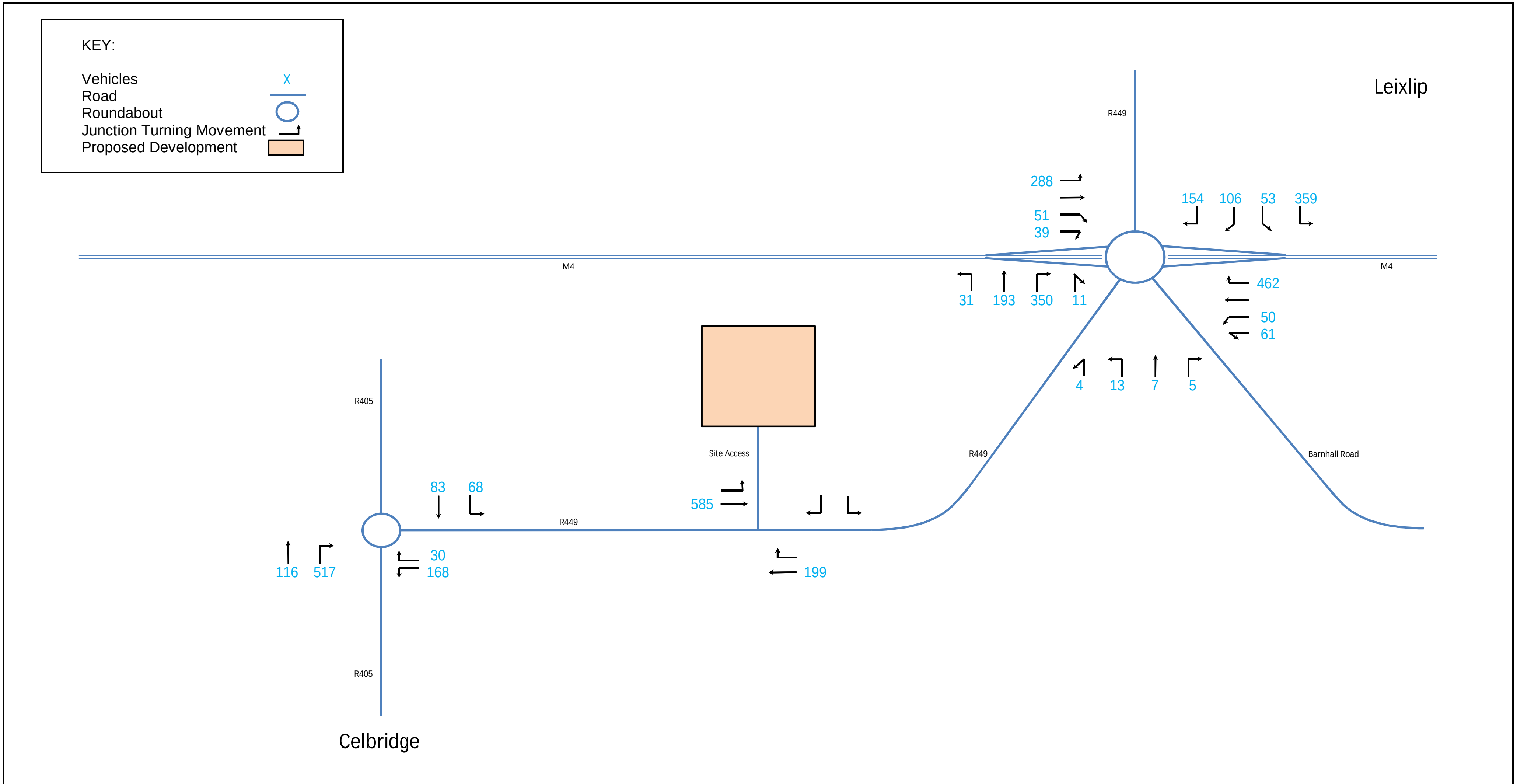

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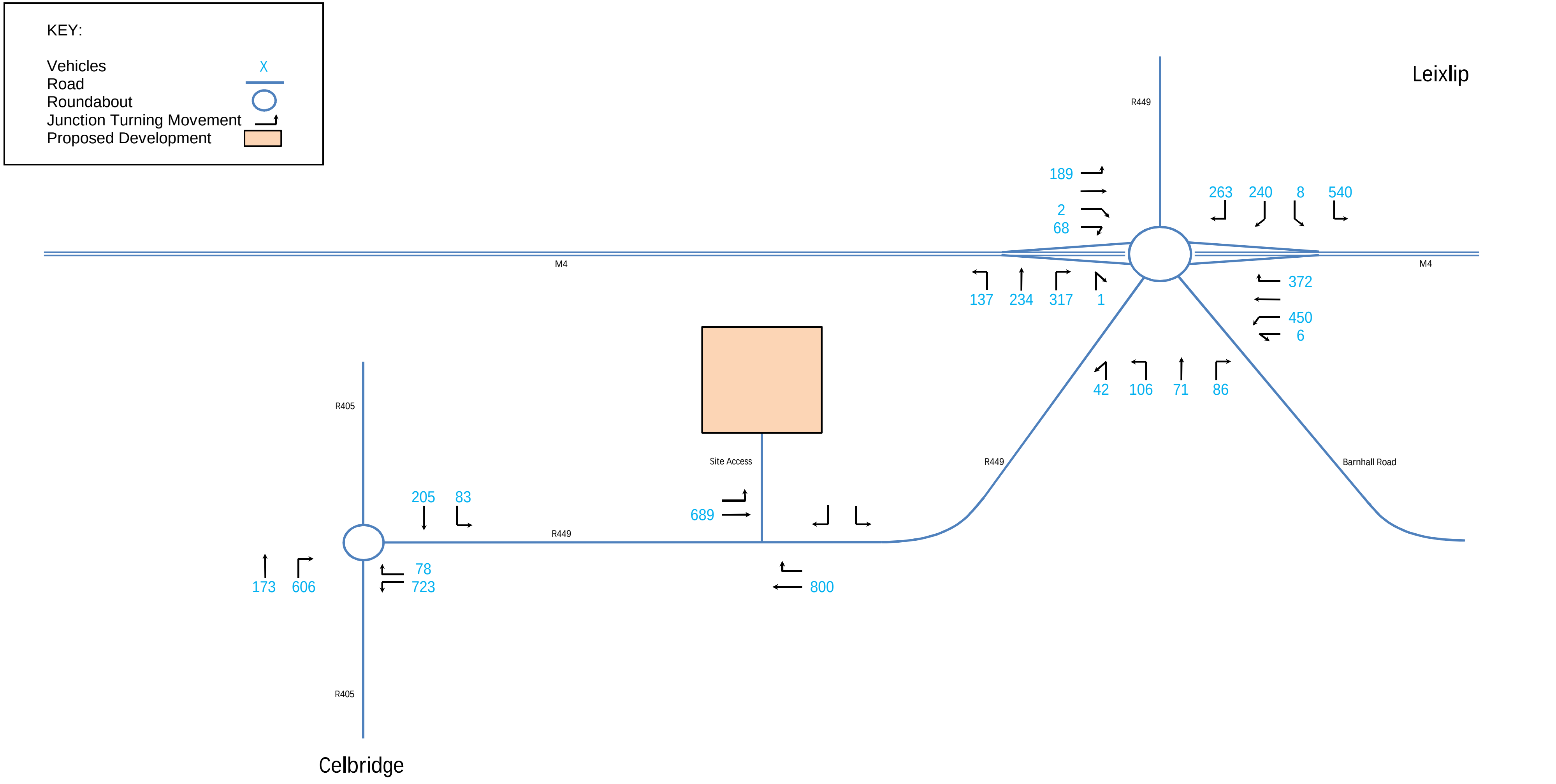

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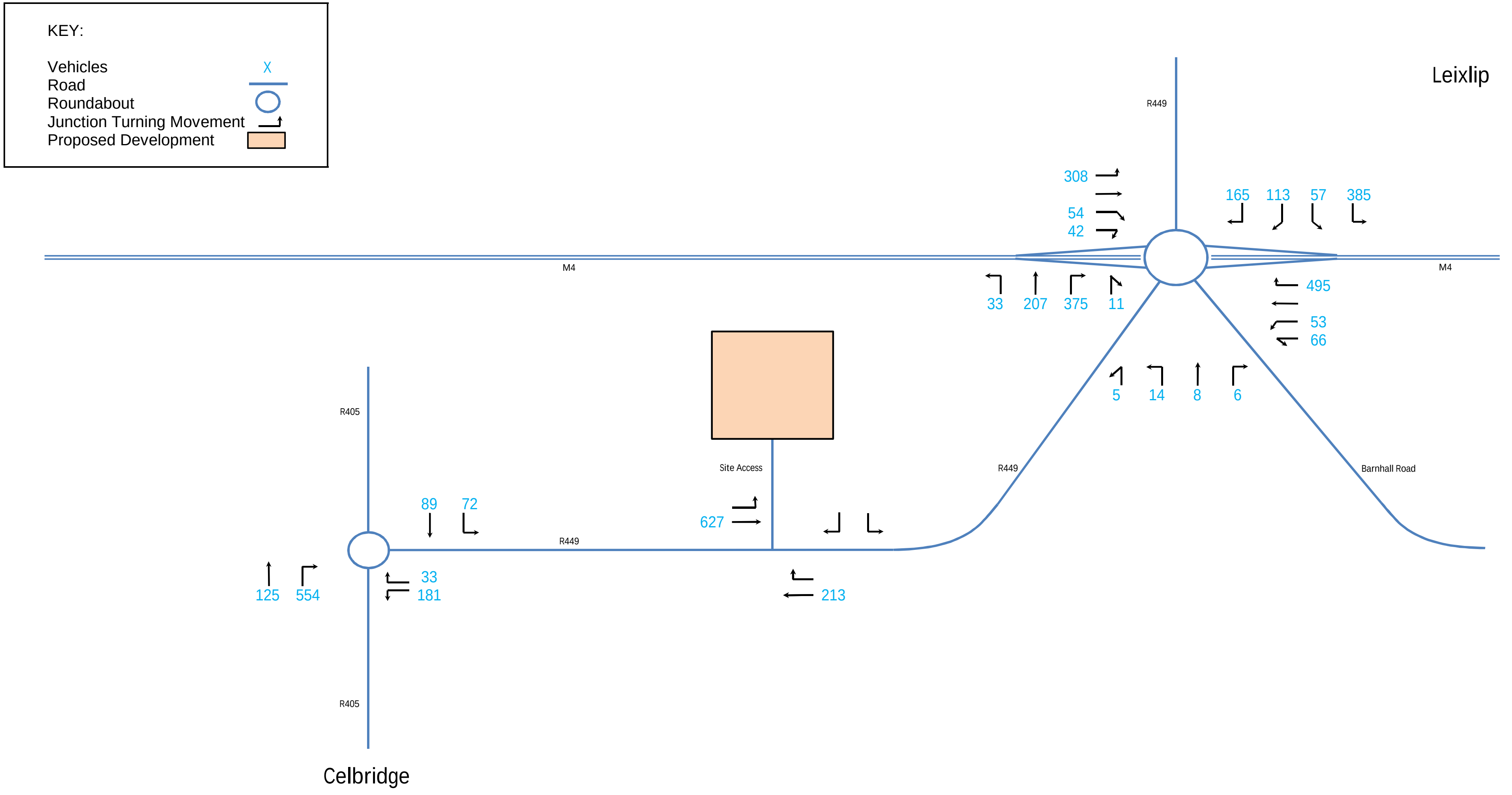

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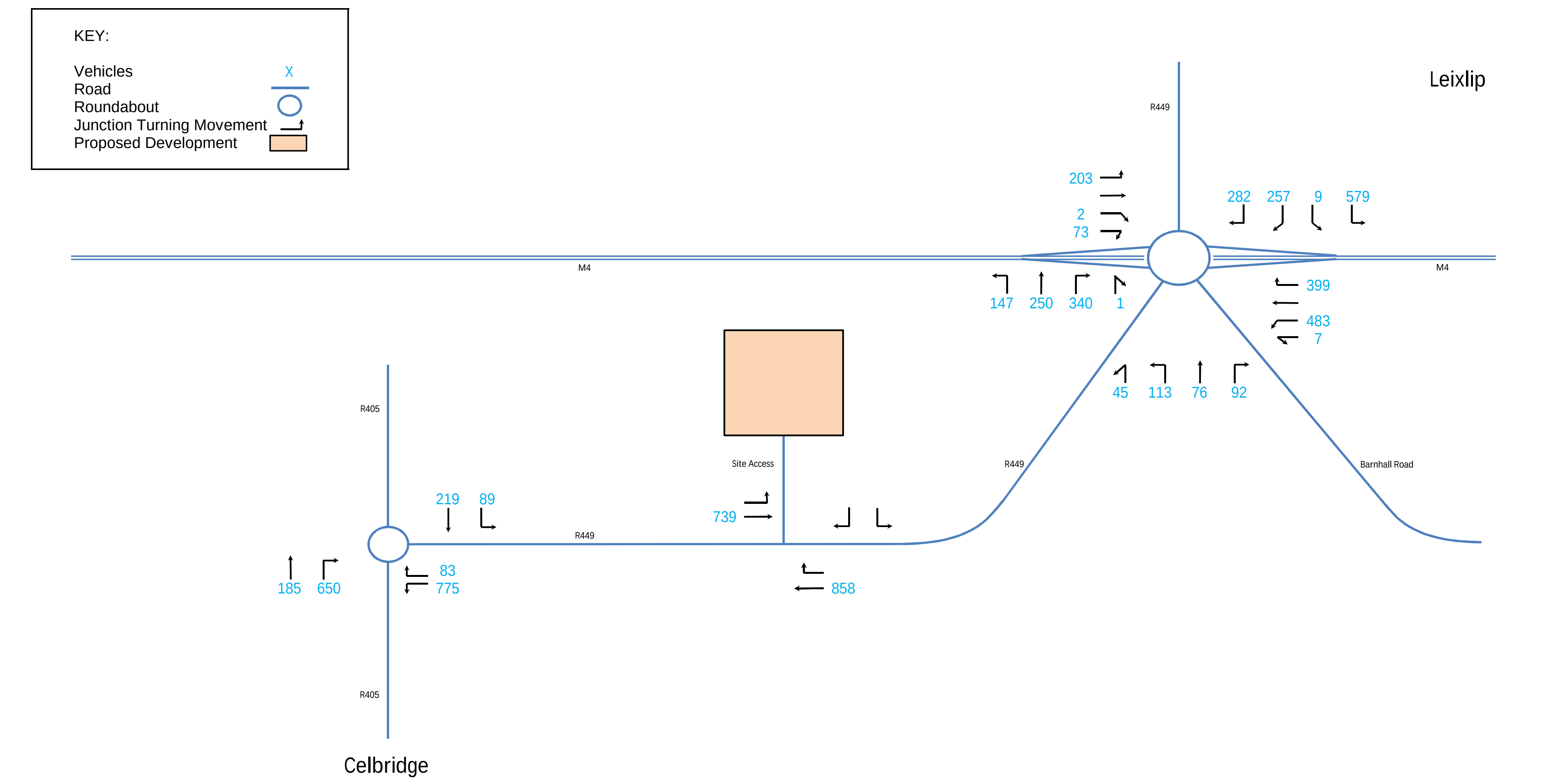

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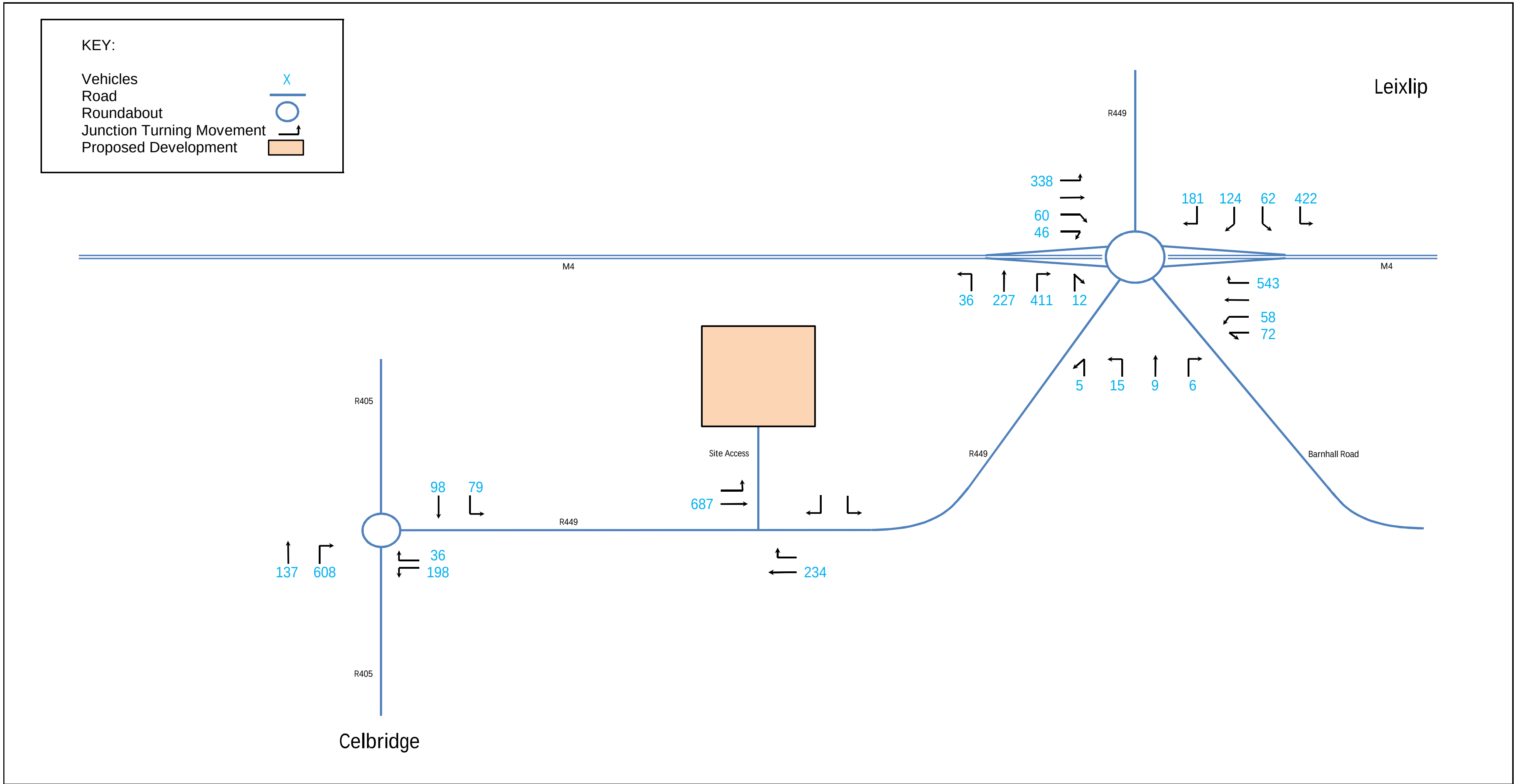

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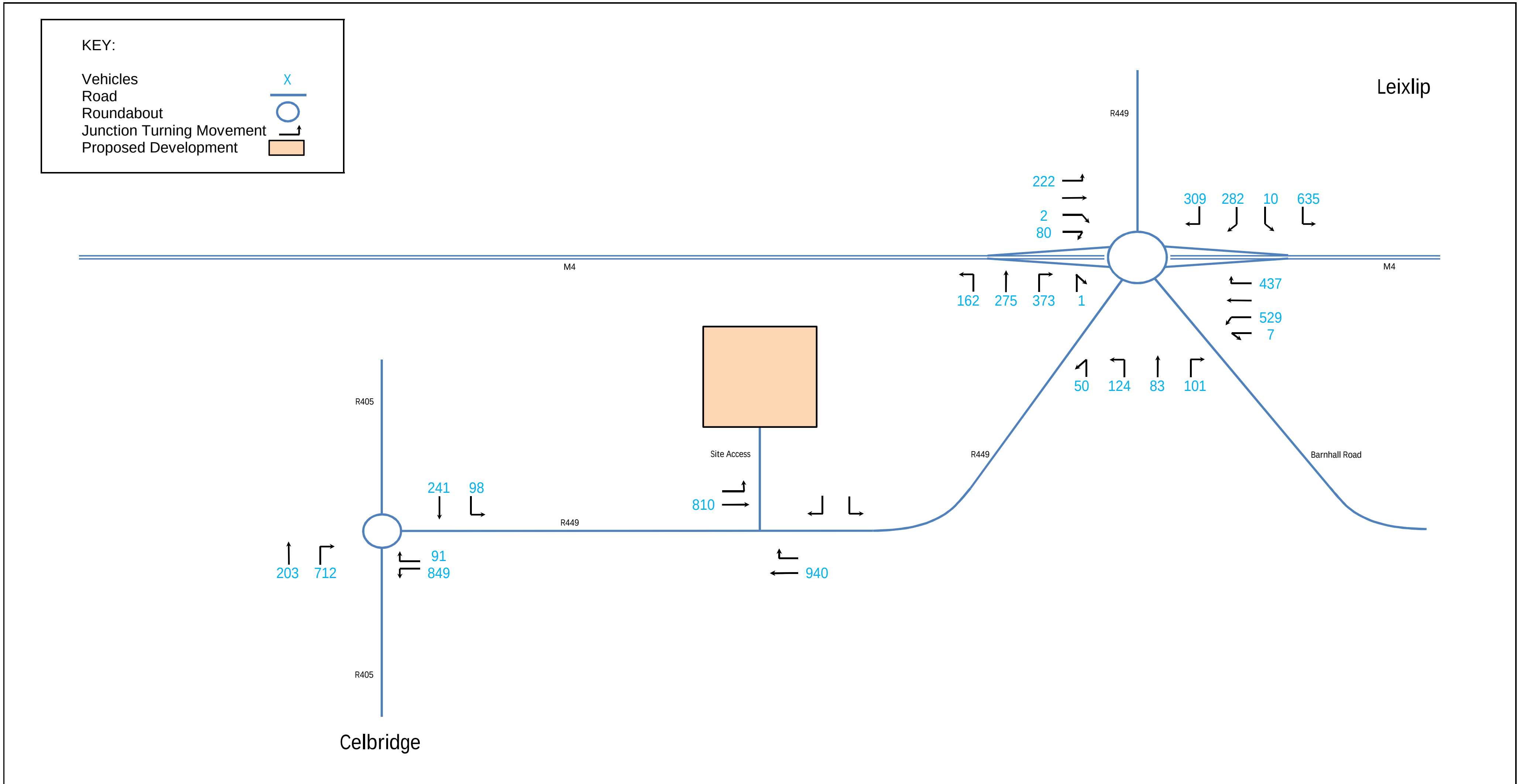

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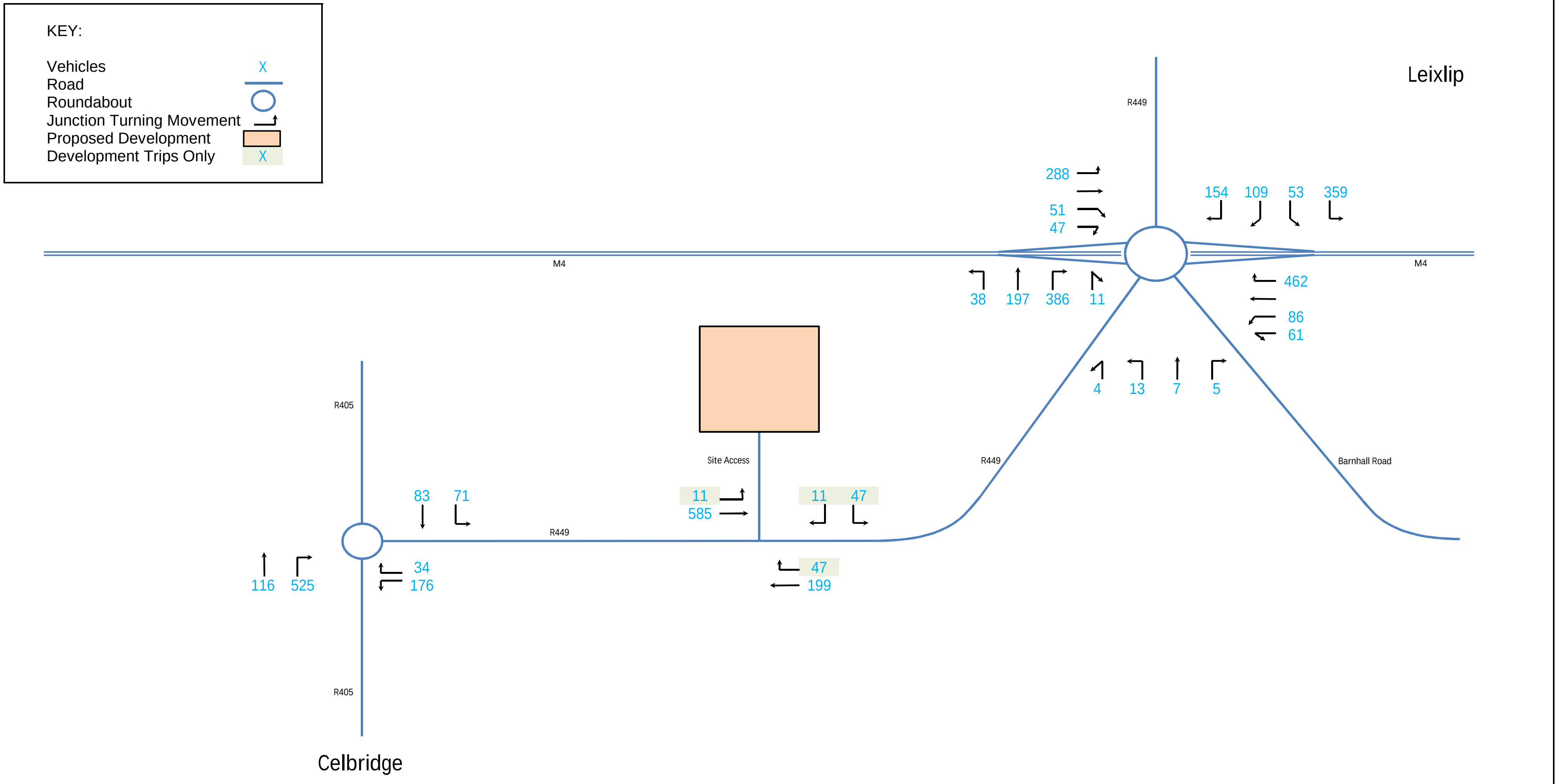

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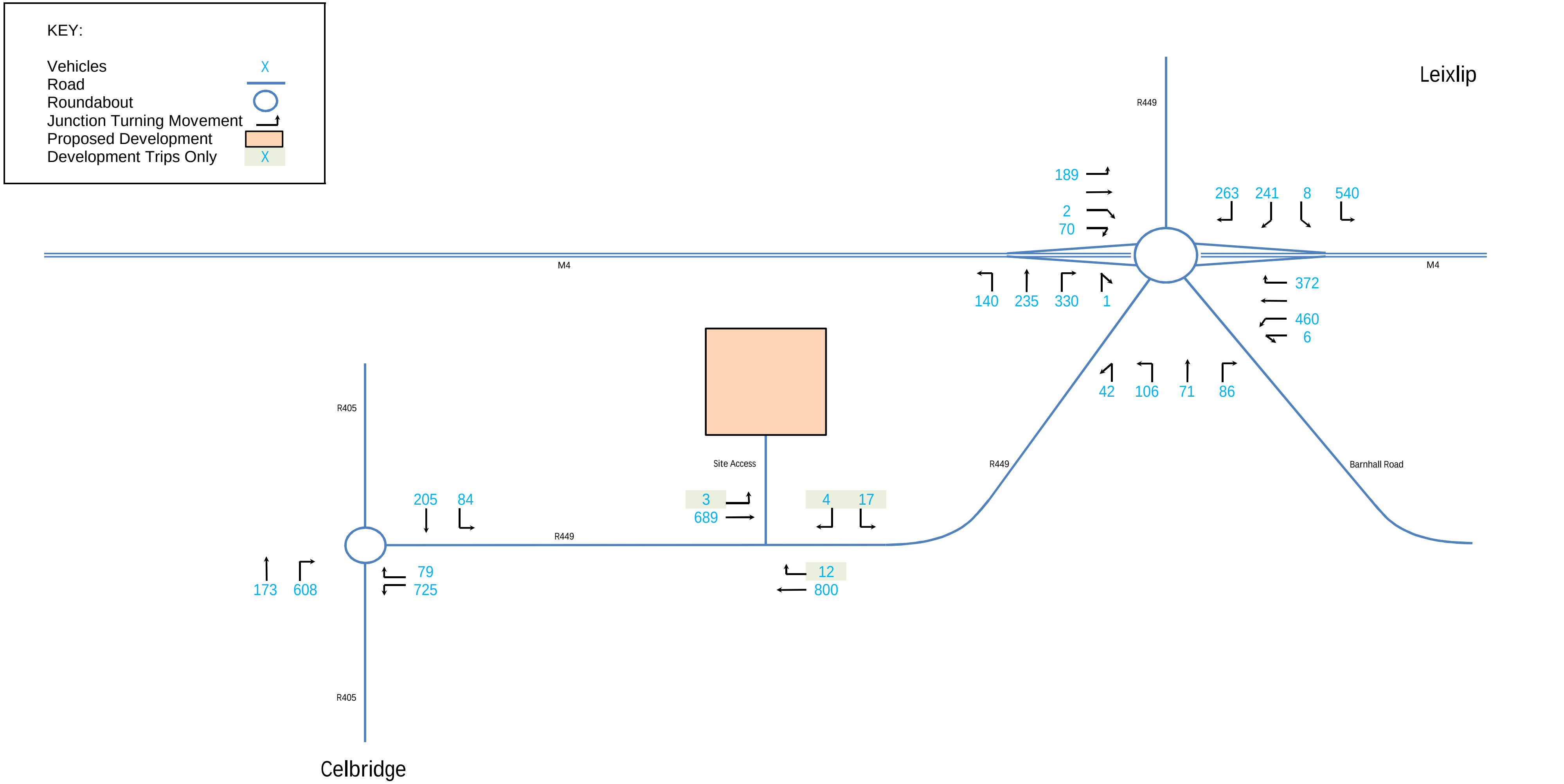

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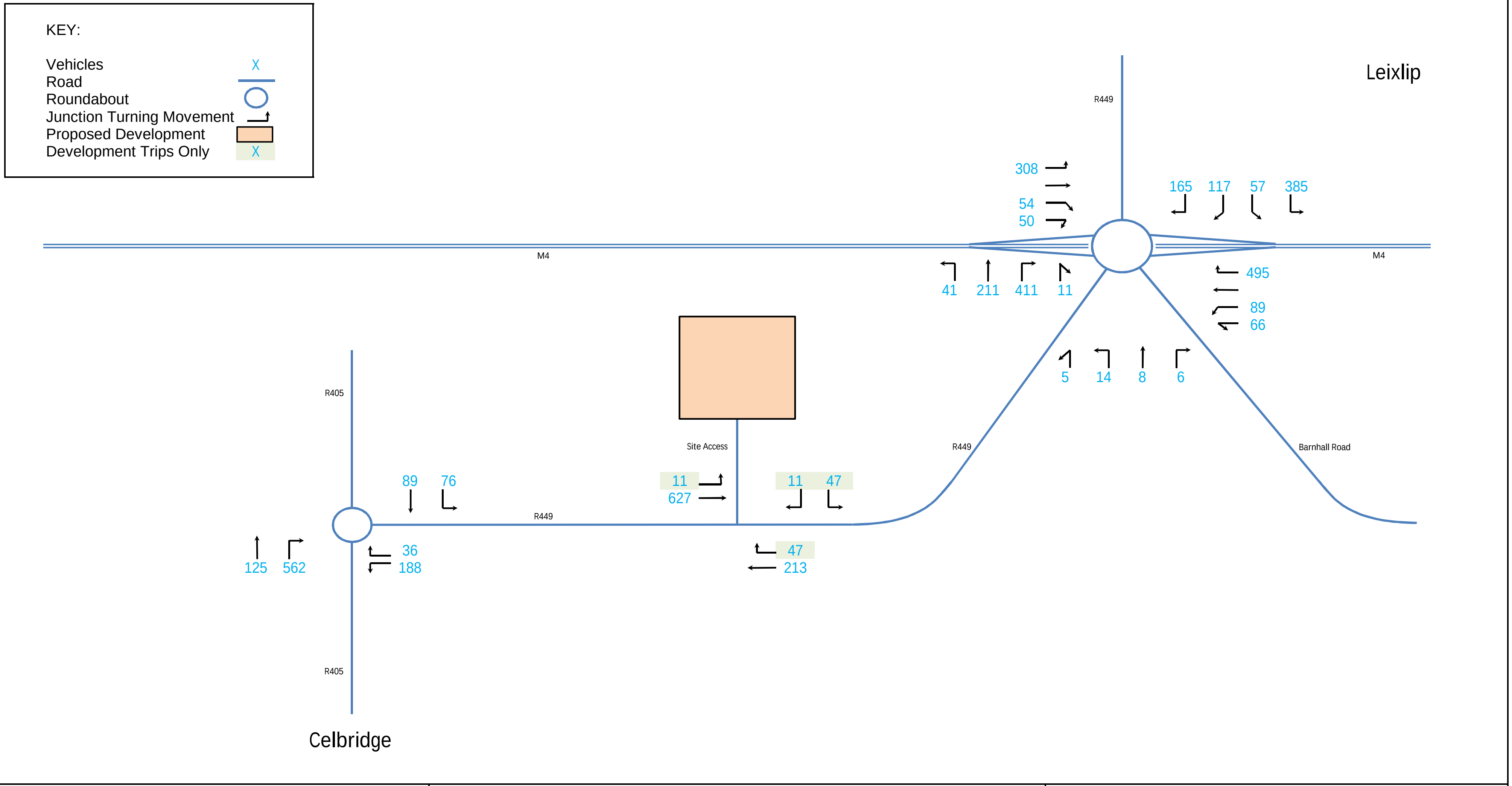

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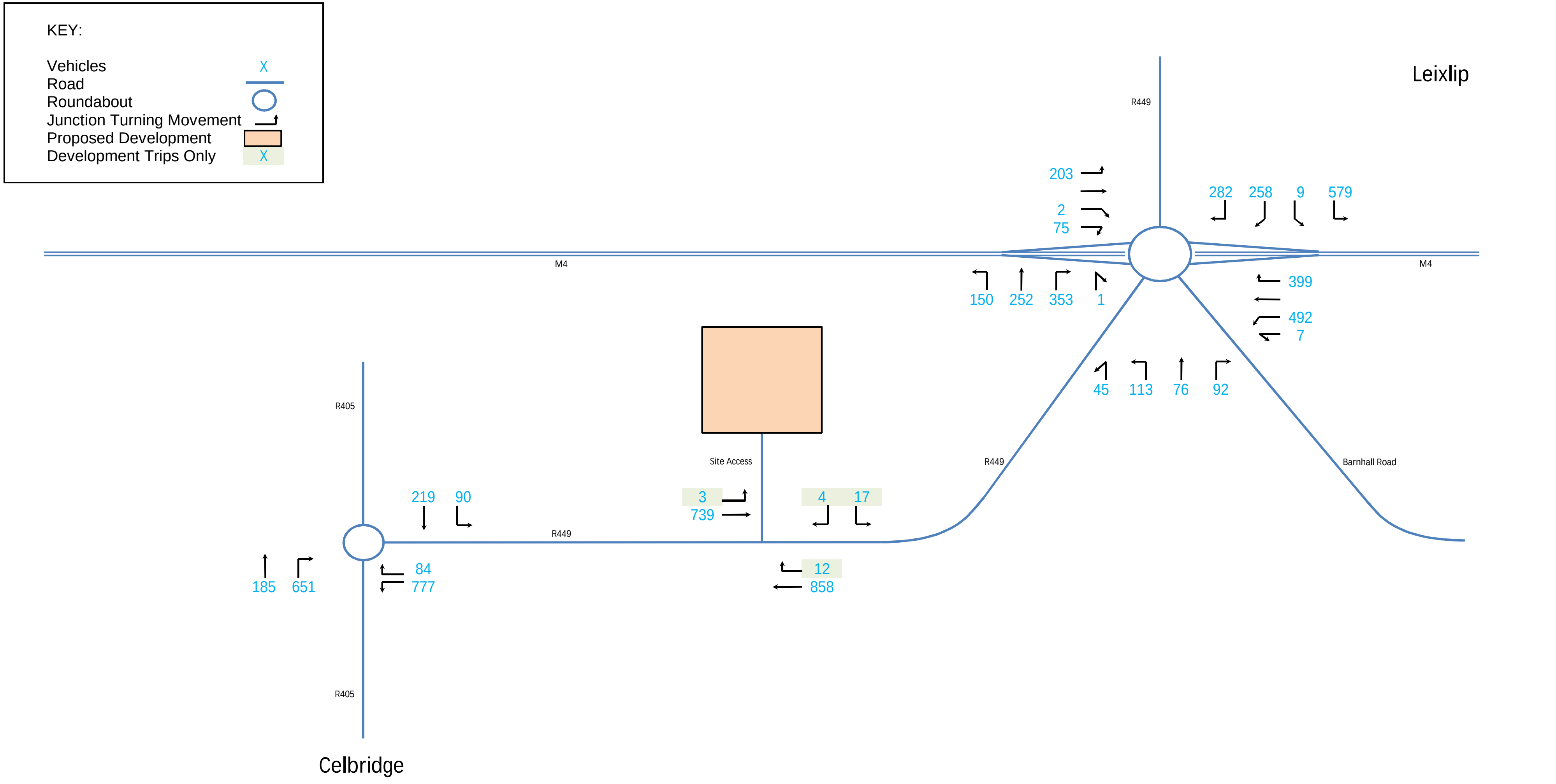

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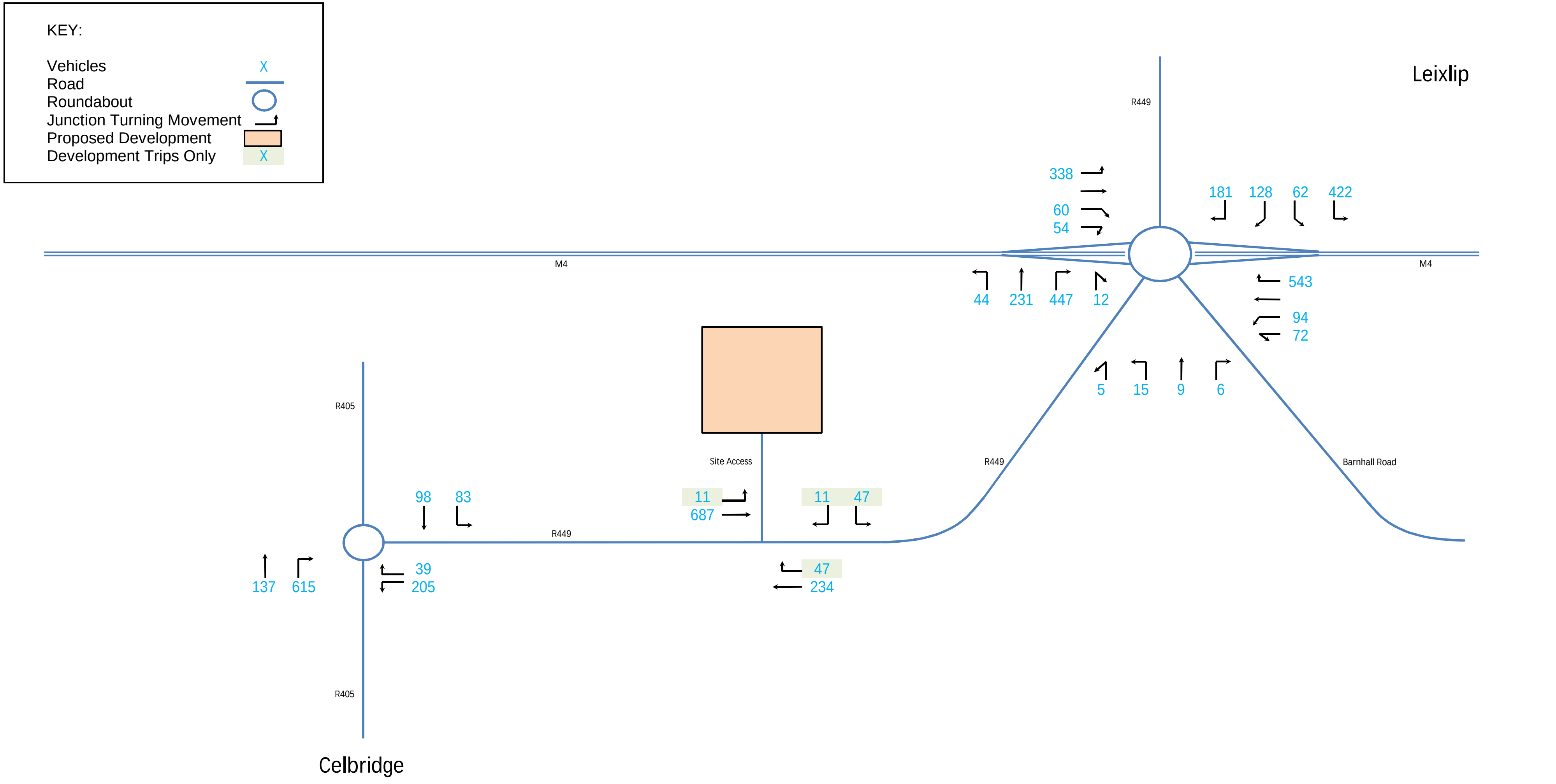

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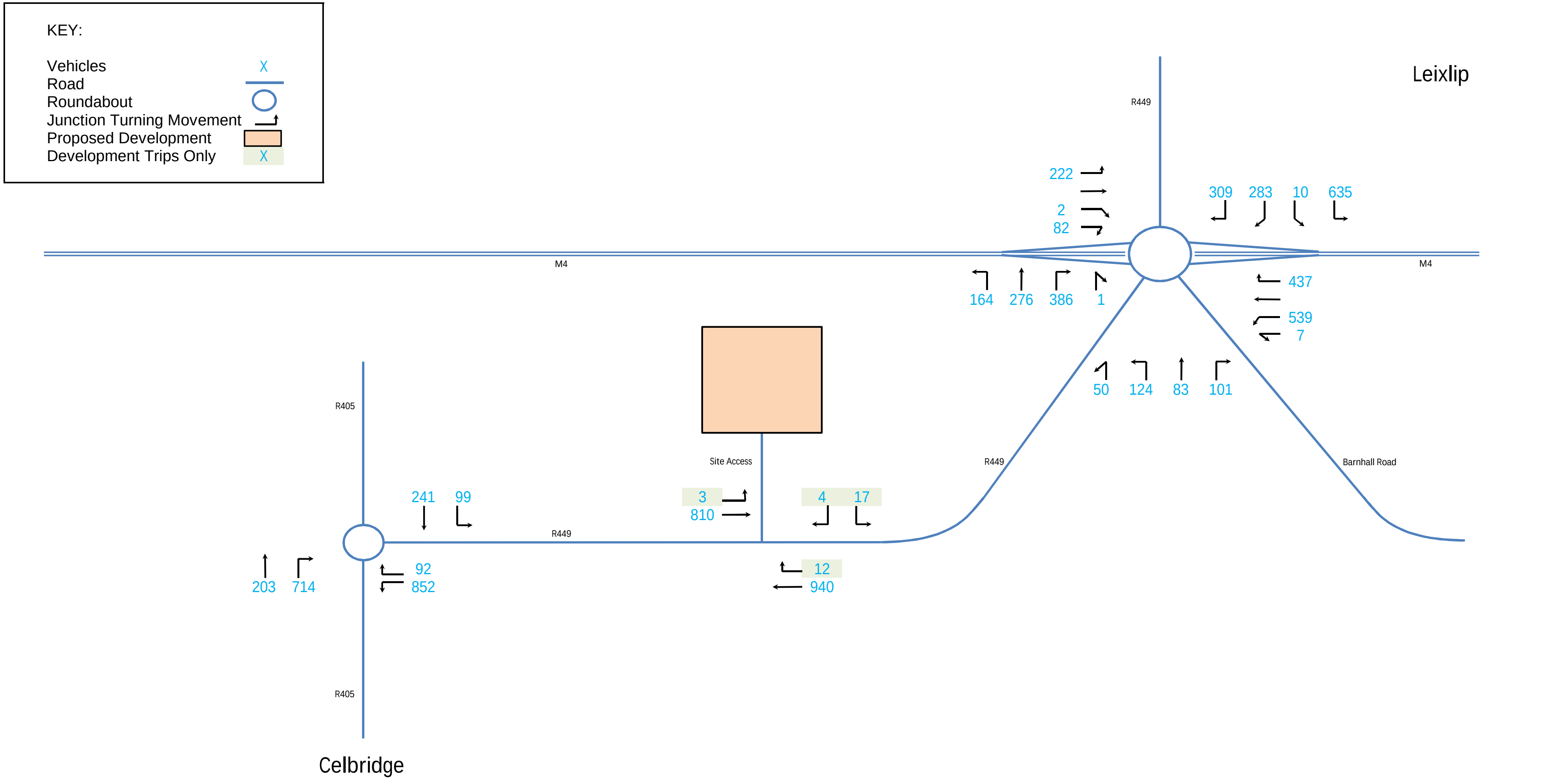

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Kildare County Council	2035 With Dev PM	TJ	GW	08/08/2018	14

Appendix C – Trip Generation Technical Note

DRAFT

AECOM

Proposed Celbridge Civic Amenity Centre

Trip Generation Technical Note

August 2018

Quality information

Prepared by	Checked by	Approved by
Justin McHenry	Brian McMahon	Brian McMahon

Revision History

Revision	Revision date	Details	Authorized	Name	Position

Distribution List

# Hard Copies	PDF Required	Association / Company Name

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Table of Contents

Figures

Tables

1. Introduction

This Technical Note has been prepared to assess the potential trip generation for the proposed Celbridge Civic Amenity Centre. The proposed site is to be one hectare in size and accommodate between 5,000 and 7,500 tonnes of waste per year. The proposed site is located on the R449, a link road between the R405 in Celbridge and the R148 in Leixlip which passes via the M4 motorway interchange. The site is approximately 406m from the M4 Business Park and 312m from the M4 interchange, as illustrated by Figure 1.

Figure 1: Proposed Site Location

2. Site Details

The site is expected to deal with between 5,000 and 7,500 tonnes of waste per year. The main catchment areas are to include the local towns of: Kilcock, Maynooth, Leixlip, Celbridge and Clane, with a total combined population of 76,800, and the adjacent areas of Lucan and Palmerstown, with an approximate population of 100,000, as illustrated by Figure 2.

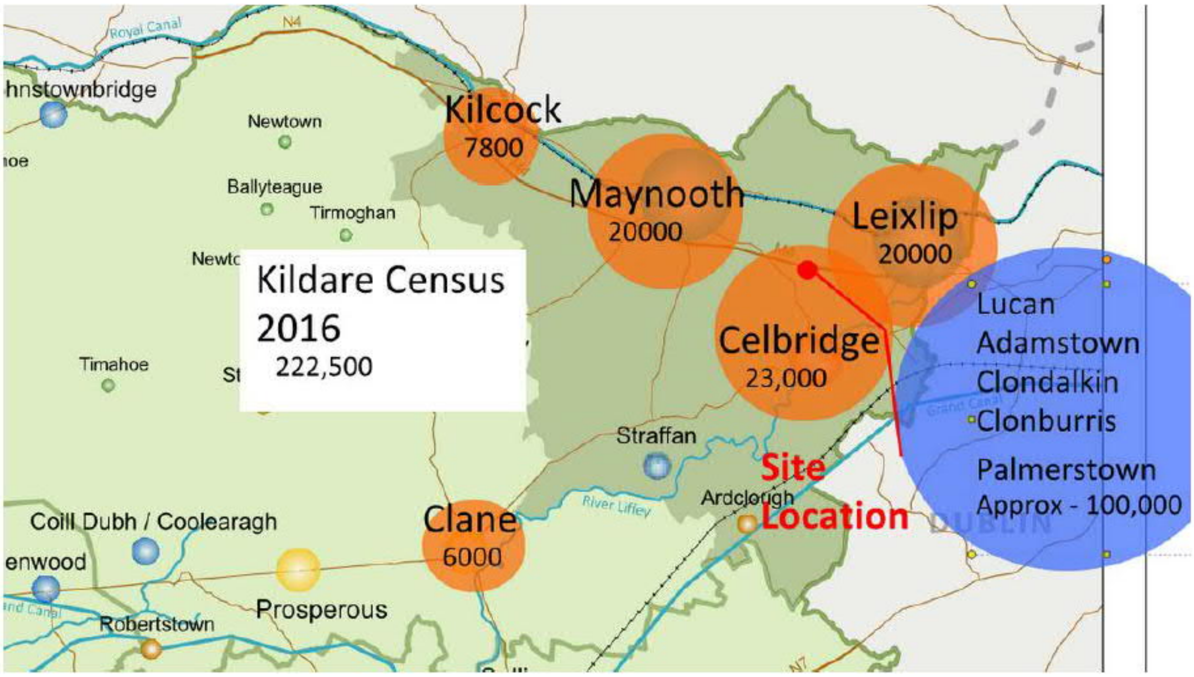

Figure 2: Catchment Area

The Civic Amenity Centre will cater for all waste streams including municipal waste. It is expected that municipal waste will account for some 58% of the waste stream at the Celbridge site. The site is approximately one hectare in size.

3. Purpose of Technical Note and Methodology

The following sections provide a Technical Note to assess the potential trip generation predicted by the Celbridge Civic Amenity Centre. The methodology used for the assessment of trip generation involved using the industry standard TRIC's database analysis. TRIC's was used in order to gain a range of comparable similar sites across Ireland and the United Kingdom. The results are presented in Sections 5, 6, 7 and 8 with a summary in Section 9.

Following appropriate filtering in terms of: site size, location and weekday counts, the TRIC's database presented six sites for comparison: Blackburn, Cheshire, Worchester, Edinburgh, Leeds and Limerick. Additionally, the daily traffic counts (daily total number of arrivals and departures) was analysed for a site in Ballyogan, within the Dun Laoghaire- Rathdown County Council district, for further comparison at local scale. A background to each site is presented in Section 4.

4. Background to Analysis Sites

4.1 Blackburn- TRICS Site Number: LC-12-A-04

This site is located in an area to the west of Blackburn Town Centre. It serves a population catchment of between 125,001 to 250,000 people within a 5 mile radius.

The site is approximately 0.41 hect and is located in a built-up area of industrial and retail development, with residential streets a bit further to the north and various town centre development further to the east. The site has 21 bays for waste stream loading. The site location is illustrated on Figure 3.

Figure 3: Blackburn Site Location

Materials disposed of at this site include the following:

- Aluminium foil, batteries, bicycles, books, bulky items, cans, car batteries, cardboard, ceramics, cooking oil, electrical goods, fluorescent light bulbs, fridges and freezers, furniture, garden waste, glass, hard plastics, hardcore and rubble, paint, paper, plastic bottles, printer cartridges, soil, fences and wood, scrap metal, shoes, sand, tetrapak cartons, textiles, tins, TV's and monitors, tyres, used engine oil, washing machines, dryers, dishwashers, white goods, timber, and yellow pages[1].
- The site disposes of municipal waste- requires permit[2].

[1] Source: TRICS Database
[2] Source: Blackburn with Darwen Council Website: https://blackburn.gov.uk/Pages/Household-waste-and-recycling-centres-permit-terms-and-conditions.aspx

4.2 Cheshire- TRICS Site Number: CH-12-A-01

This site is located in the west of Chester, within the Sealand Industrial Estate area. The site is approximately 0.3 hect with 16 bays for waste disposal. It serves a population catchment of between 125,001 to 250,000 people within a 5 mile radius.

Chester City Football Club is located next to the site, with various industrial developments nearby. There is open land to the south and further to the west. The site location is illustrated on Figure 4.

Figure 4: Cheshire Site Location

Materials disposed of at this site include the following:

- Electrical equipment, plastics, furniture, garden waste, paper, oil, rubble and soil, wood, textiles, batteries, small and large domestic appliances, metal, fluorescent tubes, cans, cardboard and books[3].
- The site disposes of municipal waste[4].

[3] Source: TRICS Database
[4] Source: Cheshire West and Chester Council Website: https://www.cheshirewestandchester.gov.uk/residents/waste-and-recycling/find-a-recycling-centre/Chester%20Recycling%20Centre.aspx

4.3 Worchester - TRICS Site Number: WO-12-A-02

Worchester Civic Amenity Site is located on Horsford Road, Worchester in a suburban area, outside of the Town Centre. It serves a population catchment of between 100,001 and 125,000 people within 5 mile radius and is a 0.52 hect site with 20 waste bays. The site location is illustrated on Figure 5.

Figure 5: Worchester Site Location

Materials disposed of at this site include the following:

- Asbestos, Small Batteries, Books, CDs and DVDs, Cans, Automobile Batteries, Cardboard, Chemicals, Textiles and Shoes, Engine Oil, Fluorescent Tubes, Foil, Fridges and Freezers, Garden Waste, Glass, Low Energy Bulbs, Mobile Phones, Paper, Plastics, Printer Cartridges, Scrap Metal, Soil and Rubble, Televisions, Tyres, Small Electrical Appliances, Wood, General Waste, Gas Bottles[5].
- This site disposes of municipal waste[6]

[5] Source: TRICS Database
[6] Source: Worchesterhire Council Website: http://www.worcestershire.gov.uk/letswasteless/directory_record/4/hallow_road

4.4 Edinburgh- TRICS Site Number: EB-12-A-02

The site is on the edge of Edinburgh and is near the A900 which leads into central Edinburgh. It is approximately 0.62 hect, with 38 bays for waste traffic, and serves a catchment of between 250,001 to 500,000 people within a 5 mile radius. The site location is illustrated on Figure 6.

Figure 6: Edinburgh Site Location

Materials disposed of at this site include the following:

- Books, CD's, DVD's, Videos, Car Batteries, Cardboard, Engine Oil, Fridges, Glass, Green waste, Paper, rubble/Bricks, Scrap metal and Electronic Equipment[7].
- The site disposes of municipal waste[8].

[7] Source: TRICS Database
[8] Source: Edinburgh Council Website:
http://www.edinburgh.gov.uk/info/20001/bins_and_recycling/1611/household_waste_recycling_centre_rules_and_access/1
http://www.edinburgh.gov.uk/info/20001/bins_and_recycling/1610/household_waste_recycling_centres/1

4.5 Leeds- TRICS Site Number: WY-12-A-01

This site is located at the north-eastern edge of Leeds, with local routes heading towards various parts of the city and out into the countryside. The site is within an industrial area, with residential streets to the south and west and is approximately 0.73 hect in size. There are 18 waste loading bays and the site serves a population catchment of between 250,001 and 500,000 people within a 5 mile radius. The site location is illustrated on Figure 7.

Figure 7: Leeds Site Location

Materials disposed of at this site include the following:

- Paper, glass, clothing, books, and aluminium cans. No trade waste, chemicals or tyres are allowed[9].
- The site does not accept municipal waste[10].

[9] Source: TRICS Database
[10] Source: TRICS Database and Leeds Council Website: https://www.leeds.gov.uk/residents/bins-and-recycling/recycling-sites/east-leeds-household-waste-sorting-site

4.6 Limerick- TRICS Site Number: LI-12-A-01

The site is located out of town, to the west of Limerick. The site is on the N69, which leads to Tralee to the south west of Limerick. The site has 46 bays for waste loading and serves a catchment of between 75,001 and 100,000 people within a 5 mile radius. The site location is illustrated on Figure 8.

Figure 8: Limerick Site Location

Materials disposed of at this site include the following:

- Batteries, Cardboard, Clothing/Footwear, Cans, Electrical Goods, Glass, Fluorescent Tubes/Bulbs, Garden Waste, Gas Cylinders, Paint, Plastics, Paper, Polystyrene, Oil Filters, Scrap Metal, Tetra Packs, Untreated Timber, Waste Oils and White Goods[11].
- This site does not accept municipal waste[12].

[11] Source: TRICS Database
[12] Source: Limerick Civic Centre Website: http://limerickrecyclingcentres.ie/?page_id=13

4.7 Ballyogan

Ballyogan Civic Amenity Site is located within close proximity to Leopardstown Valley. It is approximately 0.62hect and deals with 7,800 tonnes of waste per year. The Site location is illustrated on Figure 9.

Figure 9: Ballyogan Site Location

Statistics were not available for the site from TRICS and are therefore based on client survey findings from site. As such, figures are not available for hourly trips, instead daily trips are analysed.

Materials disposed of at this site include the following:

- Aluminium Foil Trays, Batteries, Beverage Cans, Beverage Cartons, Books, Car Batteries, Cardboard Cards, Christmas Trees, Clothes and Textiles, Electrical Waste, Fluorescent Tubes, Food Cans, Glass Bottles and Jars, Green Waste, Magazines, Metal, Mobile phone, Newspapers, Paints, Paper, Plastic Bottles, Plastic Film, Plastics other, Print Cartridges. Used Gas Cylinders, Waste Oil, White Polystyrene and Wood.
- This site does not accept municipal waste.

5. TRICS Trip Generation Site Statistics

5.1 Blackburn- TRICS Site Number: LC-12-A-04

The following provides a breakdown of the average daily trips at the Blackburn site during weekday operation. It illustrates that the AM peak, highlighted in blue, is between 11:00 and 12:00 with 144 trips (includes arrivals and departures). The PM peak is then between 12:00 and 13:00, highlighted in green, with 259 trips (includes arrivals and departures).

Table 5.1: Blackburn: LC-12-A-04 Daily Trips

Time Period	Arr 785	Dep 782	Totals 1567	% of Daily Trips
06:00-07:00				
07:00-08:00	4	0	4	3
08:00-09:00	25	23	48	5
09:00-10:00	35	36	71	9
10:00-11:00	71	72	143	9
11:00-12:00	72	72	144	17
12:00-13:00	144	115	259	15
13:00-14:00	107	127	234	12
14:00-15:00	113	76	189	15
15:00-16:00	111	128	239	12
16:00-17:00	81	100	181	2
17:00-18:00	15	22	37	1
18:00-19:00	7	11	18	3
19:00-20:00				

It must be noted that the trip generation during the AM network peak (08:00 – 09:00) is relatively low with only 5% of total daily trips. The trip generation during the PM network peak (18:00 – 19:00) is also extremely low with only 3% of total daily trips. The network peaks are highlighted in purple.

The following then also provides a breakdown of the vehicle composition for average daily trips at the Blackburn site during weekday operation. It illustrates private motor cars account for 96% of daily trips and therefore the site does not add significant HGV pressure on existing road networks.

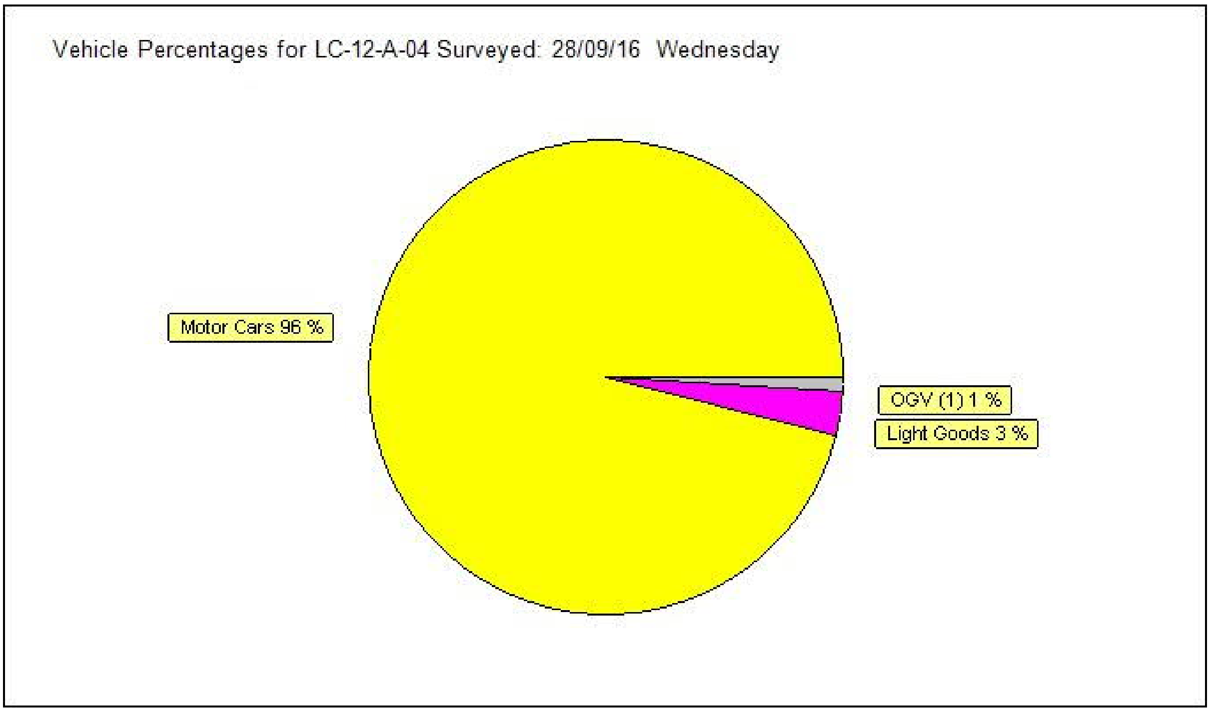

Figure 10: Blackburn: LC-12-A-04 Daily Trips Vehicle Composition

5.2 Cheshire- TRICS Site Number: CH-12-A-01

The following provides a breakdown of the average daily trips at the Cheshire site during weekday operation. It illustrates that the AM peak, highlighted in blue, is between 10:00 and 11:00 with 116 trips (includes arrivals and departures). The PM peak is then between 14:00 and 15:00, highlighted in green, with 129 trips (includes arrivals and departures).

Table 5.2 Cheshire: CH-12-A-01 Daily Trips

Time Period	Arr 408	Dep 409	Totals 817	% of Daily Trips
06:00-07:00				
07:00-08:00	5	4	9	5
08:00-09:00	20	20	40	10
09:00-10:00	42	40	82	14
10:00-11:00	58	58	116	13
11:00-12:00	54	52	106	14
12:00-13:00	56	58	114	14
13:00-14:00	56	56	112	16
14:00-15:00	65	64	129	13
15:00-16:00	51	56	107	0
16:00-17:00	1	1	2	5
17:00-18:00				
18:00-19:00				

It must be noted that the trip generation during the AM network peak (08:00 – 09:00) is relatively low with only 10% of total daily trips. The trip generation during the PM network peak (18:00 – 19:00) is not available for this site as it exceeds the site's opening hours (closes at 17:00). The network peaks are highlighted in purple.

The following provides a breakdown of the vehicle composition for average daily trips at the Cheshire site during weekday operation. It illustrates private motor cars account for 92% of daily trips and therefore the site does not add significant HGV pressure on existing road networks.

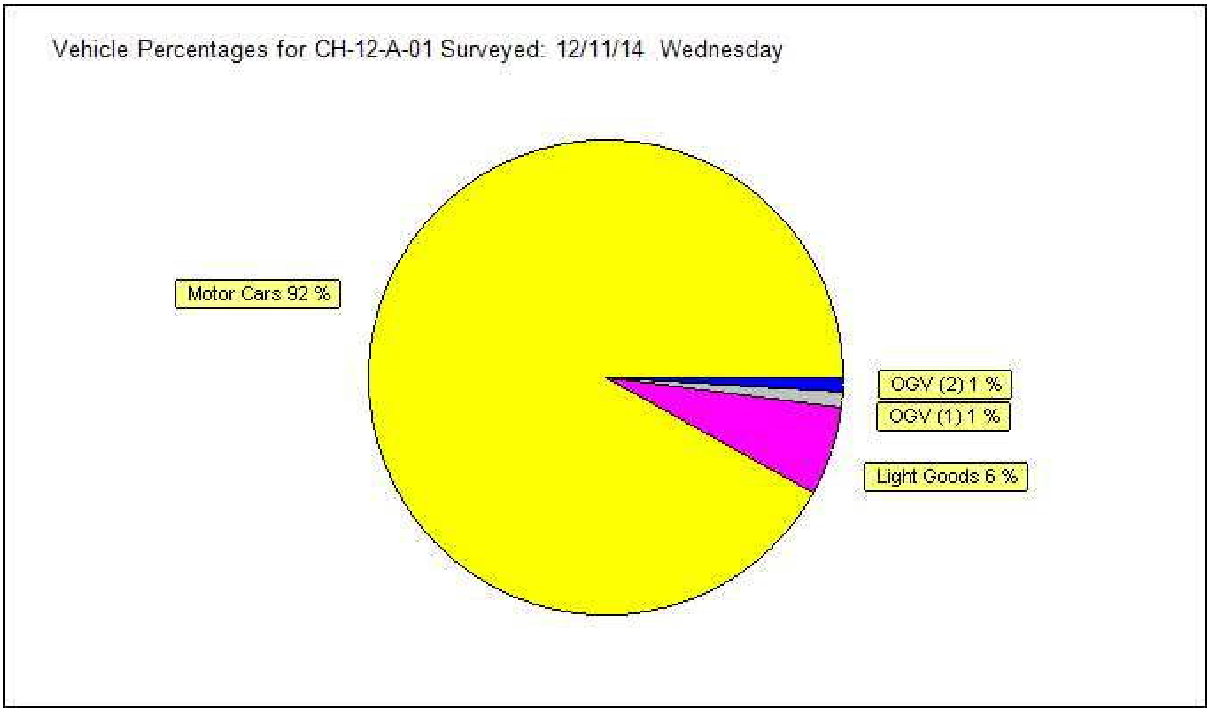

Figure 11: Cheshire: CH-12-A-01 Daily Trips Vehicle Composition

5.3 Worchester- TRICS Site Number: WO-12-A-02

The following provides a breakdown of the average daily trips at the Worchester site during weekday operation. It illustrates that the AM peak is between 11:00 and 12:00, highlighted in blue, with 152 trips (includes arrivals and departures). The PM peak is then between 12:00 and 13:00, highlighted in green, with 58 trips (includes arrivals and departures).

Table 5.3: Worchester: WO-12-A-02 Daily Trips

Time Period	Arr 279	Dep 286	Totals 565	% of Daily Trips
07:00-08:00				
08:00-09:00	35	38	73	13
09:00-10:00	61	54	115	20
10:00-11:00	72	71	143	25
11:00-12:00	77	75	152	27
12:00-13:00	27	31	58	10
13:00-14:00	4	11	15	3
14:00-15:00	2	1	3	1
15:00-16:00	1	3	4	1
16:00-17:00	0	2	2	0
17:00-18:00				
18:00-19:00				

It must be noted that the trip generation during the AM network peak (08:00 – 09:00) is relatively low with only 13% of total daily trips. The trip generation during the PM network peak (18:00 – 19:00) is not available for this site as it exceeds the site's opening hours (closes at 17:00). The network peaks are highlighted in purple.

The following provides a breakdown of the vehicle composition for average daily trips at the Worchester site during weekday operation. It illustrates private motor cars account for 97% of daily trips and therefore the site does not add significant HGV pressure on existing road networks

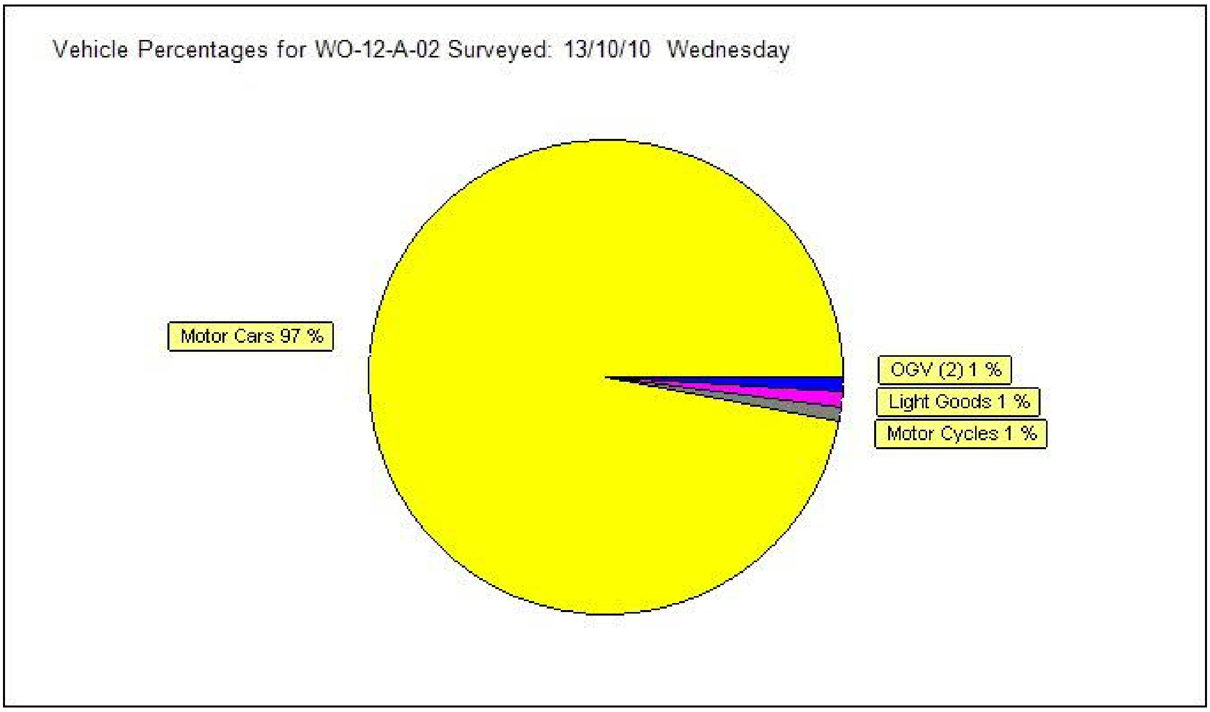

Figure 12: Worchester: WO-12-A-02 Daily Trips Vehicle Composition

5.4 Edinburgh- TRICS Site Number: EB-12-A-02

The following provides a breakdown of the average daily trips at the Edinburgh site during weekday operation. It illustrates that the AM peak is between 10:00 and 11:00, highlighted in blue, with 73 trips (includes arrivals and departures). The PM peak is then between 14:00 and 15:00, highlighted in green, with 90 trips (includes arrivals and departures).

Table 5.4: Edinburgh: EB-12-A-02 Daily Trips

Time Period	Arr 293	Dep 293	Totals 586	% of Daily Trips
06:00-07:00				
07:00-08:00	6	2	8	1
08:00-09:00	9	9	18	3
09:00-10:00	27	21	48	8
10:00-11:00	35	38	73	12
11:00-12:00	37	34	71	12
12:00-13:00	27	27	54	9
13:00-14:00	38	36	74	13
14:00-15:00	45	45	90	15
15:00-16:00	39	42	81	14
16:00-17:00	12	17	29	5
17:00-18:00	10	11	21	4
18:00-19:00	8	11	19	3
19:00-20:00				

It must be noted that the trip generation during the AM network peak (08:00 – 09:00) is extremely low with only 3% of total daily trips. The trip generation during the PM network peak (18:00 – 19:00) is also extremely low with only 3% of total daily trips. The network peaks are highlighted in purple.

The following provides a breakdown of the vehicle composition for average daily trips at the Edinburgh site during weekday operation. It illustrates private motor cars account for 77% of daily trips and therefore the site does not add significant HGV pressure on existing road networks.

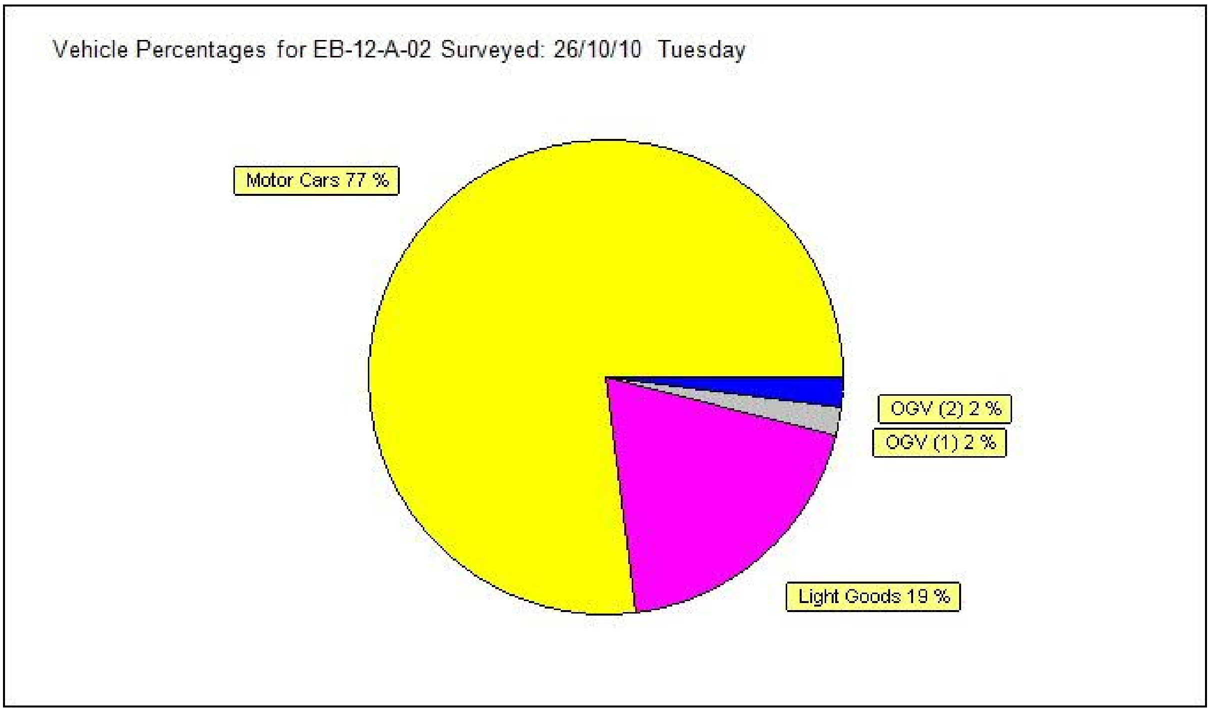

Figure 13: Edinburgh: EB-12-A-02 Daily Trips Vehicle Composition

5.5 Leeds- TRICS Site Number: WY-12-A-01

The following provides a breakdown of the average daily trips at the Leeds site during weekday operation. It illustrates that the AM peak is between 09:00 and 10:00, highlighted in blue, with 46 trips (includes arrivals and departures). The PM peak is then between 13:00 and 14:00, highlighted in green, with 48 trips (includes arrivals and departures).

Table 5.5: Leeds: WY-12-A-01 Daily Trips

Time Period	Arr 173	Dep 176	Totals 349	% of Daily Trips
06:00-07:00				
07:00-08:00	10	8	18	5
08:00-09:00	9	9	18	5
09:00-10:00	23	23	46	13
10:00-11:00	15	16	31	9
11:00-12:00	22	20	42	12
12:00-13:00	23	23	46	13
13:00-14:00	24	24	48	14
14:00-15:00	15	15	30	9
15:00-16:00	22	24	46	13
16:00-17:00	10	12	22	6
17:00-18:00	0	2	2	1
18:00-19:00				

It must be noted that the trip generation during the AM network peak (08:00 – 09:00) is relatively low with only 5% of total daily trips. The trip generation during the PM network peak (18:00 – 19:00) is not available for this site as it exceeds the site's opening hours (closes at 18:00). The network peaks are highlighted in purple.

The following provides a breakdown of the vehicle composition for average daily trips at the Leeds site during weekday operation. It illustrates private motor cars account for 87% of daily trips and therefore the site does not add significant HGV pressure on existing road networks.

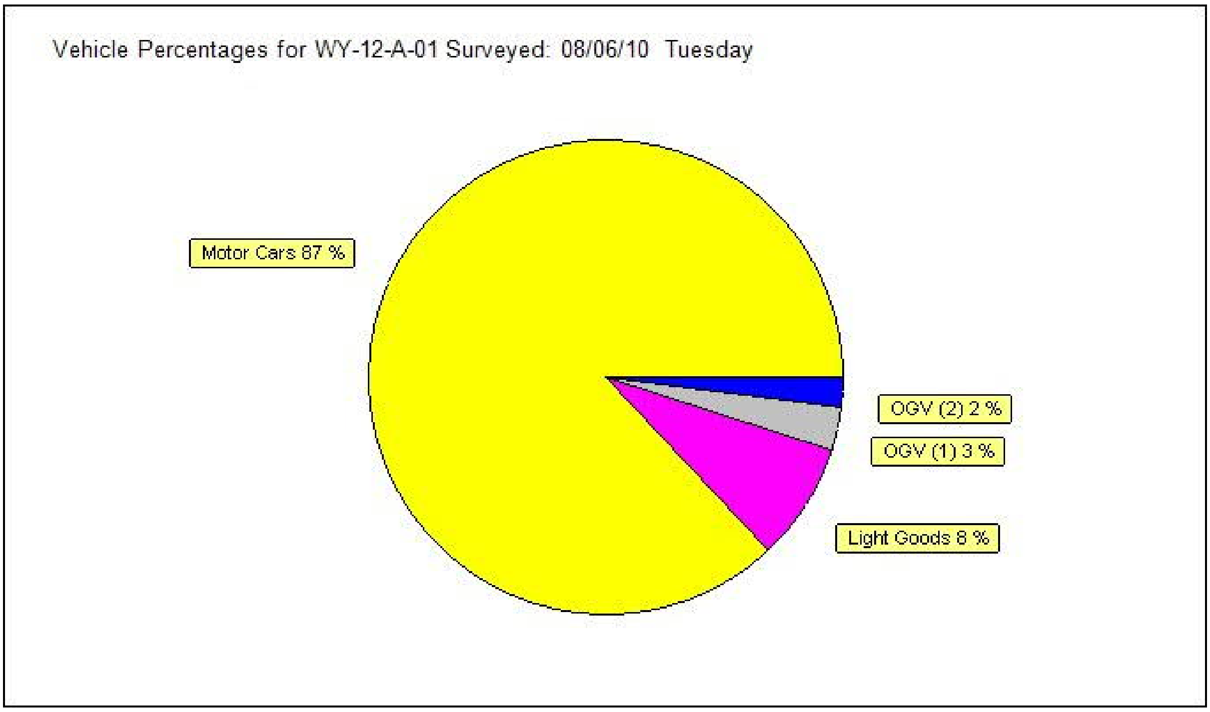

Figure 14: Leeds: WY-12-A-01 Daily Trips Vehicle Composition

5.6 Limerick- TRICS Site Number: LI-12-A-01

The following provides a breakdown of the average daily trips at the Limerick site during weekday operation. It illustrates that the AM peak is between 09:00 and 10:00, highlighted in blue, with 37 trips (includes arrivals and departures). The PM peak is then between 12:00 and 13:00, highlighted in green, with 26 trips (includes arrivals and departures).

Table 5.6: Limerick: LI-12-A-01 Daily Trips

Time Period	Arr 98	Dep 98	Totals 196	% of Daily Trips
07:00-08:00				
08:00-09:00				
09:00-10:00	19	18	37	19
10:00-11:00	14	13	27	14
11:00-12:00	16	15	31	16
12:00-13:00	14	12	26	13
13:00-14:00	9	10	19	10
14:00-15:00	7	7	14	7
15:00-16:00	8	4	12	6
16:00-17:00	11	14	25	13
17:00-18:00	0	5	5	3
18:00-19:00				

It must be noted that the trip generation during the AM network peak (08:00 – 09:00) is not available for the site as it is outside the site's opening hours (opens at 09:00). The trip generation during the PM network peak (18:00 – 19:00) is also not available for this site as it exceeds the site's opening hours (closes at 18:00). The network peaks are highlighted in purple.

The following provides a breakdown of the vehicle composition for average daily trips at the Limerick site during weekday operation. It illustrates private motor cars account for 87% of daily trips and therefore the site does not add significant HGV pressure on existing road networks.

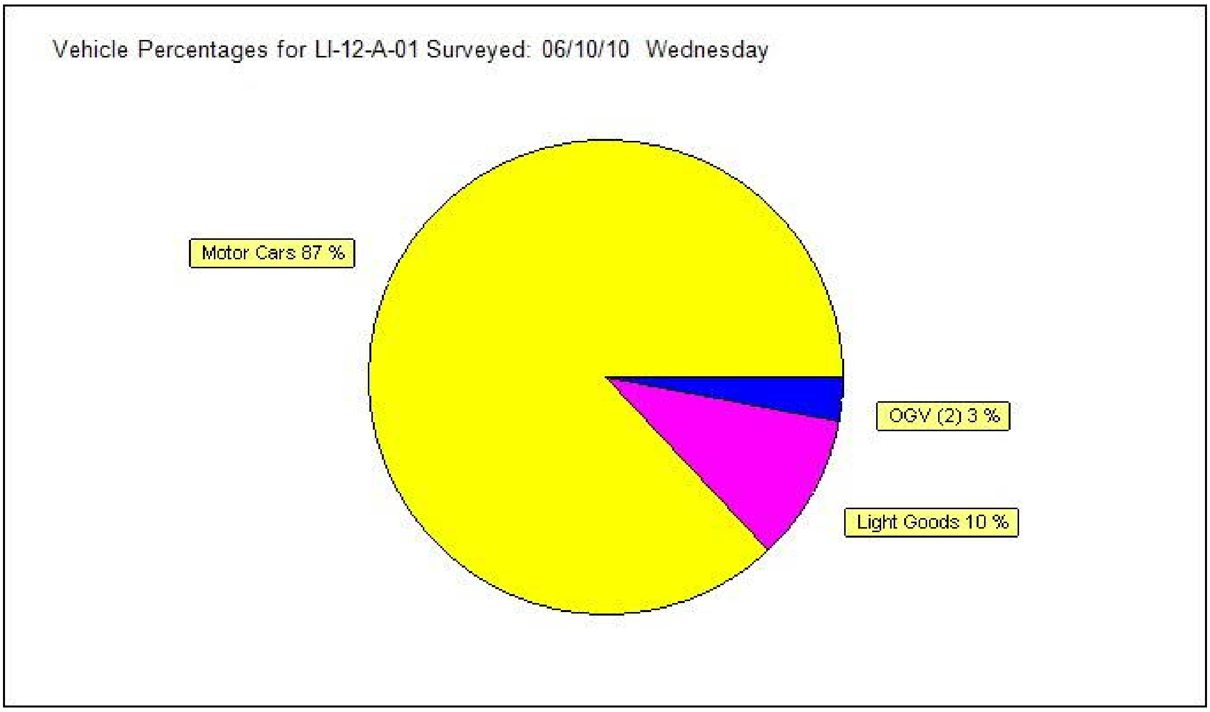

Figure 15: Limerick: LI-12-A-01 Daily Trips Vehicle Composition

5.7 Ballyogan

Statistics were not available for the site at Ballyogan from TRICs and are therefore based on the operator's survey findings from site. As such, statistics are not available for hourly trips, instead daily trips are analysed. This is illustrated on Table 5.7.

Table 5.7: Ballyogan Trip Statistics

Details	Statistic
Total Daily Trip for Weekdays	50,967
Operational Days	215
Average Arrivals to site Per Operational Weekday	237.06
Average Departures from site Per Operational Weekday	237.06
Total Trips to and from site per Weekday	474

These statistics are incorporated into an analysis in Section 6 to illustrate how Ballyogan, a site within the Greater Dublin area, compares to the average civic amenity centre daily trips.

6. TRICS and Site Analysis Results

Table 6.1 provides a calculated, ranked, comparison table for each of the sites average daily trip rate and trip total generation statistics. Daily trip statistics where used as the basis for comparison as this provided the best opportunity to compare available traffic statistics with a local site: Ballyogan.

Table 6.1: Total Trip Rates and Daily Trips Comparison

Rank	Site Ref	Mun. Waste	Description	Location	Area	Arrivals (Daily Trip Rate)	Depart (Daily Trip Rate)	Total Trip Daily Rate	Arr	Dep	Total Daily Trip Generation
1	LC-12-A-04	Yes-Permit	RECYCLING CENTRE	BLACKBURN	0.41	1790.244	1770.732	3561.0	734	726	1460
2	CH-12-A-01	Yes	RECYCLING CENTRE	CHESHIRE	0.3	1276.667	1283.333	2560.0	383	385	768
3	WO-12-A-02	Yes	CIVIC AMENITY	WORCESTER	0.21	1161.905	1180.952	2342.9	244	248	492
4	EB-12-A-02	Yes	RECYCLING CENTRE	EDINBURGH	0.62	419.355	419.355	838.7	260	260	520
5	BALLY-OGAN	No	CIVIC AMENITY	DUN LAOGHAIRE	0.62	382.26	382.26	764.52	237	237	474
6	WY-12-A-01	No	CIVIC AMENITY SITE	LEEDS	0.73	210.959	215.068	426.0	154	157	311
7	LI-12-A-01	No	RECYCLING CENTRE	NEAR LIMERICK	0.52	188.462	178.846	367.3	98	93	191

Based on the findings in Table 6.1, the four sites which accept municipal waste are ranked higher than the three sites that do not accept municipal waste. Therefore to get a robust and worst case trip generation the Leeds and Limerick sites should be removed from the list of sites.

7. TRICS Average AM and PM Trip Generation

Table 7.1 presents a calculated AM and PM trip rate of arrivals and departures throughout an average weekday for all six TRICS sites.

Table 7.1: Average Daily AM and PM Trip Rates
(One Hectare Calculation Factor)

Time Range	Days	Ave. Area	Arrival Trip Rate	No. Days	Ave. Area	Departures Trip Rate	No. Days	Ave. Area	Total Trip Rate
06:00-07:00									
07:00-08:00	4	0.51	12.136	4	0.51	6.796	4	0.51	18.932
08:00-09:00	6	0.47	35.125	6	0.47	35.484	6	0.47	70.609
09:00-10:00	6	0.47	74.194	6	0.47	68.817	6	0.47	143.011
10:00-11:00	6	0.47	94.982	6	0.47	96.057	6	0.47	191.039
11:00-12:00	6	0.47	99.642	6	0.47	96.057	6	0.47	195.699
12:00-13:00	6	0.47	104.301	6	0.47	95.341	6	0.47	199.642
13:00-14:00	6	0.47	85.305	6	0.47	94.624	6	0.47	179.929
14:00-15:00	6	0.47	88.53	6	0.47	74.552	6	0.47	163.082
15:00-16:00	6	0.47	83.154	6	0.47	92.115	6	0.47	175.269
16:00-17:00	6	0.47	41.219	6	0.47	52.33	6	0.47	93.549
17:00-18:00	5	0.5	10.04	5	0.5	16.064	5	0.5	26.104
18:00-19:00	2	0.52	14.563	2	0.52	21.359	2	0.52	35.922
19:00-20:00									
Daily Trip Rates:			743.191			749.596			1492.787

In order to then provide a robust daily trip generation assessment for the Celbridge site, an assessment is also provided in Table 7.2 that is based only on sites which accept municipal waste: Blackburn, Cheshire, Worchester, and Edinburgh. This ensures that the assessment presents findings most comparable to the average daily trip generation Celbridge can expect due to its accepted waste streams.

Table 7.2: Average Daily AM and PM Trip Rates for Sites Which Accept Municipal Waste (One Hectare Calculation Factor)

Time Range	Days	Ave. Area	Arrival Trip Rate	No. Days	Ave. Area	Departures Trip Rate	No. Days	Ave. Area	Total Trip Rate
06:00-07:00									
07:00-08:00	3	0.44	11.278	3	0.44	4.511	3	0.44	15.789
08:00-09:00	4	0.38	57.792	4	0.38	58.442	4	0.38	116.234
09:00-10:00	4	0.38	107.143	4	0.38	98.052	4	0.38	205.195
10:00-11:00	4	0.38	153.247	4	0.38	155.195	4	0.38	308.442
11:00-12:00	4	0.38	155.844	4	0.38	151.299	4	0.38	307.143
12:00-13:00	4	0.38	164.935	4	0.38	150	4	0.38	314.935
13:00-14:00	4	0.38	133.117	4	0.38	149.351	4	0.38	282.468
14:00-15:00	4	0.38	146.104	4	0.38	120.779	4	0.38	266.883
15:00-16:00	4	0.38	131.169	4	0.38	148.701	4	0.38	279.87
16:00-17:00	4	0.38	61.039	4	0.38	77.922	4	0.38	138.961
17:00-18:00	3	0.41	20.161	3	0.41	26.613	3	0.41	46.774
18:00-19:00	2	0.52	14.563	2	0.52	21.359	2	0.52	35.922
19:00-20:00									
Daily Trip Rates:			1156.392			1162.224			2318.616

8. AM And PM Peak Network Trip Generation

The latest version of the Trip Rate Information Computer System (TRICS v 7.5.2) was used to calculate the quantum of vehicle trips likely to be generated by a development of the scale and type proposed – 1 hectare. The full outputs from the TRICS analysis is shown in Table 7.2, whilst the trip rates and the resulting trip generations for the peak periods are illustrated in Tables 8.1 and 8.2 below.

Table 8.1: Proposed Trip Rates Per Hectare

Development	TRICs Land Use	AM Peak Hour (08:00 – 09:00)		PM Peak Hour (18:00 – 19:00)	
		Arrivals	Departures	Arrivals	Departures
Civic Amenity Centre	07 V - Library	57.792	58.442	14.563	21.359

Table 8.2: Proposed Trip Generations

Development	Development Size	AM Peak Hour (08:00 – 09:00)		PM Peak Hour (18:00 – 19:00)	
		Arrivals	Departures	Arrivals	**Departures**
Civic Amenity Centre	1 hectare	58	58	15	21
Peak Hour Totals		116		36	

Table 8.2 demonstrates that the anticipated trip generations associated with the development are 116 and 36 trips respectively during the morning (08:00 – 09:00) and evening (18:00 – 19:00) peak hour periods.

9. Summary

Summarising the above analysis, a number of key trends have become apparent that will provide useful technical information in relation to the Celbridge Civic Amenity Centre proposal.

To begin with, it is of significant note that average trends indicate that the AM peak for civic amenity sites (accepting and not accepting municipal waste combined) is between 11:00 and 12:00, as highlighted in blue on Table 7.1, with a trip rate of 195.70. The PM peak of between 12:00 and 13:00, as highlighted in green in Table 7.1, has a trip rate of 199.64. These development peaks are outside of Celbridge's network AM peak (08:00 -09:00) and PM peak (18:00 – 19:00) hours. Figure 16 plots the combined total hourly trip rates for the six combined TRICS sites to illustrate development trip generation.

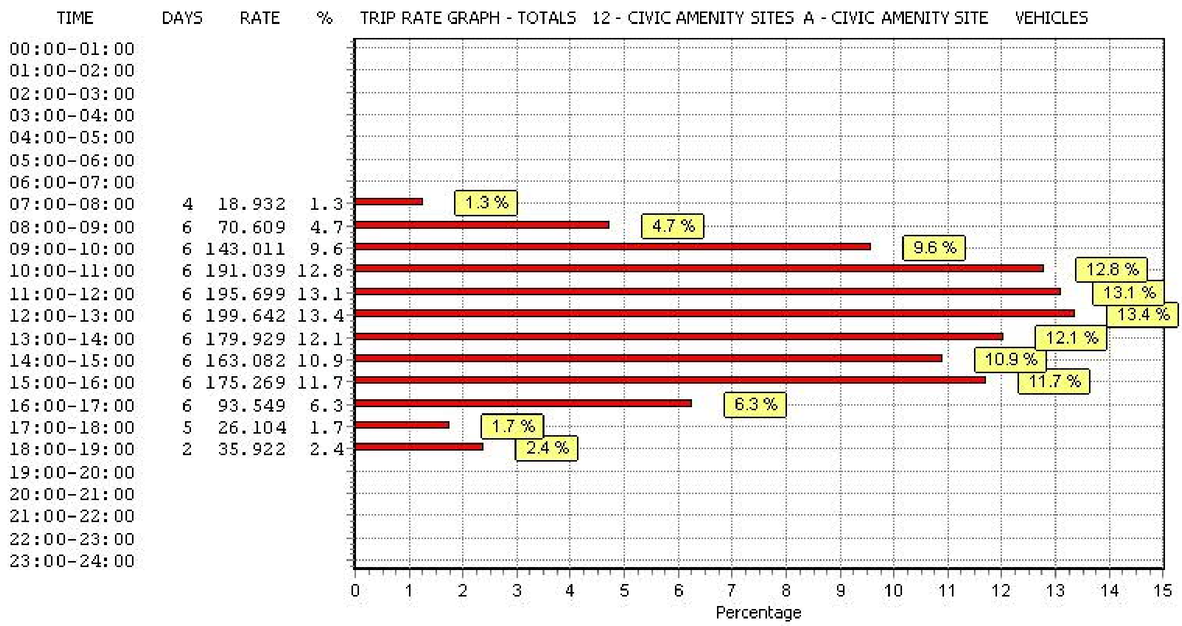

Figure 16: Total Average Hourly Trip Rates (Six TRICS Sites Accepting and Not Accepting Municipal Waste Combined)

Assessing only sites which also accept municipal waste, Table 7.2, also demonstrates that on average the AM development peak, between 10:00 and 11:00, and the PM development peak, between 12:00 and 13:00, falls outside the proposed site's network peaks (AM: 08:00 – 09:00 and PM: 18:00 – 19:00). Again, Figure 17 plots the combined total hourly trip rates for the four sites which accept municipal waste in order to demonstrate the impact on trip generation flows.

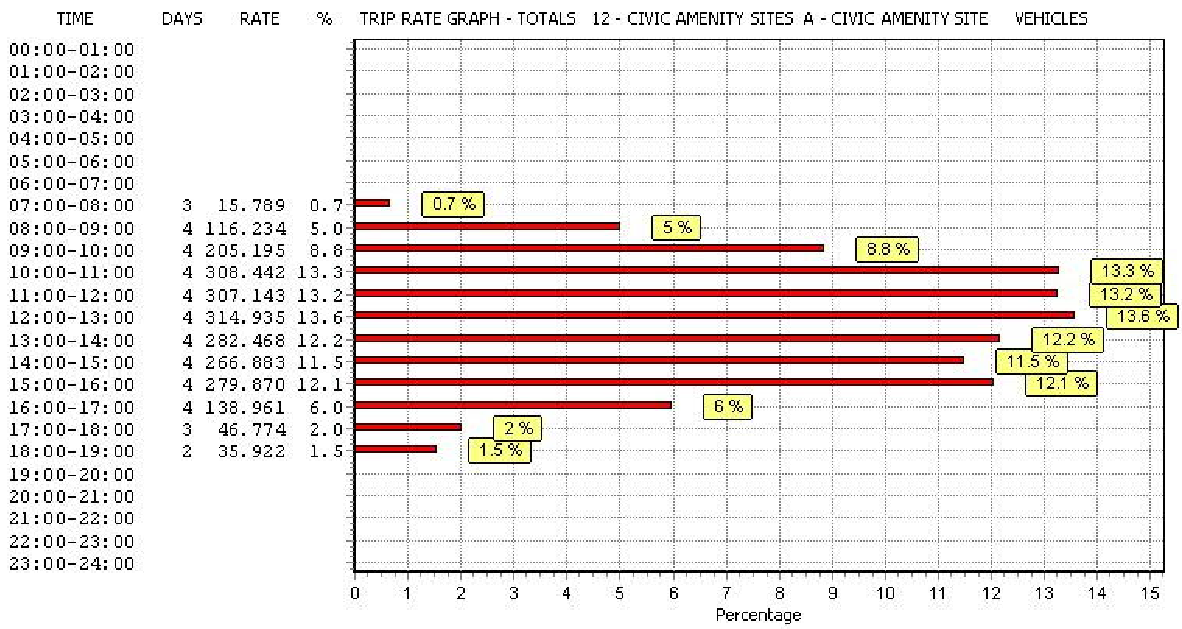

Figure 17: Total Average Hourly Trip Rates (Only Sites Which Accept Municipal Waste)

These findings together indicate that network flows should not see significant disruption due to traffic streams going to and from the proposed Civic Amenity Centre because development peaks are outside of the network peak hours.

Finally, the analysis has also highlighted that private motors are the predominant trip takers to civic amenity centres, with 89% of the modal split, and therefore the site will not significantly increase HGV presence on the road network.

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Appendix D – Junction Modelling Results

Junctions 9

ARCADY 9 - Roundabout Module

Version: 9.0.1.4646 []

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758   email: software@trl.co.uk   Web: http://www.trlsoftware.co.uk

Filename: 180810_R449 R405 Rbt_V1.j9
Path: \\eu.aecomnet.com\EMIA\UKI\IEDBL2\Jobs\PR-334308_Kildare_Civic_amenity_transpor\400_Technical\431_Transport\Modelling
Report generation date: 15/08/2018 13:39:55

Summary of junction performance

	AM						PM					
	Queue (Veh)	Delay (s)	RFC	LOS	Junction Delay (s)	Network Residual Capacity	Queue (Veh)	Delay (s)	RFC	LOS	Junction Delay (s)	Network Residual Capacity
	Existing Layout - 2018											
1 - R449 NE	0.2	3.18	0.16	A	3.78	115 % [2 - R405 SE]	2.1	8.80	0.68	A	6.57	32 % [1 - R449 NE]
2 - R405 SE	0.8	4.07	0.43	A			1.2	5.18	0.55	A		
3 - R405 NW	0.1	3.32	0.13	A			0.4	4.12	0.26	A		
	Existing Layout - 2020											
1 - R449 NE	0.2	3.20	0.16	A	3.85	109 % [2 - R405 SE]	2.3	9.48	0.70	A	6.96	28 % [1 - R449 NE]
2 - R405 SE	0.8	4.16	0.45	A			1.3	5.38	0.56	A		
3 - R405 NW	0.2	3.37	0.13	A			0.4	4.22	0.27	A		
	Existing Layout - 2020 With Dev											
1 - R449 NE	0.2	3.24	0.17	A	3.89	106 % [2 - R405 SE]	2.3	9.56	0.70	A	7.01	28 % [1 - R449 NE]
2 - R405 SE	0.8	4.22	0.45	A			1.3	5.40	0.56	A		
3 - R405 NW	0.2	3.40	0.14	A			0.4	4.23	0.27	A		
	Existing Layout - 2025											
1 - R449 NE	0.2	3.26	0.18	A	4.05	95 % [2 - R405 SE]	3.0	11.68	0.75	B	8.19	20 % [1 - R449 NE]
2 - R405 SE	0.9	4.43	0.48	A			1.5	5.96	0.60	A		
3 - R405 NW	0.2	3.49	0.15	A			0.4	4.51	0.30	A		
	Existing Layout - 2025 With Dev											
1 - R449 NE	0.2	3.29	0.18	A	4.10	92 % [2 - R405 SE]	3.0	11.81	0.76	B	8.26	20 % [1 - R449 NE]
2 - R405 SE	0.9	4.49	0.49	A			1.5	5.98	0.60	A		
3 - R405 NW	0.2	3.53	0.15	A			0.4	4.52	0.30	A		
	Existing Layout - 2035											
1 - R449 NE	0.2	3.35	0.19	A	4.39	77 % [2 - R405 SE]	4.8	17.55	0.84	C	11.23	9 % [1 - R449 NE]
2 - R405 SE	1.1	4.88	0.53	A			2.0	7.06	0.66	A		
3 - R405 NW	0.2	3.70	0.17	A			0.5	5.00	0.34	A		
	Existing Layout - 2035 With Dev											
1 - R449 NE	0.3	3.38	0.20	A	4.44	75 % [2 - R405 SE]	5.0	17.92	0.84	C	11.42	9 % [1 - R449 NE]
2 - R405 SE	1.1	4.95	0.53	A			2.0	7.10	0.67	A		
3 - R405 NW	0.2	3.73	0.17	A			0.5	5.02	0.34	A		

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle. Junction LOS and Junction Delay are demand-weighted averages. Network Residual Capacity indicates the amount by which network flow could be increased before a user-definable threshold (see Analysis Options) is met.

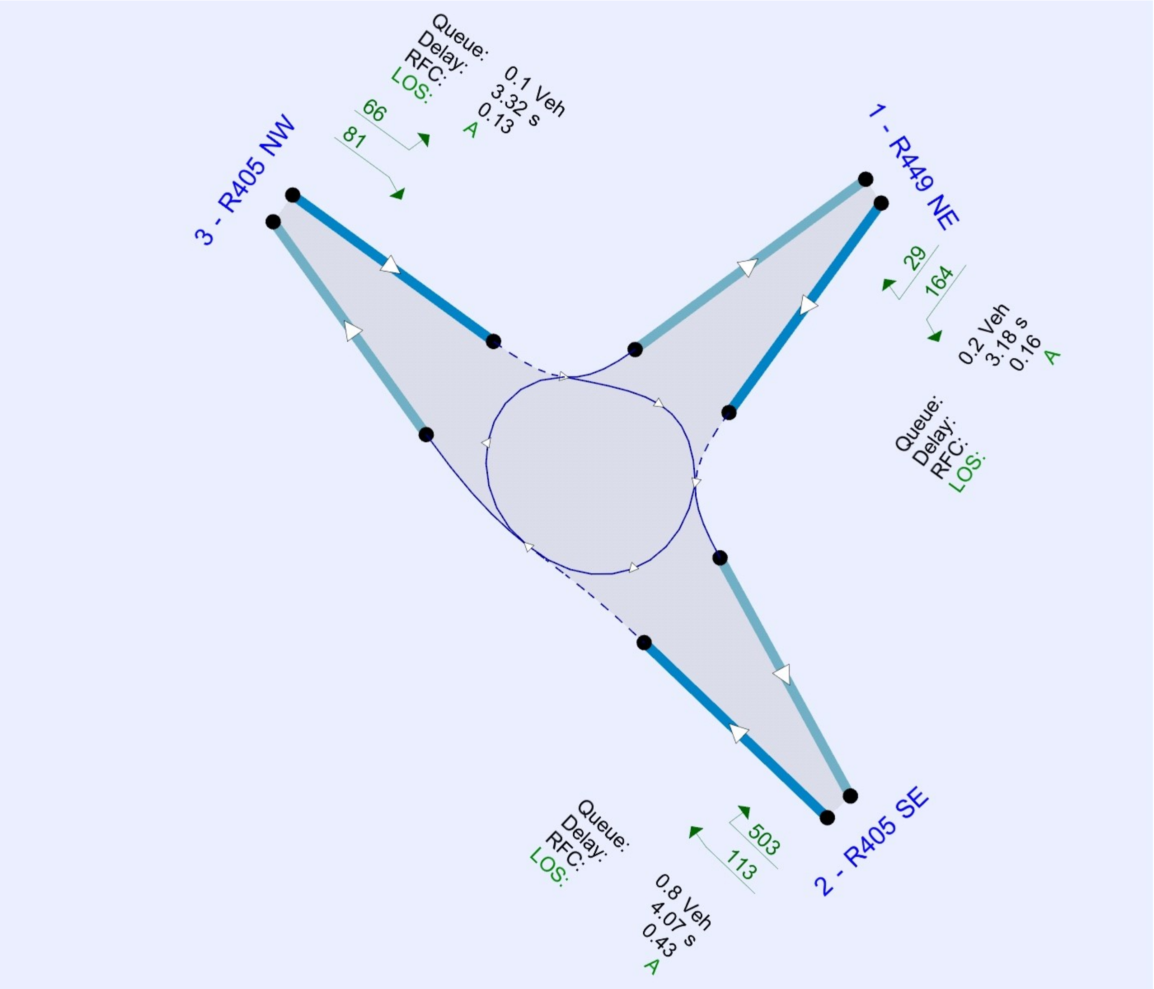
File summary

File Description

Title	R449/R405 Three-Arm Roundabout
Location	Co. Kildare, Ireland
Site number	
Date	10/08/2018
Version	
Status	Existing
Identifier	
Client	
Jobnumber	
Enumerator	EU\theodore.jones
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	Veh	Veh	perHour	s	-Min	perMin



The junction diagram reflects the last run of Junctions.

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	Residual capacity criteria type	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
	✓	Delay	0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2018	AM	ONE HOUR	07:45	09:15	15
D2	2018	PM	ONE HOUR	17:45	19:15	15
D3	2020	AM	ONE HOUR	07:45	09:15	15
D4	2020	PM	ONE HOUR	17:45	19:15	15
D5	2020 With Dev	AM	ONE HOUR	07:45	09:15	15
D6	2020 With Dev	PM	ONE HOUR	17:45	19:15	15
D7	2025	AM	ONE HOUR	07:45	09:15	15
D8	2025	PM	ONE HOUR	17:45	19:15	15
D9	2025 With Dev	AM	ONE HOUR	07:45	09:15	15
D10	2025 With Dev	PM	ONE HOUR	17:45	19:15	15
D11	2035	AM	ONE HOUR	07:45	09:15	15
D12	2035	PM	ONE HOUR	17:45	19:15	15
D13	2035 With Dev	AM	ONE HOUR	07:45	09:15	15
D14	2035 With Dev	PM	ONE HOUR	17:45	19:15	15

Analysis Set Details

ID	Name	Network flow scaling factor (%)
A1	Existing Layout	100.000

Existing Layout - 2018, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	R449 / R405 Three-Arm Roundabout	Standard Roundabout	3.78	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	115	2 - R405 SE

Arms

Arms

Arm	Name	Description
1	R449 NE	
2	R405 SE	
3	R405 NW	

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1 - R449 NE	3.30	6.64	9.9	40.2	43.0	26.9	
2 - R405 SE	3.53	7.28	11.2	33.4	43.0	13.5	
3 - R405 NW	3.48	7.37	15.1	39.2	43.0	24.9	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1 - R449 NE	0.613	1539
2 - R405 SE	0.665	1742
3 - R405 NW	0.660	1771

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2018	AM	ONE HOUR	07:45	09:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - R449 NE		✓	193	100.000
2 - R405 SE		✓	616	100.000
3 - R405 NW		✓	147	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	0	164	29
	2 - R405 SE	503	0	113
	3 - R405 NW	66	81	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	10	10	10
	2 - R405 SE	10	10	10
	3 - R405 NW	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
1 - R449 NE	0.16	3.18	0.2	A
2 - R405 SE	0.43	4.07	0.8	A
3 - R405 NW	0.13	3.32	0.1	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	145	61	1362	0.107	145	0.1	2.957	A
2 - R405 SE	464	22	1569	0.296	462	0.4	3.247	A
3 - R405 NW	111	377	1361	0.081	110	0.1	2.878	A

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	174	73	1355	0.128	173	0.1	3.046	A
2 - R405 SE	554	26	1567	0.354	553	0.5	3.551	A
3 - R405 NW	132	452	1312	0.101	132	0.1	3.050	A

08:15 - 08:30

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	212	89	1345	0.158	212	0.2	3.178	A
2 - R405 SE	678	32	1563	0.434	677	0.8	4.062	A
3 - R405 NW	162	553	1245	0.130	162	0.1	3.322	A

08:30 - 08:45

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	212	89	1345	0.158	212	0.2	3.178	A
2 - R405 SE	678	32	1563	0.434	678	0.8	4.070	A
3 - R405 NW	162	554	1244	0.130	162	0.1	3.324	A

08:45 - 09:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	174	73	1355	0.128	174	0.1	3.049	A
2 - R405 SE	554	26	1566	0.354	555	0.6	3.559	A
3 - R405 NW	132	453	1311	0.101	132	0.1	3.055	A

09:00 - 09:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	145	61	1362	0.107	145	0.1	2.958	A
2 - R405 SE	464	22	1569	0.296	464	0.4	3.258	A
3 - R405 NW	111	379	1360	0.081	111	0.1	2.881	A

Existing Layout - 2018, PM

Data Errors and Warnings
No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	R449 / R405 Three-Arm Roundabout	Standard Roundabout	6.57	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	32	1 - R449 NE

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2018	PM	ONE HOUR	17:45	19:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - R449 NE		✓	778	100.000
2 - R405 SE		✓	757	100.000
3 - R405 NW		✓	280	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	0	703	75
	2 - R405 SE	589	0	168
	3 - R405 NW	81	199	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	10	10	10
	2 - R405 SE	10	10	10
	3 - R405 NW	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
1 - R449 NE	0.68	8.80	2.1	A
2 - R405 SE	0.55	5.18	1.2	A
3 - R405 NW	0.26	4.12	0.4	A

Main Results for each time segment

17:45 - 18:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	586	149	1308	0.448	583	0.8	4.940	A
2 - R405 SE	570	56	1546	0.369	568	0.6	3.666	A
3 - R405 NW	211	442	1319	0.160	210	0.2	3.246	A

18:00 - 18:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	699	179	1290	0.542	698	1.2	6.066	A
2 - R405 SE	681	67	1539	0.442	680	0.8	4.186	A
3 - R405 NW	252	529	1261	0.200	251	0.2	3.566	A

18:15 - 18:30

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	857	219	1265	0.677	853	2.0	8.657	A
2 - R405 SE	833	82	1529	0.545	832	1.2	5.152	A
3 - R405 NW	308	647	1183	0.261	308	0.4	4.113	A

18:30 - 18:45

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	857	219	1265	0.677	856	2.1	8.801	A
2 - R405 SE	833	83	1529	0.545	833	1.2	5.176	A
3 - R405 NW	308	648	1182	0.261	308	0.4	4.120	A

18:45 - 19:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	699	179	1290	0.542	703	1.2	6.169	A
2 - R405 SE	681	68	1539	0.442	682	0.8	4.211	A
3 - R405 NW	252	531	1260	0.200	252	0.3	3.573	A

19:00 - 19:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	586	150	1308	0.448	587	0.8	5.009	A
2 - R405 SE	570	57	1546	0.369	571	0.6	3.695	A
3 - R405 NW	211	444	1317	0.160	211	0.2	3.257	A

Existing Layout - 2020, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	R449 / R405 Three-Arm Roundabout	Standard Roundabout	3.85	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	109	2 - R405 SE

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2020	AM	ONE HOUR	07:45	09:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - R449 NE		✓	198	100.000
2 - R405 SE		✓	633	100.000
3 - R405 NW		✓	151	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	0	168	30
	2 - R405 SE	517	0	116
	3 - R405 NW	68	83	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	10	10	10
	2 - R405 SE	10	10	10
	3 - R405 NW	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
1 - R449 NE	0.16	3.20	0.2	A
2 - R405 SE	0.45	4.16	0.8	A
3 - R405 NW	0.13	3.37	0.2	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	149	62	1361	0.110	149	0.1	2.966	A
2 - R405 SE	477	23	1569	0.304	475	0.4	3.284	A
3 - R405 NW	114	388	1354	0.084	113	0.1	2.901	A

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	178	75	1354	0.131	178	0.2	3.061	A
2 - R405 SE	569	27	1566	0.363	569	0.6	3.607	A
3 - R405 NW	136	464	1304	0.104	136	0.1	3.081	A

08:15 - 08:30

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	218	91	1344	0.162	218	0.2	3.197	A
2 - R405 SE	697	33	1562	0.446	696	0.8	4.153	A
3 - R405 NW	166	568	1235	0.135	166	0.2	3.368	A

08:30 - 08:45

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	218	91	1344	0.162	218	0.2	3.197	A
2 - R405 SE	697	33	1562	0.446	697	0.8	4.161	A
3 - R405 NW	166	569	1234	0.135	166	0.2	3.369	A

08:45 - 09:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	178	75	1354	0.131	178	0.2	3.064	A
2 - R405 SE	569	27	1566	0.363	570	0.6	3.617	A
3 - R405 NW	136	466	1303	0.104	136	0.1	3.087	A

09:00 - 09:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	149	63	1361	0.110	149	0.1	2.972	A
2 - R405 SE	477	23	1569	0.304	477	0.4	3.301	A
3 - R405 NW	114	390	1353	0.084	114	0.1	2.907	A

Existing Layout - 2020, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	R449 / R405 Three-Arm Roundabout	Standard Roundabout	6.96	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	28	1 - R449 NE

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2020	PM	ONE HOUR	17:45	19:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - R449 NE		✓	801	100.000
2 - R405 SE		✓	779	100.000
3 - R405 NW		✓	288	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	0	723	78
	2 - R405 SE	606	0	173
	3 - R405 NW	83	205	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	10	10	10
	2 - R405 SE	10	10	10
	3 - R405 NW	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
1 - R449 NE	0.70	9.48	2.3	A
2 - R405 SE	0.56	5.38	1.3	A
3 - R405 NW	0.27	4.22	0.4	A

Main Results for each time segment

17:45 - 18:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	603	154	1305	0.462	600	0.8	5.077	A
2 - R405 SE	586	58	1545	0.380	584	0.6	3.737	A
3 - R405 NW	217	454	1310	0.165	216	0.2	3.289	A

18:00 - 18:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	720	184	1287	0.560	718	1.3	6.318	A
2 - R405 SE	700	70	1537	0.456	699	0.8	4.292	A
3 - R405 NW	259	544	1251	0.207	259	0.3	3.628	A

18:15 - 18:30

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	882	225	1261	0.699	878	2.2	9.290	A
2 - R405 SE	858	85	1527	0.562	856	1.3	5.351	A
3 - R405 NW	317	666	1170	0.271	317	0.4	4.214	A

18:30 - 18:45

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	882	226	1261	0.699	882	2.3	9.478	A
2 - R405 SE	858	86	1527	0.562	858	1.3	5.380	A
3 - R405 NW	317	667	1170	0.271	317	0.4	4.222	A

18:45 - 19:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	720	185	1286	0.560	724	1.3	6.445	A
2 - R405 SE	700	71	1537	0.456	702	0.8	4.320	A
3 - R405 NW	259	546	1250	0.207	259	0.3	3.639	A

19:00 - 19:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	603	155	1305	0.462	605	0.9	5.154	A
2 - R405 SE	586	59	1545	0.380	587	0.6	3.766	A
3 - R405 NW	217	457	1308	0.166	217	0.2	3.298	A

Existing Layout - 2020 With Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	R449 / R405 Three-Arm Roundabout	Standard Roundabout	3.89	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	106	2 - R405 SE

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D5	2020 With Dev	AM	ONE HOUR	07:45	09:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - R449 NE		✓	210	100.000
2 - R405 SE		✓	641	100.000
3 - R405 NW		✓	154	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	0	176	34
	2 - R405 SE	525	0	116
	3 - R405 NW	71	83	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	10	10	10
	2 - R405 SE	10	10	10
	3 - R405 NW	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
1 - R449 NE	0.17	3.24	0.2	A
2 - R405 SE	0.45	4.22	0.8	A
3 - R405 NW	0.14	3.40	0.2	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	158	62	1361	0.116	158	0.1	2.988	A
2 - R405 SE	483	26	1567	0.308	481	0.4	3.308	A
3 - R405 NW	116	394	1350	0.086	116	0.1	2.916	A

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	189	75	1354	0.139	189	0.2	3.089	A
2 - R405 SE	576	31	1564	0.369	576	0.6	3.642	A
3 - R405 NW	138	472	1299	0.107	138	0.1	3.101	A

08:15 - 08:30

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	231	91	1344	0.172	231	0.2	3.235	A
2 - R405 SE	706	37	1559	0.453	705	0.8	4.210	A
3 - R405 NW	170	577	1229	0.138	169	0.2	3.397	A

08:30 - 08:45

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	231	91	1344	0.172	231	0.2	3.235	A
2 - R405 SE	706	37	1559	0.453	706	0.8	4.219	A
3 - R405 NW	170	578	1228	0.138	170	0.2	3.398	A

08:45 - 09:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	189	75	1354	0.139	189	0.2	3.090	A
2 - R405 SE	576	31	1563	0.369	577	0.6	3.652	A
3 - R405 NW	138	473	1298	0.107	139	0.1	3.107	A

09:00 - 09:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	158	63	1361	0.116	158	0.1	2.992	A
2 - R405 SE	483	26	1567	0.308	483	0.4	3.325	A
3 - R405 NW	116	396	1349	0.086	116	0.1	2.919	A

Existing Layout - 2020 With Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	R449 / R405 Three-Arm Roundabout	Standard Roundabout	7.01	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	28	1 - R449 NE

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D6	2020 With Dev	PM	ONE HOUR	17:45	19:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - R449 NE		✓	804	100.000
2 - R405 SE		✓	781	100.000
3 - R405 NW		✓	289	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	0	725	79
	2 - R405 SE	608	0	173
	3 - R405 NW	84	205	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	10	10	10
	2 - R405 SE	10	10	10
	3 - R405 NW	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
1 - R449 NE	0.70	9.56	2.3	A
2 - R405 SE	0.56	5.40	1.3	A
3 - R405 NW	0.27	4.23	0.4	A

Main Results for each time segment

17:45 - 18:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	605	154	1305	0.464	602	0.9	5.094	A
2 - R405 SE	588	59	1545	0.381	586	0.6	3.745	A
3 - R405 NW	218	456	1309	0.166	217	0.2	3.294	A

18:00 - 18:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	723	184	1287	0.562	721	1.3	6.348	A
2 - R405 SE	702	71	1537	0.457	701	0.8	4.304	A
3 - R405 NW	260	546	1250	0.208	260	0.3	3.635	A

18:15 - 18:30

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	885	225	1261	0.702	881	2.3	9.368	A
2 - R405 SE	860	87	1526	0.563	858	1.3	5.374	A
3 - R405 NW	318	668	1169	0.272	318	0.4	4.227	A

18:30 - 18:45

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	885	226	1261	0.702	885	2.3	9.562	A
2 - R405 SE	860	87	1526	0.564	860	1.3	5.404	A
3 - R405 NW	318	669	1168	0.272	318	0.4	4.235	A

18:45 - 19:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	723	185	1286	0.562	727	1.3	6.478	A
2 - R405 SE	702	71	1536	0.457	704	0.8	4.332	A
3 - R405 NW	260	548	1248	0.208	260	0.3	3.646	A

19:00 - 19:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	605	155	1305	0.464	607	0.9	5.171	A
2 - R405 SE	588	60	1544	0.381	589	0.6	3.771	A
3 - R405 NW	218	458	1307	0.166	218	0.2	3.306	A

Existing Layout - 2025, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	R449 / R405 Three-Arm Roundabout	Standard Roundabout	4.05	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	95	2 - R405 SE

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D7	2025	AM	ONE HOUR	07:45	09:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - R449 NE		✓	214	100.000
2 - R405 SE		✓	679	100.000
3 - R405 NW		✓	161	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	0	181	33
	2 - R405 SE	554	0	125
	3 - R405 NW	72	89	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	10	10	10
	2 - R405 SE	10	10	10
	3 - R405 NW	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
1 - R449 NE	0.18	3.26	0.2	A
2 - R405 SE	0.48	4.43	0.9	A
3 - R405 NW	0.15	3.49	0.2	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	161	67	1359	0.119	161	0.1	3.003	A
2 - R405 SE	511	25	1567	0.326	509	0.5	3.397	A
3 - R405 NW	121	416	1336	0.091	121	0.1	2.963	A

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	192	80	1351	0.142	192	0.2	3.107	A
2 - R405 SE	610	30	1564	0.390	610	0.6	3.770	A
3 - R405 NW	145	498	1282	0.113	145	0.1	3.165	A

08:15 - 08:30

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	236	98	1340	0.176	235	0.2	3.260	A
2 - R405 SE	748	36	1560	0.479	746	0.9	4.420	A
3 - R405 NW	177	609	1208	0.147	177	0.2	3.491	A

08:30 - 08:45

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	236	98	1339	0.176	236	0.2	3.260	A
2 - R405 SE	748	36	1560	0.479	748	0.9	4.432	A
3 - R405 NW	177	610	1207	0.147	177	0.2	3.493	A

08:45 - 09:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	192	80	1350	0.142	193	0.2	3.108	A
2 - R405 SE	610	30	1564	0.390	611	0.6	3.782	A
3 - R405 NW	145	499	1281	0.113	145	0.1	3.169	A

09:00 - 09:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	161	67	1358	0.119	161	0.1	3.006	A
2 - R405 SE	511	25	1567	0.326	512	0.5	3.414	A
3 - R405 NW	121	418	1334	0.091	121	0.1	2.967	A

Existing Layout - 2025, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	R449 / R405 Three-Arm Roundabout	Standard Roundabout	8.19	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	20	1 - R449 NE

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D8	2025	PM	ONE HOUR	17:45	19:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - R449 NE		✓	858	100.000
2 - R405 SE		✓	835	100.000
3 - R405 NW		✓	308	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	0	775	83
	2 - R405 SE	650	0	185
	3 - R405 NW	89	219	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	10	10	10
	2 - R405 SE	10	10	10
	3 - R405 NW	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
1 - R449 NE	0.75	11.68	3.0	B
2 - R405 SE	0.60	5.96	1.5	A
3 - R405 NW	0.30	4.51	0.4	A

Main Results for each time segment

17:45 - 18:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	646	164	1299	0.497	642	1.0	5.450	A
2 - R405 SE	629	62	1543	0.408	626	0.7	3.915	A
3 - R405 NW	232	487	1288	0.180	231	0.2	3.401	A

18:00 - 18:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	771	197	1279	0.603	769	1.5	7.035	A
2 - R405 SE	751	74	1534	0.489	750	0.9	4.580	A
3 - R405 NW	277	584	1225	0.226	277	0.3	3.796	A

18:15 - 18:30

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	945	241	1252	0.755	939	2.9	11.294	B
2 - R405 SE	919	91	1523	0.603	917	1.5	5.917	A
3 - R405 NW	339	714	1139	0.298	339	0.4	4.496	A

18:30 - 18:45

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	945	241	1252	0.755	944	3.0	11.684	B
2 - R405 SE	919	91	1523	0.604	919	1.5	5.962	A
3 - R405 NW	339	716	1138	0.298	339	0.4	4.508	A

18:45 - 19:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	771	197	1279	0.603	777	1.5	7.261	A
2 - R405 SE	751	75	1534	0.489	753	1.0	4.621	A
3 - R405 NW	277	586	1223	0.226	277	0.3	3.807	A

19:00 - 19:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	646	165	1298	0.498	648	1.0	5.557	A
2 - R405 SE	629	63	1542	0.408	630	0.7	3.950	A
3 - R405 NW	232	490	1286	0.180	232	0.2	3.417	A

Existing Layout - 2025 With Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	R449 / R405 Three-Arm Roundabout	Standard Roundabout	4.10	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	92	2 - R405 SE

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D9	2025 With Dev	AM	ONE HOUR	07:45	09:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - R449 NE		✓	224	100.000
2 - R405 SE		✓	687	100.000
3 - R405 NW		✓	165	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
From		1 - R449 NE	2 - R405 SE	3 - R405 NW
	1 - R449 NE	0	188	36
	2 - R405 SE	562	0	125
	3 - R405 NW	76	89	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
From		1 - R449 NE	2 - R405 SE	3 - R405 NW
	1 - R449 NE	10	10	10
	2 - R405 SE	10	10	10
	3 - R405 NW	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
1 - R449 NE	0.18	3.29	0.2	A
2 - R405 SE	0.49	4.49	0.9	A
3 - R405 NW	0.15	3.53	0.2	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	169	67	1359	0.124	168	0.1	3.022	A
2 - R405 SE	517	27	1566	0.330	515	0.5	3.421	A
3 - R405 NW	124	421	1332	0.093	124	0.1	2.980	A

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	201	80	1351	0.149	201	0.2	3.132	A
2 - R405 SE	618	32	1562	0.395	617	0.6	3.806	A
3 - R405 NW	148	505	1277	0.116	148	0.1	3.189	A

08:15 - 08:30

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	247	98	1340	0.184	246	0.2	3.293	A
2 - R405 SE	756	40	1557	0.486	755	0.9	4.481	A
3 - R405 NW	182	618	1202	0.151	181	0.2	3.526	A

08:30 - 08:45

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	247	98	1339	0.184	247	0.2	3.293	A
2 - R405 SE	756	40	1557	0.486	756	0.9	4.493	A
3 - R405 NW	182	619	1202	0.151	182	0.2	3.528	A

08:45 - 09:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	201	80	1350	0.149	202	0.2	3.135	A
2 - R405 SE	618	32	1562	0.395	619	0.7	3.818	A
3 - R405 NW	148	506	1276	0.116	149	0.1	3.192	A

09:00 - 09:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	169	67	1358	0.124	169	0.1	3.028	A
2 - R405 SE	517	27	1566	0.330	518	0.5	3.436	A
3 - R405 NW	124	424	1330	0.093	124	0.1	2.986	A

Existing Layout - 2025 With Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	R449 / R405 Three-Arm Roundabout	Standard Roundabout	8.26	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	20	1 - R449 NE

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D10	2025 With Dev	PM	ONE HOUR	17:45	19:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - R449 NE		✓	861	100.000
2 - R405 SE		✓	836	100.000
3 - R405 NW		✓	309	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	0	777	84
	2 - R405 SE	651	0	185
	3 - R405 NW	90	219	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	10	10	10
	2 - R405 SE	10	10	10
	3 - R405 NW	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
1 - R449 NE	0.76	11.81	3.0	B
2 - R405 SE	0.60	5.98	1.5	A
3 - R405 NW	0.30	4.52	0.4	A

Main Results for each time segment

17:45 - 18:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	648	164	1299	0.499	644	1.0	5.467	A
2 - R405 SE	629	63	1542	0.408	627	0.7	3.921	A
3 - R405 NW	233	488	1288	0.181	232	0.2	3.405	A

18:00 - 18:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	774	197	1279	0.605	772	1.5	7.070	A
2 - R405 SE	752	75	1534	0.490	750	1.0	4.589	A
3 - R405 NW	278	584	1224	0.227	277	0.3	3.802	A

18:15 - 18:30

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	948	241	1252	0.757	942	3.0	11.405	B
2 - R405 SE	920	92	1523	0.604	918	1.5	5.934	A
3 - R405 NW	340	715	1138	0.299	340	0.4	4.506	A

18:30 - 18:45

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	948	241	1252	0.757	948	3.0	11.809	B
2 - R405 SE	920	92	1522	0.605	920	1.5	5.980	A
3 - R405 NW	340	717	1137	0.299	340	0.4	4.518	A

18:45 - 19:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	774	197	1279	0.605	780	1.6	7.301	A
2 - R405 SE	752	76	1533	0.490	754	1.0	4.630	A
3 - R405 NW	278	587	1223	0.227	278	0.3	3.816	A

19:00 - 19:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	648	165	1298	0.499	650	1.0	5.574	A
2 - R405 SE	629	63	1542	0.408	630	0.7	3.957	A
3 - R405 NW	233	491	1286	0.181	233	0.2	3.421	A

Existing Layout - 2035, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	R449 / R405 Three-Arm Roundabout	Standard Roundabout	4.39	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	77	2 - R405 SE

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D11	2035	AM	ONE HOUR	07:45	09:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - R449 NE		✓	234	100.000
2 - R405 SE		✓	745	100.000
3 - R405 NW		✓	177	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	0	198	36
	2 - R405 SE	608	0	137
	3 - R405 NW	79	98	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	10	10	10
	2 - R405 SE	10	10	10
	3 - R405 NW	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
1 - R449 NE	0.19	3.35	0.2	A
2 - R405 SE	0.53	4.88	1.1	A
3 - R405 NW	0.17	3.70	0.2	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	176	74	1354	0.130	176	0.1	3.052	A
2 - R405 SE	561	27	1566	0.358	559	0.6	3.567	A
3 - R405 NW	133	456	1309	0.102	133	0.1	3.060	A

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	210	88	1346	0.156	210	0.2	3.170	A
2 - R405 SE	670	32	1562	0.429	669	0.7	4.026	A
3 - R405 NW	159	546	1250	0.127	159	0.1	3.300	A

08:15 - 08:30

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	258	108	1333	0.193	257	0.2	3.345	A
2 - R405 SE	820	40	1557	0.527	819	1.1	4.865	A
3 - R405 NW	195	668	1169	0.167	195	0.2	3.695	A

08:30 - 08:45

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	258	108	1333	0.193	258	0.2	3.345	A
2 - R405 SE	820	40	1557	0.527	820	1.1	4.882	A
3 - R405 NW	195	669	1168	0.167	195	0.2	3.697	A

08:45 - 09:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	210	88	1345	0.156	211	0.2	3.172	A
2 - R405 SE	670	32	1562	0.429	671	0.8	4.045	A
3 - R405 NW	159	548	1249	0.127	159	0.1	3.305	A

09:00 - 09:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	176	74	1354	0.130	176	0.2	3.058	A
2 - R405 SE	561	27	1566	0.358	562	0.6	3.589	A
3 - R405 NW	133	458	1308	0.102	133	0.1	3.065	A

Existing Layout - 2035, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	R449 / R405 Three-Arm Roundabout	Standard Roundabout	11.23	B

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	9	1 - R449 NE

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D12	2035	PM	ONE HOUR	17:45	19:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - R449 NE		✓	940	100.000
2 - R405 SE		✓	915	100.000
3 - R405 NW		✓	339	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	0	849	91
	2 - R405 SE	712	0	203
	3 - R405 NW	98	241	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	10	10	10
	2 - R405 SE	10	10	10
	3 - R405 NW	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
1 - R449 NE	0.84	17.55	4.8	C
2 - R405 SE	0.66	7.06	2.0	A
3 - R405 NW	0.34	5.00	0.5	A

Main Results for each time segment

17:45 - 18:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	708	181	1289	0.549	703	1.2	6.095	A
2 - R405 SE	689	68	1539	0.448	686	0.8	4.204	A
3 - R405 NW	255	534	1258	0.203	254	0.3	3.583	A

18:00 - 18:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	845	216	1267	0.667	842	2.0	8.413	A
2 - R405 SE	823	82	1530	0.538	821	1.1	5.071	A
3 - R405 NW	305	639	1188	0.256	304	0.3	4.071	A

18:15 - 18:30

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	1035	265	1237	0.837	1024	4.6	16.144	C
2 - R405 SE	1007	99	1518	0.664	1004	1.9	6.966	A
3 - R405 NW	373	781	1094	0.341	373	0.5	4.985	A

18:30 - 18:45

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	1035	265	1237	0.837	1034	4.8	17.546	C
2 - R405 SE	1007	100	1517	0.664	1007	2.0	7.057	A
3 - R405 NW	373	784	1093	0.342	373	0.5	5.004	A

18:45 - 19:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	845	217	1266	0.667	856	2.1	9.001	A
2 - R405 SE	823	83	1529	0.538	826	1.2	5.144	A
3 - R405 NW	305	642	1186	0.257	305	0.3	4.091	A

19:00 - 19:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	708	182	1288	0.549	711	1.2	6.271	A
2 - R405 SE	689	69	1538	0.448	690	0.8	4.255	A
3 - R405 NW	255	537	1255	0.203	256	0.3	3.603	A

Existing Layout - 2035 With Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	R449 / R405 Three-Arm Roundabout	Standard Roundabout	4.44	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	75	2 - R405 SE

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D13	2035 With Dev	AM	ONE HOUR	07:45	09:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - R449 NE		✓	244	100.000
2 - R405 SE		✓	752	100.000
3 - R405 NW		✓	181	100.000

Origin-Destination Data

Demand (Veh/hr)

	To			
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	0	205	39
	2 - R405 SE	615	0	137
	3 - R405 NW	83	98	0

Vehicle Mix

Heavy Vehicle Percentages

	To			
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	10	10	10
	2 - R405 SE	10	10	10
	3 - R405 NW	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
1 - R449 NE	0.20	3.38	0.3	A
2 - R405 SE	0.53	4.95	1.1	A
3 - R405 NW	0.17	3.73	0.2	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	184	74	1354	0.136	183	0.2	3.071	A
2 - R405 SE	566	29	1564	0.362	564	0.6	3.591	A
3 - R405 NW	136	461	1306	0.104	136	0.1	3.075	A

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	219	88	1346	0.163	219	0.2	3.195	A
2 - R405 SE	676	35	1561	0.433	675	0.8	4.063	A
3 - R405 NW	163	552	1246	0.131	163	0.1	3.323	A

08:15 - 08:30

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	269	108	1333	0.201	268	0.3	3.380	A
2 - R405 SE	828	43	1555	0.532	826	1.1	4.929	A
3 - R405 NW	199	676	1164	0.171	199	0.2	3.731	A

08:30 - 08:45

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	269	108	1333	0.201	269	0.3	3.380	A
2 - R405 SE	828	43	1555	0.532	828	1.1	4.949	A
3 - R405 NW	199	677	1163	0.171	199	0.2	3.734	A

08:45 - 09:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	219	88	1345	0.163	220	0.2	3.199	A
2 - R405 SE	676	35	1560	0.433	677	0.8	4.083	A
3 - R405 NW	163	554	1244	0.131	163	0.2	3.331	A

09:00 - 09:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	184	74	1354	0.136	184	0.2	3.077	A
2 - R405 SE	566	29	1564	0.362	567	0.6	3.611	A
3 - R405 NW	136	464	1304	0.105	136	0.1	3.085	A

Existing Layout - 2035 With Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1	R449 / R405 Three-Arm Roundabout	Standard Roundabout	11.42	B

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	9	1 - R449 NE

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D14	2035 With Dev	PM	ONE HOUR	17:45	19:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - R449 NE		✓	944	100.000
2 - R405 SE		✓	917	100.000
3 - R405 NW		✓	340	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	0	852	92
	2 - R405 SE	714	0	203
	3 - R405 NW	99	241	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - R449 NE	2 - R405 SE	3 - R405 NW
From	1 - R449 NE	10	10	10
	2 - R405 SE	10	10	10
	3 - R405 NW	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
1 - R449 NE	0.84	17.92	5.0	C
2 - R405 SE	0.67	7.10	2.0	A
3 - R405 NW	0.34	5.02	0.5	A

Main Results for each time segment

17:45 - 18:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	711	181	1289	0.551	706	1.2	6.127	A
2 - R405 SE	690	69	1538	0.449	687	0.8	4.214	A
3 - R405 NW	256	535	1257	0.204	255	0.3	3.590	A

18:00 - 18:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	849	216	1267	0.670	846	2.0	8.482	A
2 - R405 SE	824	82	1529	0.539	823	1.2	5.088	A
3 - R405 NW	306	641	1187	0.257	305	0.3	4.080	A

18:15 - 18:30

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	1039	265	1237	0.840	1028	4.7	16.425	C
2 - R405 SE	1010	100	1517	0.665	1006	1.9	7.006	A
3 - R405 NW	374	784	1093	0.343	374	0.5	5.003	A

18:30 - 18:45

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	1039	265	1237	0.840	1038	5.0	17.916	C
2 - R405 SE	1010	101	1517	0.666	1010	2.0	7.098	A
3 - R405 NW	374	786	1091	0.343	374	0.5	5.022	A

18:45 - 19:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	849	217	1266	0.670	860	2.1	9.099	A
2 - R405 SE	824	84	1528	0.539	827	1.2	5.162	A
3 - R405 NW	306	644	1185	0.258	306	0.3	4.102	A

19:00 - 19:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - R449 NE	711	182	1288	0.552	714	1.2	6.308	A
2 - R405 SE	690	70	1538	0.449	692	0.8	4.265	A
3 - R405 NW	256	539	1254	0.204	256	0.3	3.607	A

Junctions 9

PICADY 9 - Priority Intersection Module

For sales and distribution information, program advice and maintenance, contact TRL:
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Filename: 180814_Kildare Site Access_V1.j9
Path: \\eu.aecomnet.com\EMIA\UKI\IEDBL2\Jobs\PR-334308_Kildare_Civic_amenity_transpor\400_Technical\431_Transport\Modelling
Report generation date: 15/08/2018 13:36:26

Summary of junction performance

	AM						PM					
	Queue (Veh)	Delay (s)	RFC	LOS	Junction Delay (s)	Network Residual Capacity	Queue (Veh)	Delay (s)	RFC	LOS	Junction Delay (s)	Network Residual Capacity
	Proposed Layout - 2018											
Stream B-AC	0.0	0.00	0.00	A	0.00	900 % []	0.0	0.00	0.00	A	0.00	900 % []
Stream C-AB	0.0	0.00	0.00	A			0.0	0.00	0.00	A		
	Proposed Layout - 2020											
Stream B-AC	0.0	0.00	0.00	A	0.00	900 % []	0.0	0.00	0.00	A	0.00	900 % []
Stream C-AB	0.0	0.00	0.00	A			0.0	0.00	0.00	A		
	Proposed Layout - 2020 With Dev											
Stream B-AC	0.2	8.57	0.13	A	0.93	97 % [Stream B-AC]	0.1	9.79	0.06	A	0.19	42 % [Stream B-AC]
Stream C-AB	0.1	7.27	0.09	A			0.0	7.19	0.03	A		
	Proposed Layout - 2025											
Stream B-AC	0.0	0.00	0.00	A	0.00	900 % []	0.0	0.00	0.00	A	0.00	900 % []
Stream C-AB	0.0	0.00	0.00	A			0.0	0.00	0.00	A		
	Proposed Layout - 2025 With Dev											
Stream B-AC	0.2	8.90	0.14	A	0.91	87 % [Stream B-AC]	0.1	10.65	0.06	B	0.19	33 % [Stream B-AC]
Stream C-AB	0.1	7.49	0.10	A			0.0	7.45	0.03	A		
	Proposed Layout - 2035											
Stream B-AC	0.0	0.00	0.00	A	0.00	900 % []	0.0	0.00	0.00	A	0.00	900 % []
Stream C-AB	0.0	0.00	0.00	A			0.0	0.00	0.00	A		
	Proposed Layout - 2035 With Dev											
Stream B-AC	0.2	9.43	0.14	A	0.88	73 % [Stream B-AC]	0.1	12.37	0.07	B	0.20	21 % [Stream B-AC]
Stream C-AB	0.1	7.83	0.10	A			0.0	7.85	0.03	A		

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle. Junction LOS and Junction Delay are demand-weighted averages. Network Residual Capacity indicates the amount by which network flow could be increased before a user-definable threshold (see Analysis Options) is met.

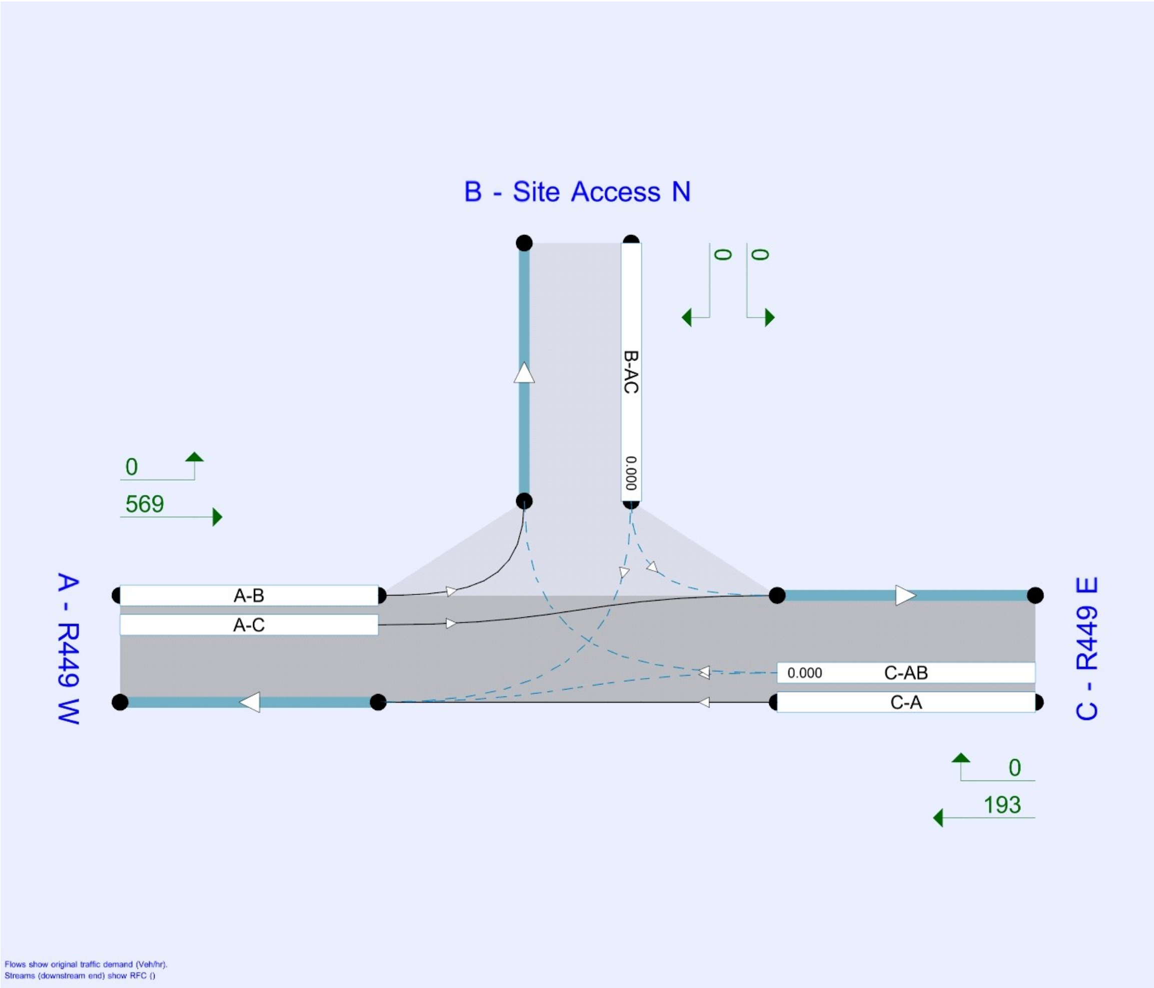
File summary

File Description

Title	Proposed Site Access Priority Junction
Location	R449, Celbridge, Co. Kildare
Site number	
Date	14/08/2018
Version	
Status	Proposed
Identifier	
Client	
Jobnumber	
Enumerator	EU\theodore.jones
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	Veh	Veh	perHour	s	-Min	perMin



The junction diagram reflects the last run of Junctions.

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	Residual capacity criteria type	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
	✓	Delay	0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2018	AM	ONE HOUR	07:45	09:15	15
D2	2018	PM	ONE HOUR	17:45	19:15	15
D3	2020	AM	ONE HOUR	07:45	09:15	15
D4	2020	PM	ONE HOUR	17:45	19:15	15
D5	2020 With Dev	AM	ONE HOUR	07:45	09:15	15
D6	2020 With Dev	PM	ONE HOUR	17:45	19:15	15
D7	2025	AM	ONE HOUR	07:45	09:15	15
D8	2025	PM	ONE HOUR	17:45	19:15	15
D9	2025 With Dev	AM	ONE HOUR	07:45	09:15	15
D10	2025 With Dev	PM	ONE HOUR	17:45	19:15	15
D11	2035	AM	ONE HOUR	07:45	09:15	15
D12	2035	PM	ONE HOUR	17:45	19:15	15
D13	2035 With Dev	AM	ONE HOUR	07:45	09:15	15
D14	2035 With Dev	PM	ONE HOUR	17:45	19:15	15

Analysis Set Details

ID	Name	Network flow scaling factor (%)
A1	Proposed Layout	100.000

Proposed Layout - 2018, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	R449 / Site Access	T-Junction	Two-way	0.00	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	900	

Arms

Arms

Arm	Name	Description	Arm type
A	R449 W		Major
B	Site Access N		Minor
C	R449 E		Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Width for right turn (m)	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
C - R449 E	6.50		✓	3.60	250.0	✓	7.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Lane width (m)	Visibility to left (m)	Visibility to right (m)
B - Site Access N	One lane	4.44	54	138

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Junction	Stream	Intercept (Veh/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
1	B-A	645	0.115	0.291	0.183	0.415
1	B-C	814	0.122	0.308	-	-
1	C-B	828	0.314	0.314	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.
Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2018	AM	ONE HOUR	07:45	09:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - R449 W		✓	569	100.000
B - Site Access N		✓	0	100.000
C - R449 E		✓	193	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	0	0	569
	B - Site Access N	0	0	0
	C - R449 E	193	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	10	10	10
	B - Site Access N	10	10	10
	C - R449 E	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.00	0.00	0.0	A
C-AB	0.00	0.00	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	507	0.000	0	0.0	0.000	A
C-AB	0	1237	0.000	0	0.0	0.000	A
C-A	145			145			
A-B	0			0			
A-C	428			428			

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	478	0.000	0	0.0	0.000	A
C-AB	0	1185	0.000	0	0.0	0.000	A
C-A	174			174			
A-B	0			0			
A-C	512			512			

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	438	0.000	0	0.0	0.000	A
C-AB	0	1113	0.000	0	0.0	0.000	A
C-A	212			212			
A-B	0			0			
A-C	626			626			

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	438	0.000	0	0.0	0.000	A
C-AB	0	1113	0.000	0	0.0	0.000	A
C-A	212			212			
A-B	0			0			
A-C	626			626			

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	478	0.000	0	0.0	0.000	A
C-AB	0	1185	0.000	0	0.0	0.000	A
C-A	174			174			
A-B	0			0			
A-C	512			512			

09:00 - 09:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	507	0.000	0	0.0	0.000	A
C-AB	0	1237	0.000	0	0.0	0.000	A
C-A	145			145			
A-B	0			0			
A-C	428			428			

Proposed Layout - 2018, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	R449 / Site Access	T-Junction	Two-way	0.00	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	900	

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2018	PM	ONE HOUR	17:45	19:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - R449 W		✓	670	100.000
B - Site Access N		✓	0	100.000
C - R449 E		✓	778	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	0	0	670
	B - Site Access N	0	0	0
	C - R449 E	778	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	10	10	10
	B - Site Access N	10	10	10
	C - R449 E	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.00	0.00	0.0	A
C-AB	0.00	0.00	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	424	0.000	0	0.0	0.000	A
C-AB	0	1189	0.000	0	0.0	0.000	A
C-A	586			586			
A-B	0			0			
A-C	504			504			

18:00 - 18:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	375	0.000	0	0.0	0.000	A
C-AB	0	1128	0.000	0	0.0	0.000	A
C-A	699			699			
A-B	0			0			
A-C	602			602			

18:15 - 18:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	303	0.000	0	0.0	0.000	A
C-AB	0	1043	0.000	0	0.0	0.000	A
C-A	857			857			
A-B	0			0			
A-C	738			738			

18:30 - 18:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	303	0.000	0	0.0	0.000	A
C-AB	0	1043	0.000	0	0.0	0.000	A
C-A	857			857			
A-B	0			0			
A-C	738			738			

18:45 - 19:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	375	0.000	0	0.0	0.000	A
C-AB	0	1128	0.000	0	0.0	0.000	A
C-A	699			699			
A-B	0			0			
A-C	602			602			

19:00 - 19:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	424	0.000	0	0.0	0.000	A
C-AB	0	1189	0.000	0	0.0	0.000	A
C-A	586			586			
A-B	0			0			
A-C	504			504			

Proposed Layout - 2020, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	R449 / Site Access	T-Junction	Two-way	0.00	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	900	

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2020	AM	ONE HOUR	07:45	09:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - R449 W		✓	585	100.000
B - Site Access N		✓	0	100.000
C - R449 E		✓	199	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	0	0	585
	B - Site Access N	0	0	0
	C - R449 E	199	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	10	10	10
	B - Site Access N	10	10	10
	C - R449 E	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.00	0.00	0.0	A
C-AB	0.00	0.00	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	503	0.000	0	0.0	0.000	A
C-AB	0	1229	0.000	0	0.0	0.000	A
C-A	150			150			
A-B	0			0			
A-C	440			440			

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	473	0.000	0	0.0	0.000	A
C-AB	0	1176	0.000	0	0.0	0.000	A
C-A	179			179			
A-B	0			0			
A-C	526			526			

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	432	0.000	0	0.0	0.000	A
C-AB	0	1102	0.000	0	0.0	0.000	A
C-A	219			219			
A-B	0			0			
A-C	644			644			

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	432	0.000	0	0.0	0.000	A
C-AB	0	1102	0.000	0	0.0	0.000	A
C-A	219			219			
A-B	0			0			
A-C	644			644			

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	473	0.000	0	0.0	0.000	A
C-AB	0	1176	0.000	0	0.0	0.000	A
C-A	179			179			
A-B	0			0			
A-C	526			526			

09:00 - 09:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	503	0.000	0	0.0	0.000	A
C-AB	0	1229	0.000	0	0.0	0.000	A
C-A	150			150			
A-B	0			0			
A-C	440			440			

Proposed Layout - 2020, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	R449 / Site Access	T-Junction	Two-way	0.00	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	900	

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2020	PM	ONE HOUR	17:45	19:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - R449 W		✓	689	100.000
B - Site Access N		✓	0	100.000
C - R449 E		✓	800	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	0	0	689
	B - Site Access N	0	0	0
	C - R449 E	800	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	10	10	10
	B - Site Access N	10	10	10
	C - R449 E	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.00	0.00	0.0	A
C-AB	0.00	0.00	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	417	0.000	0	0.0	0.000	A
C-AB	0	1180	0.000	0	0.0	0.000	A
C-A	602			602			
A-B	0			0			
A-C	519			519			

18:00 - 18:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	366	0.000	0	0.0	0.000	A
C-AB	0	1117	0.000	0	0.0	0.000	A
C-A	719			719			
A-B	0			0			
A-C	619			619			

18:15 - 18:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	292	0.000	0	0.0	0.000	A
C-AB	0	1030	0.000	0	0.0	0.000	A
C-A	881			881			
A-B	0			0			
A-C	759			759			

18:30 - 18:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	292	0.000	0	0.0	0.000	A
C-AB	0	1030	0.000	0	0.0	0.000	A
C-A	881			881			
A-B	0			0			
A-C	759			759			

18:45 - 19:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	366	0.000	0	0.0	0.000	A
C-AB	0	1117	0.000	0	0.0	0.000	A
C-A	719			719			
A-B	0			0			
A-C	619			619			

19:00 - 19:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	417	0.000	0	0.0	0.000	A
C-AB	0	1180	0.000	0	0.0	0.000	A
C-A	602			602			
A-B	0			0			
A-C	519			519			

Proposed Layout - 2020 With Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	R449 / Site Access	T-Junction	Two-way	0.93	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	97	Stream B-AC

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D5	2020 With Dev	AM	ONE HOUR	07:45	09:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - R449 W		✓	596	100.000
B - Site Access N		✓	58	100.000
C - R449 E		✓	246	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	0	11	585
	B - Site Access N	11	0	47
	C - R449 E	199	47	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	10	10	10
	B - Site Access N	10	10	10
	C - R449 E	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.13	8.57	0.2	A
C-AB	0.09	7.27	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	44	555	0.079	43	0.1	7.027	A
C-AB	35	612	0.058	35	0.1	6.236	A
C-A	150			150			
A-B	8			8			
A-C	440			440			

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	52	526	0.099	52	0.1	7.599	A
C-AB	42	585	0.072	42	0.1	6.635	A
C-A	179			179			
A-B	10			10			
A-C	526			526			

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	64	484	0.132	64	0.2	8.558	A
C-AB	52	547	0.095	52	0.1	7.265	A
C-A	219			219			
A-B	12			12			
A-C	644			644			

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	64	484	0.132	64	0.2	8.567	A
C-AB	52	547	0.095	52	0.1	7.268	A
C-A	219			219			
A-B	12			12			
A-C	644			644			

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	52	526	0.099	52	0.1	7.610	A
C-AB	42	585	0.072	42	0.1	6.640	A
C-A	179			179			
A-B	10			10			
A-C	526			526			

09:00 - 09:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	44	555	0.079	44	0.1	7.041	A
C-AB	35	612	0.058	35	0.1	6.243	A
C-A	150			150			
A-B	8			8			
A-C	440			440			

Proposed Layout - 2020 With Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	R449 / Site Access	T-Junction	Two-way	0.19	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	42	Stream B-AC

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D6	2020 With Dev	PM	ONE HOUR	17:45	19:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - R449 W		✓	692	100.000
B - Site Access N		✓	21	100.000
C - R449 E		✓	812	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	0	3	689
	B - Site Access N	4	0	17
	C - R449 E	800	12	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	10	10	10
	B - Site Access N	10	10	10
	C - R449 E	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.06	9.79	0.1	A
C-AB	0.03	7.19	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	16	503	0.031	16	0.0	7.390	A
C-AB	9	589	0.015	9	0.0	6.202	A
C-A	602			602			
A-B	2			2			
A-C	519			519			

18:00 - 18:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	19	458	0.041	19	0.0	8.189	A
C-AB	11	558	0.019	11	0.0	6.582	A
C-A	719			719			
A-B	3			3			
A-C	619			619			

18:15 - 18:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	23	391	0.059	23	0.1	9.785	A
C-AB	13	514	0.026	13	0.0	7.191	A
C-A	881			881			
A-B	3			3			
A-C	759			759			

18:30 - 18:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	23	391	0.059	23	0.1	9.789	A
C-AB	13	514	0.026	13	0.0	7.191	A
C-A	881			881			
A-B	3			3			
A-C	759			759			

18:45 - 19:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	19	458	0.041	19	0.0	8.194	A
C-AB	11	558	0.019	11	0.0	6.585	A
C-A	719			719			
A-B	3			3			
A-C	619			619			

19:00 - 19:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	16	503	0.031	16	0.0	7.397	A
C-AB	9	589	0.015	9	0.0	6.202	A
C-A	602			602			
A-B	2			2			
A-C	519			519			

Proposed Layout - 2025, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	R449 / Site Access	T-Junction	Two-way	0.00	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	900	

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D7	2025	AM	ONE HOUR	07:45	09:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - R449 W		✓	627	100.000
B - Site Access N		✓	0	100.000
C - R449 E		✓	213	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	0	0	627
	B - Site Access N	0	0	0
	C - R449 E	213	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	10	10	10
	B - Site Access N	10	10	10
	C - R449 E	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.00	0.00	0.0	A
C-AB	0.00	0.00	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	492	0.000	0	0.0	0.000	A
C-AB	0	1210	0.000	0	0.0	0.000	A
C-A	160			160			
A-B	0			0			
A-C	472			472			

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	460	0.000	0	0.0	0.000	A
C-AB	0	1152	0.000	0	0.0	0.000	A
C-A	191			191			
A-B	0			0			
A-C	564			564			

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	416	0.000	0	0.0	0.000	A
C-AB	0	1072	0.000	0	0.0	0.000	A
C-A	235			235			
A-B	0			0			
A-C	690			690			

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	416	0.000	0	0.0	0.000	A
C-AB	0	1072	0.000	0	0.0	0.000	A
C-A	235			235			
A-B	0			0			
A-C	690			690			

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	460	0.000	0	0.0	0.000	A
C-AB	0	1152	0.000	0	0.0	0.000	A
C-A	191			191			
A-B	0			0			
A-C	564			564			

09:00 - 09:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	492	0.000	0	0.0	0.000	A
C-AB	0	1210	0.000	0	0.0	0.000	A
C-A	160			160			
A-B	0			0			
A-C	472			472			

Proposed Layout - 2025, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	R449 / Site Access	T-Junction	Two-way	0.00	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	900	

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D8	2025	PM	ONE HOUR	17:45	19:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - R449 W		✓	739	100.000
B - Site Access N		✓	0	100.000
C - R449 E		✓	858	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	0	0	739
	B - Site Access N	0	0	0
	C - R449 E	858	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	10	10	10
	B - Site Access N	10	10	10
	C - R449 E	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.00	0.00	0.0	A
C-AB	0.00	0.00	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	398	0.000	0	0.0	0.000	A
C-AB	0	1157	0.000	0	0.0	0.000	A
C-A	646			646			
A-B	0			0			
A-C	556			556			

18:00 - 18:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	343	0.000	0	0.0	0.000	A
C-AB	0	1089	0.000	0	0.0	0.000	A
C-A	771			771			
A-B	0			0			
A-C	664			664			

18:15 - 18:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	260	0.000	0	0.0	0.000	A
C-AB	0	995	0.000	0	0.0	0.000	A
C-A	945			945			
A-B	0			0			
A-C	814			814			

18:30 - 18:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	260	0.000	0	0.0	0.000	A
C-AB	0	995	0.000	0	0.0	0.000	A
C-A	945			945			
A-B	0			0			
A-C	814			814			

18:45 - 19:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	343	0.000	0	0.0	0.000	A
C-AB	0	1089	0.000	0	0.0	0.000	A
C-A	771			771			
A-B	0			0			
A-C	664			664			

19:00 - 19:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	398	0.000	0	0.0	0.000	A
C-AB	0	1157	0.000	0	0.0	0.000	A
C-A	646			646			
A-B	0			0			
A-C	556			556			

Proposed Layout - 2025 With Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	R449 / Site Access	T-Junction	Two-way	0.91	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	87	Stream B-AC

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D9	2025 With Dev	AM	ONE HOUR	07:45	09:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - R449 W		✓	638	100.000
B - Site Access N		✓	58	100.000
C - R449 E		✓	260	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	0	11	627
	B - Site Access N	11	0	47
	C - R449 E	213	47	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	10	10	10
	B - Site Access N	10	10	10
	C - R449 E	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.14	8.90	0.2	A
C-AB	0.10	7.49	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	44	545	0.080	43	0.1	7.174	A
C-AB	35	602	0.059	35	0.1	6.345	A
C-A	160			160			
A-B	8			8			
A-C	472			472			

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	52	513	0.102	52	0.1	7.808	A
C-AB	42	573	0.074	42	0.1	6.783	A
C-A	191			191			
A-B	10			10			
A-C	564			564			

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	64	468	0.136	64	0.2	8.893	A
C-AB	52	532	0.097	52	0.1	7.485	A
C-A	235			235			
A-B	12			12			
A-C	690			690			

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	64	468	0.136	64	0.2	8.901	A
C-AB	52	532	0.097	52	0.1	7.488	A
C-A	235			235			
A-B	12			12			
A-C	690			690			

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	52	513	0.102	52	0.1	7.819	A
C-AB	42	573	0.074	42	0.1	6.786	A
C-A	191			191			
A-B	10			10			
A-C	564			564			

09:00 - 09:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	44	545	0.080	44	0.1	7.186	A
C-AB	35	602	0.059	35	0.1	6.352	A
C-A	160			160			
A-B	8			8			
A-C	472			472			

Proposed Layout - 2025 With Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	R449 / Site Access	T-Junction	Two-way	0.19	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	33	Stream B-AC

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D10	2025 With Dev	PM	ONE HOUR	17:45	19:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - R449 W		✓	742	100.000
B - Site Access N		✓	21	100.000
C - R449 E		✓	870	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	0	3	739
	B - Site Access N	4	0	17
	C - R449 E	858	12	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	10	10	10
	B - Site Access N	10	10	10
	C - R449 E	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.06	10.65	0.1	B
C-AB	0.03	7.45	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	16	487	0.032	16	0.0	7.642	A
C-AB	9	578	0.016	9	0.0	6.331	A
C-A	646			646			
A-B	2			2			
A-C	556			556			

18:00 - 18:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	19	438	0.043	19	0.0	8.590	A
C-AB	11	544	0.020	11	0.0	6.756	A
C-A	771			771			
A-B	3			3			
A-C	664			664			

18:15 - 18:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	23	361	0.064	23	0.1	10.642	B
C-AB	13	496	0.027	13	0.0	7.448	A
C-A	945			945			
A-B	3			3			
A-C	814			814			

18:30 - 18:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	23	361	0.064	23	0.1	10.647	B
C-AB	13	496	0.027	13	0.0	7.448	A
C-A	945			945			
A-B	3			3			
A-C	814			814			

18:45 - 19:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	19	438	0.043	19	0.0	8.597	A
C-AB	11	544	0.020	11	0.0	6.757	A
C-A	771			771			
A-B	3			3			
A-C	664			664			

19:00 - 19:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	16	487	0.032	16	0.0	7.647	A
C-AB	9	578	0.016	9	0.0	6.333	A
C-A	646			646			
A-B	2			2			
A-C	556			556			

Proposed Layout - 2035, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	R449 / Site Access	T-Junction	Two-way	0.00	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	900	

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D11	2035	AM	ONE HOUR	07:45	09:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - R449 W		✓	687	100.000
B - Site Access N		✓	0	100.000
C - R449 E		✓	234	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	0	0	687
	B - Site Access N	0	0	0
	C - R449 E	234	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	10	10	10
	B - Site Access N	10	10	10
	C - R449 E	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.00	0.00	0.0	A
C-AB	0.00	0.00	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	476	0.000	0	0.0	0.000	A
C-AB	0	1181	0.000	0	0.0	0.000	A
C-A	176			176			
A-B	0			0			
A-C	517			517			

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	441	0.000	0	0.0	0.000	A
C-AB	0	1118	0.000	0	0.0	0.000	A
C-A	210			210			
A-B	0			0			
A-C	618			618			

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	392	0.000	0	0.0	0.000	A
C-AB	0	1031	0.000	0	0.0	0.000	A
C-A	258			258			
A-B	0			0			
A-C	756			756			

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	392	0.000	0	0.0	0.000	A
C-AB	0	1031	0.000	0	0.0	0.000	A
C-A	258			258			
A-B	0			0			
A-C	756			756			

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	441	0.000	0	0.0	0.000	A
C-AB	0	1118	0.000	0	0.0	0.000	A
C-A	210			210			
A-B	0			0			
A-C	618			618			

09:00 - 09:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	476	0.000	0	0.0	0.000	A
C-AB	0	1181	0.000	0	0.0	0.000	A
C-A	176			176			
A-B	0			0			
A-C	517			517			

Proposed Layout - 2035, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	R449 / Site Access	T-Junction	Two-way	0.00	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	900	

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D12	2035	PM	ONE HOUR	17:45	19:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - R449 W		✓	810	100.000
B - Site Access N		✓	0	100.000
C - R449 E		✓	940	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	0	0	810
	B - Site Access N	0	0	0
	C - R449 E	940	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	10	10	10
	B - Site Access N	10	10	10
	C - R449 E	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.00	0.00	0.0	A
C-AB	0.00	0.00	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	371	0.000	0	0.0	0.000	A
C-AB	0	1123	0.000	0	0.0	0.000	A
C-A	708			708			
A-B	0			0			
A-C	610			610			

18:00 - 18:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	309	0.000	0	0.0	0.000	A
C-AB	0	1049	0.000	0	0.0	0.000	A
C-A	845			845			
A-B	0			0			
A-C	728			728			

18:15 - 18:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	213	0.000	0	0.0	0.000	A
C-AB	0	946	0.000	0	0.0	0.000	A
C-A	1035			1035			
A-B	0			0			
A-C	892			892			

18:30 - 18:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	213	0.000	0	0.0	0.000	A
C-AB	0	946	0.000	0	0.0	0.000	A
C-A	1035			1035			
A-B	0			0			
A-C	892			892			

18:45 - 19:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	309	0.000	0	0.0	0.000	A
C-AB	0	1049	0.000	0	0.0	0.000	A
C-A	845			845			
A-B	0			0			
A-C	728			728			

19:00 - 19:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	0	371	0.000	0	0.0	0.000	A
C-AB	0	1123	0.000	0	0.0	0.000	A
C-A	708			708			
A-B	0			0			
A-C	610			610			

Proposed Layout - 2035 With Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	R449 / Site Access	T-Junction	Two-way	0.88	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	73	Stream B-AC

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D13	2035 With Dev	AM	ONE HOUR	07:45	09:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - R449 W		✓	698	100.000
B - Site Access N		✓	58	100.000
C - R449 E		✓	281	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	0	11	687
	B - Site Access N	11	0	47
	C - R449 E	234	47	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	10	10	10
	B - Site Access N	10	10	10
	C - R449 E	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.14	9.43	0.2	A
C-AB	0.10	7.83	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	44	530	0.082	43	0.1	7.396	A
C-AB	35	588	0.060	35	0.1	6.508	A
C-A	176			176			
A-B	8			8			
A-C	517			517			

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	52	495	0.105	52	0.1	8.129	A
C-AB	42	556	0.076	42	0.1	7.006	A
C-A	210			210			
A-B	10			10			
A-C	618			618			

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	64	446	0.143	64	0.2	9.422	A
C-AB	52	512	0.101	52	0.1	7.823	A
C-A	258			258			
A-B	12			12			
A-C	756			756			

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	64	446	0.143	64	0.2	9.431	A
C-AB	52	512	0.101	52	0.1	7.826	A
C-A	258			258			
A-B	12			12			
A-C	756			756			

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	52	495	0.105	52	0.1	8.141	A
C-AB	42	556	0.076	42	0.1	7.012	A
C-A	210			210			
A-B	10			10			
A-C	618			618			

09:00 - 09:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	44	530	0.082	44	0.1	7.412	A
C-AB	35	588	0.060	35	0.1	6.515	A
C-A	176			176			
A-B	8			8			
A-C	517			517			

Proposed Layout - 2035 With Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	R449 / Site Access	T-Junction	Two-way	0.20	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	21	Stream B-AC

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D14	2035 With Dev	PM	ONE HOUR	17:45	19:15	15

Default vehicle mix	Vehicle mix source	PCU Factor for a HV (PCU)
✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - R449 W		✓	813	100.000
B - Site Access N		✓	21	100.000
C - R449 E		✓	952	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	0	3	810
	B - Site Access N	4	0	17
	C - R449 E	940	12	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - R449 W	B - Site Access N	C - R449 E
From	A - R449 W	10	10	10
	B - Site Access N	10	10	10
	C - R449 E	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.07	12.37	0.1	B
C-AB	0.03	7.85	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	16	463	0.034	16	0.0	8.040	A
C-AB	9	561	0.016	9	0.0	6.523	A
C-A	708			708			
A-B	2			2			
A-C	610			610			

18:00 - 18:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	19	407	0.046	19	0.0	9.269	A
C-AB	11	524	0.021	11	0.0	7.020	A
C-A	845			845			
A-B	3			3			
A-C	728			728			

18:15 - 18:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	23	314	0.074	23	0.1	12.361	B
C-AB	13	472	0.028	13	0.0	7.847	A
C-A	1035			1035			
A-B	3			3			
A-C	892			892			

18:30 - 18:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	23	314	0.074	23	0.1	12.371	B
C-AB	13	472	0.028	13	0.0	7.847	A
C-A	1035			1035			
A-B	3			3			
A-C	892			892			

18:45 - 19:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	19	407	0.046	19	0.0	9.276	A
C-AB	11	524	0.021	11	0.0	7.021	A
C-A	845			845			
A-B	3			3			
A-C	728			728			

19:00 - 19:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
B-AC	16	463	0.034	16	0.0	8.047	A
C-AB	9	561	0.016	9	0.0	6.526	A
C-A	708			708			
A-B	2			2			
A-C	610			610			

AECOM Imagine it. Delivered.

Proposed Celbridge Civic Amenity Centre

Trip Generation Technical Note

February 2019

Quality information

Prepared by	Checked by	Approved by
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Revision History

Revision	Revision date	Details	Authorised	Name	Position
1	21.02.2019	Planning Submission	BMc	Brian McMahon	Principal Engineer

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Table of Contents

Figures

Tables

1. Introduction

This Technical Note has been prepared to assess the potential trip generation for the proposed Celbridge Civic Amenity Centre. The proposed site is to be one hectare in size and accommodate between 5,000 and 7,500 tonnes of waste per year. The proposed site is located on the R449, a link road between the R405 in Celbridge and the R148 in Leixlip which passes via the M4 motorway interchange. The site is approximately 406m from the M4 Business Park and 312m from the M4 interchange, as illustrated by Figure 1.

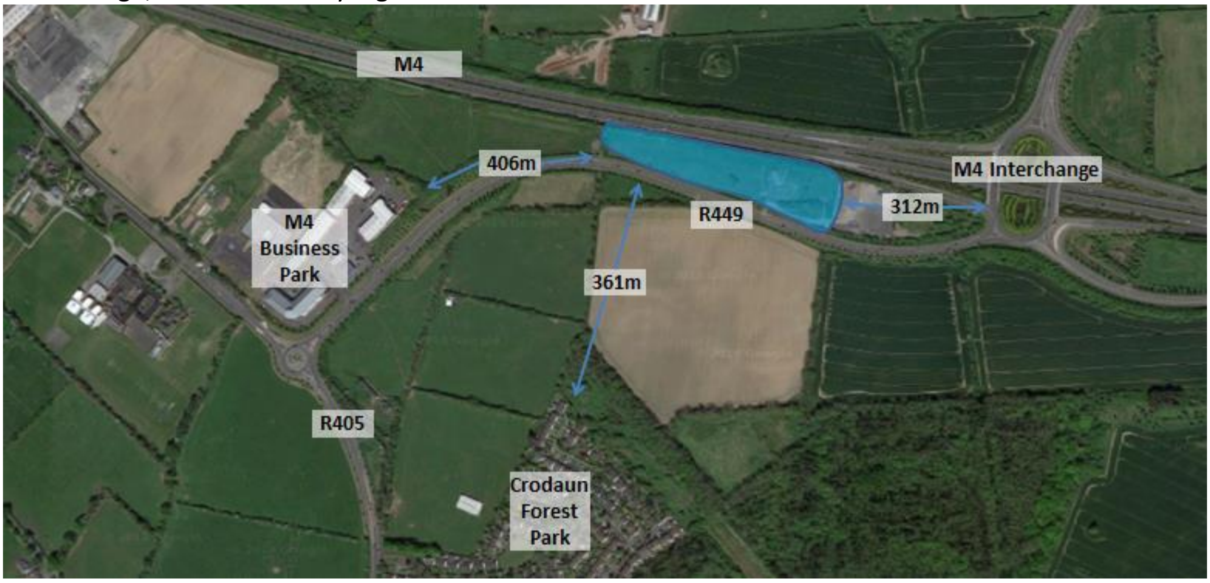

Figure 1: Proposed Site Location

2. Site Details

The site is expected to deal with between 5,000 and 7,500 tonnes of waste per year. The main catchment areas are to include the local towns of: Kilcock, Maynooth, Leixlip, Celbridge and Clane, with a total combined population of 76,800, and the adjacent areas of Lucan and Palmerstown, with an approximate population of 100,000, as illustrated by Figure 2.

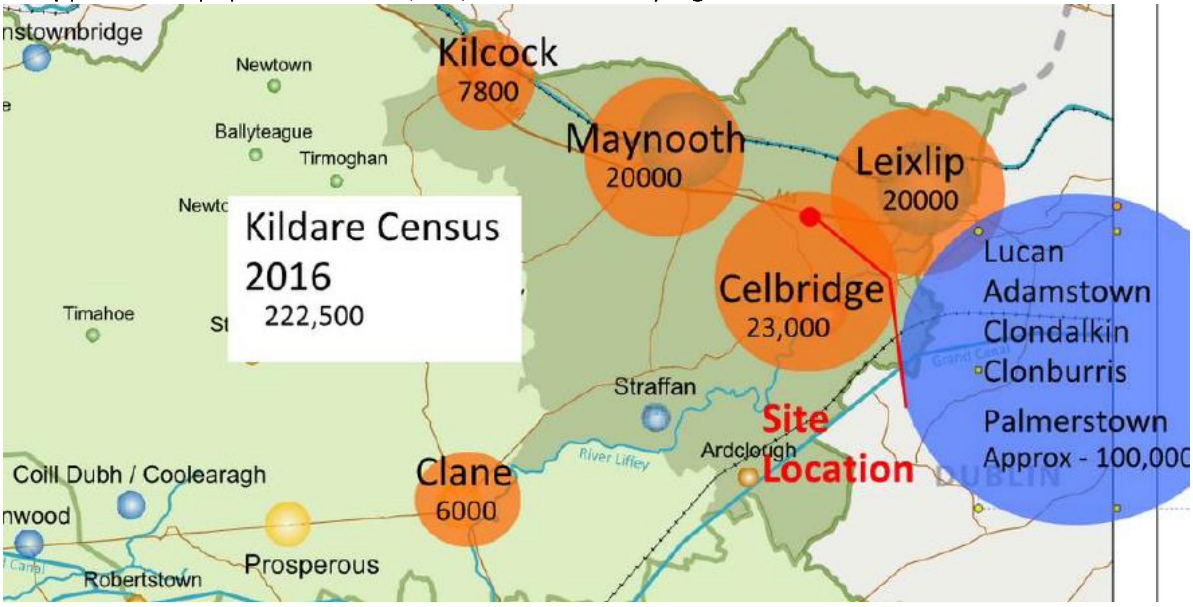

Figure 2: Catchment Area

The Civic Amenity Centre will cater for all waste streams including municipal waste. It is expected that municipal waste will account for some 58% of the waste stream at the Celbridge site. The site is approximately one hectare in size.

3. Trip Generation Methodology

In order to establish the number of trips the proposed development could generate, reference has been made to the latest version of the Trip Rate Information Computer System (TRICS) database to obtain the potential vehicular trip generation rates for the proposed civic amenity centre.

TRICS is an industry standard tool comprising a database of trip rates for developments in Ireland and the United Kingdom for transport planning purposes, specifically to quantify the trip generation of new developments.

The TRICS database was interrogated to identify developments with comparable characteristics to determine the anticipated level of trips that will be generated by the proposed development.

Following appropriate filtering in terms of site area, location and weekday counts, the TRICS database presented six sites for comparison and inclusion within the trip rate calculation:

- Blackburn, Lancashire, England;
- Cheshire, Northwest England;
- Worcester, West Midlands, England;
- Edinburgh, Scotland;
- Leeds, North England; and
- Limerick, Republic of Ireland.

Additionally, the daily traffic counts (daily total number of arrivals and departures) was analysed for a site in Ballyogan, within the Dun Laoghaire- Rathdown County Council district, for further comparison at local scale. This information was also included within the estimated trip rate.

Whilst it is noted that the majority of the above sites included within the assessment are located within the UK, AECOM considers that these sites are appropriate for establishing the number of trips to be generated by the proposed development.

The proposed Celbridge Civic Amenity Centre will accept municipal waste, while the two sites noted above from Ireland do not. Therefore these sites are excluded from our calculation when predicting the proposed trip rates.

We have therefore used the only other five sites from the TRICS database to predict the future trip rate in Celbridge. The five UK sites have trip rates which far exceed those at the two Irish sites, therefore the predicted trip generation is a robust and worst case trip generation for this assessment.

The following sections provide an assessment of the sites included within the TRICS assessment. The results are presented in Sections 5, 6, 7 and 8 with a summary in Section 9.

4. Background to Analysis Sites

4.1 Blackburn- TRICS Site Number: LC-12-A-04

This site is located in an area to the west of Blackburn Town Centre. It serves a population catchment of between 125,001 to 250,000 people within a 5 mile radius.

The site is approximately 0.41 hect and is located in a built-up area of industrial and retail development, with residential streets a bit further to the north and various town centre development further to the east. The site has 21 bays for waste stream loading. The site location is illustrated on Figure 3.

Figure 3: Blackburn Site Location

Materials disposed of at this site include the following:

- Aluminium foil, batteries, bicycles, books, bulky items, cans, car batteries, cardboard, ceramics, cooking oil, electrical goods, fluorescent light bulbs, fridges and freezers, furniture, garden waste, glass, hard plastics, hardcore and rubble, paint, paper, plastic bottles, printer cartridges, soil, fences and wood, scrap metal, shoes, sand, tetrapak cartons, textiles, tins, TV's and monitors, tyres, used engine oil, washing machines, dryers, dishwashers, white goods, timber, and yellow pages[1].
- **The site disposes of municipal waste- requires permit[2].**

[1] Source: TRICS Database
[2] Source: Blackburn with Darwen Council Website: https://blackburn.gov.uk/Pages/Household-waste-and-recycling-centres-permit-terms-and-conditions.aspx

4.2 Cheshire- TRICS Site Number: CH-12-A-01

This site is located in the west of Chester, within the Sealand Industrial Estate area. The site is approximately 0.3 hect with 16 bays for waste disposal. It serves a population catchment of between 125,001 to 250,000 people within a 5 mile radius.

Chester City Football Club is located next to the site, with various industrial developments nearby. There is open land to the south and further to the west. The site location is illustrated on Figure 4.

Figure 4: Cheshire Site Location

Materials disposed of at this site include the following:

- Electrical equipment, plastics, furniture, garden waste, paper, oil, rubble and soil, wood, textiles, batteries, small and large domestic appliances, metal, fluorescent tubes, cans, cardboard and books[3].
- **The site disposes of municipal waste[4].**

[3] Source: TRICS Database
[4] Source: Cheshire West and Chester Council Website: https://www.cheshirewestandchester.gov.uk/residents/waste-and-recycling/find-a-recycling-centre/Chester%20Recycling%20Centre.aspx

4.3 Worchester - TRICS Site Number: WO-12-A-02

Worchester Civic Amenity Site is located on Horsford Road, Worchester in a suburban area, outside of the Town Centre. It serves a population catchment of between 100,001 and 125,000 people within 5 mile radius and is a 0.52 hect site with 20 waste bays. The site location is illustrated on Figure 5.

Figure 5: Worchester Site Location

Materials disposed of at this site include the following:

- Asbestos, Small Batteries, Books, CDs and DVDs, Cans, Automobile Batteries, Cardboard, Chemicals, Textiles and Shoes, Engine Oil, Fluorescent Tubes, Foil, Fridges and Freezers, Garden Waste, Glass, Low Energy Bulbs, Mobile Phones, Paper, Plastics, Printer Cartridges, Scrap Metal, Soil and Rubble, Televisions, Tyres, Small Electrical Appliances, Wood, General Waste, Gas Bottles[5].
- **This site disposes of municipal waste[6]**

[5] Source: TRICS Database
[6] Source: Worchesterhire Council Website: http://www.worcestershire.gov.uk/letswasteless/directory_record/4/hallow_road

4.4 Edinburgh- TRICS Site Number: EB-12-A-02

The site is on the edge of Edinburgh and is near the A900 which leads into central Edinburgh. It is approximately 0.62 hect, with 38 bays for waste traffic, and serves a catchment of between 250,001 to 500,000 people within a 5 mile radius. The site location is illustrated on Figure 6.

Figure 6: Edinburgh Site Location

Materials disposed of at this site include the following:

- Books, CD's, DVD's, Videos, Car Batteries, Cardboard, Engine Oil, Fridges, Glass, Green waste, Paper, rubble/Bricks, Scrap metal and Electronic Equipment[7].
- **The site disposes of municipal waste[8].**

[7] Source: TRICS Database
[8] Source: Edinburgh Council Website:
http://www.edinburgh.gov.uk/info/20001/bins_and_recycling/1611/household_waste_recycling_centre_rules_and_access/1
http://www.edinburgh.gov.uk/info/20001/bins_and_recycling/1610/household_waste_recycling_centres/1

4.5 Leeds- TRICS Site Number: WY-12-A-01

This site is located at the north-eastern edge of Leeds, with local routes heading towards various parts of the city and out into the countryside. The site is within an industrial area, with residential streets to the south and west and is approximately 0.73 hect in size. There are 18 waste loading bays and the site serves a population catchment of between 250,001 and 500,000 people within a 5 mile radius. The site location is illustrated on Figure 7.

Figure 7: Leeds Site Location

Materials disposed of at this site include the following:

- Paper, glass, clothing, books, and aluminium cans. No trade waste, chemicals or tyres are allowed[9].
- **The site does not accept municipal waste[10].**

[9] Source: TRICS Database
[10] Source: TRICS Database and Leeds Council Website: https://www.leeds.gov.uk/residents/bins-and-recycling/recycling-sites/east-leeds-household-waste-sorting-site

4.6 Limerick- TRICS Site Number: LI-12-A-01

The site is located out of town, to the west of Limerick. The site is on the N69, which leads to Tralee to the south west of Limerick. The site has 46 bays for waste loading and serves a catchment of between 75,001 and 100,000 people within a 5 mile radius. The site location is illustrated on Figure 8.

Figure 8: Limerick Site Location

Materials disposed of at this site include the following:

- Batteries, Cardboard, Clothing/Footwear, Cans, Electrical Goods, Glass, Fluorescent Tubes/Bulbs, Garden Waste, Gas Cylinders, Paint, Plastics, Paper, Polystyrene, Oil Filters, Scrap Metal, Tetra Packs, Untreated Timber, Waste Oils and White Goods[11].
- **This site does not accept municipal waste[12].**

[11] Source: TRICS Database
[12] Source: Limerick Civic Centre Website: http://limerickrecyclingcentres.ie/?page_id=13

4.7 Ballyogan

Ballyogan Civic Amenity Site is located within close proximity to Leopardstown Valley. It is approximately 0.62hect and deals with 7,800 tonnes of waste per year. The Site location is illustrated on Figure 9.

Figure 9: Ballyogan Site Location

Statistics were not available for the site from TRICS and are therefore based on client survey findings from site. As such, figures are not available for hourly trips, instead daily trips are analysed.

Materials disposed of at this site include the following:

- Aluminium Foil Trays, Batteries, Beverage Cans, Beverage Cartons, Books, Car Batteries, Cardboard Cards, Christmas Trees, Clothes and Textiles, Electrical Waste, Fluorescent Tubes, Food Cans, Glass Bottles and Jars, Green Waste, Magazines, Metal, Mobile phone, Newspapers, Paints, Paper, Plastic Bottles, Plastic Film, Plastics other, Print Cartridges. Used Gas Cylinders, Waste Oil, White Polystyrene and Wood.
- **This site does not accept municipal waste.**

5. TRICS Trip Generation Site Statistics

5.1 Blackburn- TRICS Site Number: LC-12-A-04

The following provides a breakdown of the average daily trips at the Blackburn site during weekday operation. It illustrates that the AM peak, highlighted in blue, is between 11:00 and 12:00 with 144 trips (includes arrivals and departures). The PM peak is then between 12:00 and 13:00, highlighted in green, with 259 trips (includes arrivals and departures).

Table 5.1: Blackburn: LC-12-A-04 Daily Trips

Time Period	Arr 785	Dep 782	Totals 1567	% of Daily Trips
06:00-07:00				
07:00-08:00	4	0	4	3
08:00-09:00	**25**	**23**	**48**	**5**
09:00-10:00	35	36	71	9
10:00-11:00	71	72	143	9
11:00-12:00	**72**	**72**	**144**	**17**
12:00-13:00	**144**	**115**	**259**	**15**
13:00-14:00	107	127	234	12
14:00-15:00	113	76	189	15
15:00-16:00	111	128	239	12
16:00-17:00	81	100	181	2
17:00-18:00	15	22	37	1
18:00-19:00	**7**	**11**	**18**	**3**
19:00-20:00				

It must be noted that the trip generation during the AM network peak (08:00 – 09:00) is relatively low with only 5% of total daily trips. The trip generation during the PM network peak (18:00 – 19:00) is also extremely low with only 3% of total daily trips. The network peaks are highlighted in purple.

The following then also provides a breakdown of the vehicle composition for average daily trips at the Blackburn site during weekday operation. It illustrates private motor cars account for 96% of daily trips and therefore the site does not add significant HGV pressure on existing road networks.

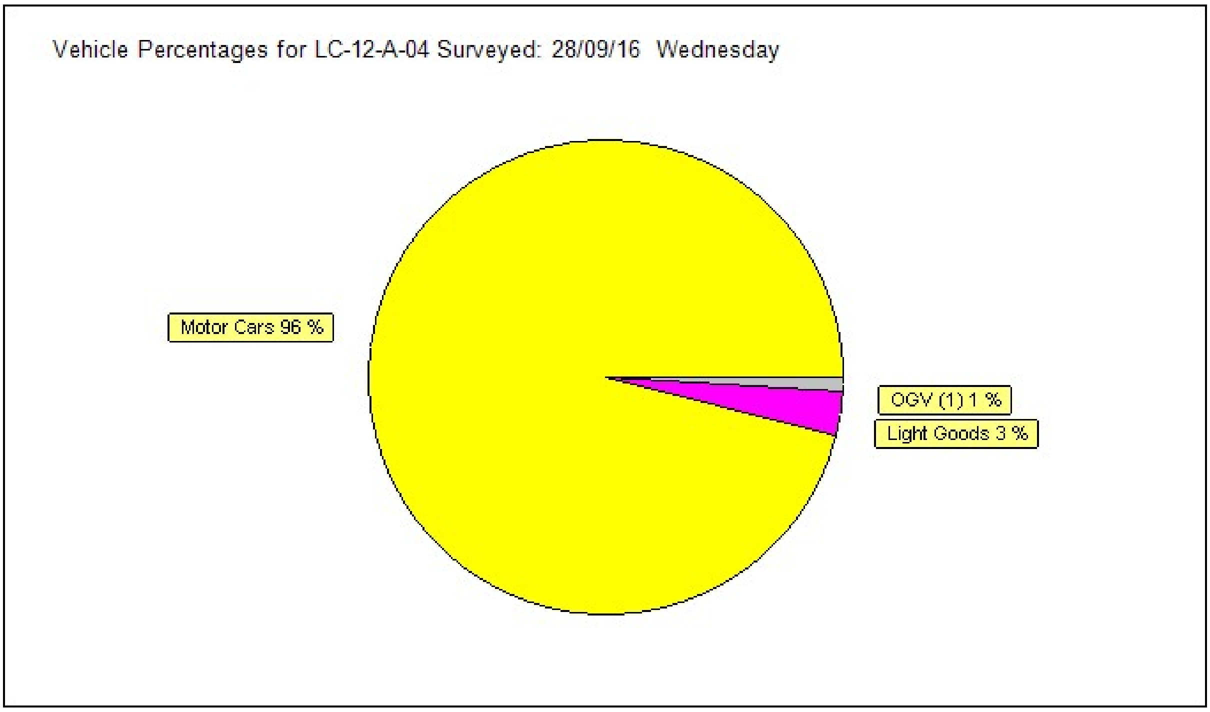

Figure 10: Blackburn: LC-12-A-04 Daily Trips Vehicle Composition

5.2 Cheshire- TRICS Site Number: CH-12-A-01

The following provides a breakdown of the average daily trips at the Cheshire site during weekday operation. It illustrates that the AM peak, highlighted in blue, is between 10:00 and 11:00 with 116 trips (includes arrivals and departures). The PM peak is then between 14:00 and 15:00, highlighted in green, with 129 trips (includes arrivals and departures).

Table 5.2 Cheshire: CH-12-A-01 Daily Trips

Time Period	Arr 408	Dep 409	Totals 817	% of Daily Trips
06:00-07:00				
07:00-08:00	5	4	9	5
08:00-09:00	**20**	**20**	**40**	**10**
09:00-10:00	42	40	82	14
10:00-11:00	**58**	**58**	**116**	**13**
11:00-12:00	54	52	106	14
12:00-13:00	56	58	114	14
13:00-14:00	56	56	112	16
14:00-15:00	**65**	**64**	**129**	**13**
15:00-16:00	51	56	107	0
16:00-17:00	1	1	2	5
17:00-18:00				
18:00-19:00				

It must be noted that the trip generation during the AM network peak (08:00 – 09:00) is relatively low with only 10% of total daily trips. The trip generation during the PM network peak (18:00 – 19:00) is not available for this site as it exceeds the site's opening hours (closes at 17:00). The network peaks are highlighted in purple.

The following provides a breakdown of the vehicle composition for average daily trips at the Cheshire site during weekday operation. It illustrates private motor cars account for 92% of daily trips and therefore the site does not add significant HGV pressure on existing road networks.

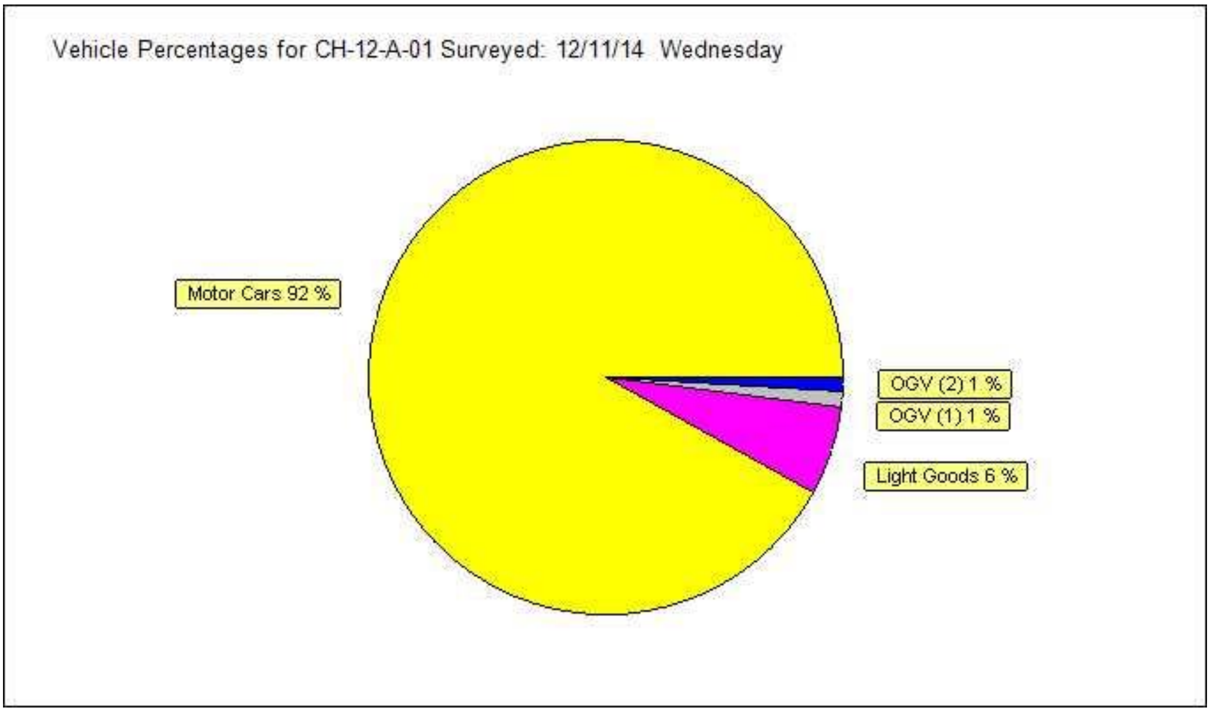

Figure 11: Cheshire: CH-12-A-01 Daily Trips Vehicle Composition

5.3 Worchester- TRICS Site Number: WO-12-A-02

The following provides a breakdown of the average daily trips at the Worchester site during weekday operation. It illustrates that the AM peak is between 11:00 and 12:00, highlighted in blue, with 152 trips (includes arrivals and departures). The PM peak is then between 12:00 and 13:00, highlighted in green, with 58 trips (includes arrivals and departures).

Table 5.3: Worchester: WO-12-A-02 Daily Trips

Time Period	Arr 279	Dep 286	Totals 565	% of Daily Trips
07:00-08:00				
08:00-09:00	**35**	**38**	**73**	**13**
09:00-10:00	61	54	115	20
10:00-11:00	72	71	143	25
11:00-12:00	**77**	**75**	**152**	**27**
12:00-13:00	**27**	**31**	**58**	**10**
13:00-14:00	4	11	15	3
14:00-15:00	2	1	3	1
15:00-16:00	1	3	4	1
16:00-17:00	0	2	2	0
17:00-18:00				
18:00-19:00				

It must be noted that the trip generation during the AM network peak (08:00 – 09:00) is relatively low with only 13% of total daily trips. The trip generation during the PM network peak (18:00 – 19:00) is not available for this site as it exceeds the site's opening hours (closes at 17:00). The network peaks are highlighted in purple.

The following provides a breakdown of the vehicle composition for average daily trips at the Worchester site during weekday operation. It illustrates private motor cars account for 97% of daily trips and therefore the site does not add significant HGV pressure on existing road networks

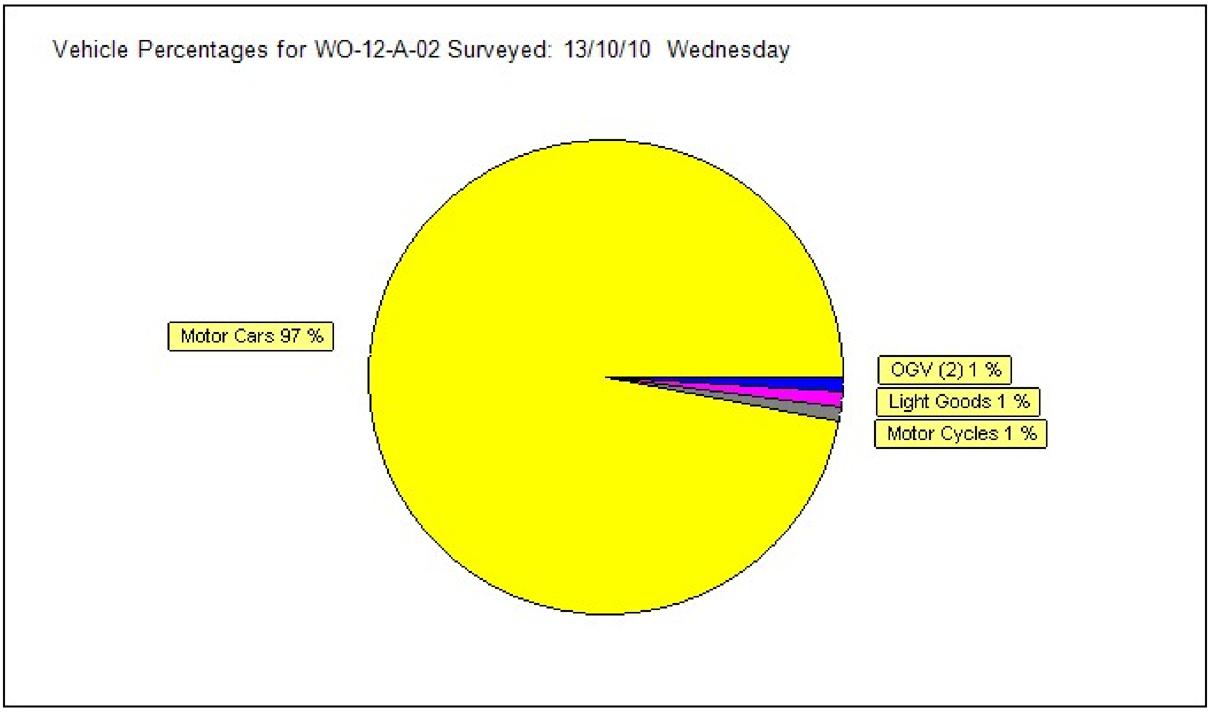

Figure 12: Worchester: WO-12-A-02 Daily Trips Vehicle Composition

5.4 Edinburgh- TRICS Site Number: EB-12-A-02

The following provides a breakdown of the average daily trips at the Edinburgh site during weekday operation. It illustrates that the AM peak is between 10:00 and 11:00, highlighted in blue, with 73 trips (includes arrivals and departures). The PM peak is then between 14:00 and 15:00, highlighted in green, with 90 trips (includes arrivals and departures).

Table 5.4: Edinburgh: EB-12-A-02 Daily Trips

Time Period	Arr 293	Dep 293	Totals 586	% of Daily Trips
06:00-07:00				
07:00-08:00	6	2	8	1
08:00-09:00	**9**	**9**	**18**	**3**
09:00-10:00	27	21	48	8
10:00-11:00	**35**	**38**	**73**	**12**
11:00-12:00	37	34	71	12
12:00-13:00	27	27	54	9
13:00-14:00	38	36	74	13
14:00-15:00	**45**	**45**	**90**	**15**
15:00-16:00	39	42	81	14
16:00-17:00	12	17	29	5
17:00-18:00	10	11	21	4
18:00-19:00	**8**	**11**	**19**	**3**
19:00-20:00				

It must be noted that the trip generation during the AM network peak (08:00 – 09:00) is extremely low with only 3% of total daily trips. The trip generation during the PM network peak (18:00 – 19:00) is also extremely low with only 3% of total daily trips. The network peaks are highlighted in purple.

The following provides a breakdown of the vehicle composition for average daily trips at the Edinburgh site during weekday operation. It illustrates private motor cars account for 77% of daily trips and therefore the site does not add significant HGV pressure on existing road networks.

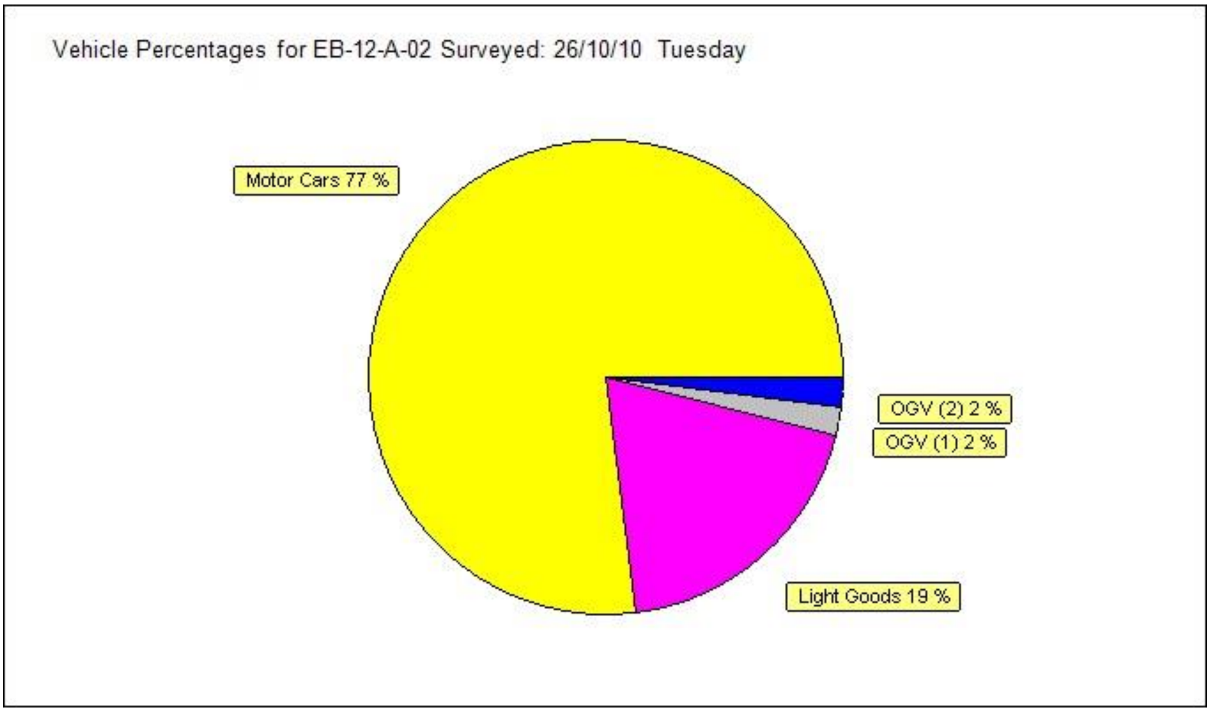

Figure 13: Edinburgh: EB-12-A-02 Daily Trips Vehicle Composition

5.5 Leeds- TRICS Site Number: WY-12-A-01

The following provides a breakdown of the average daily trips at the Leeds site during weekday operation. It illustrates that the AM peak is between 09:00 and 10:00, highlighted in blue, with 46 trips (includes arrivals and departures). The PM peak is then between 13:00 and 14:00, highlighted in green, with 48 trips (includes arrivals and departures).

Table 5.5: Leeds: WY-12-A-01 Daily Trips

Time Period	Arr 173	Dep 176	Totals 349	% of Daily Trips
06:00-07:00				
07:00-08:00	10	8	18	5
08:00-09:00	**9**	**9**	**18**	**5**
09:00-10:00	**23**	**23**	**46**	**13**
10:00-11:00	15	16	31	9
11:00-12:00	22	20	42	12
12:00-13:00	23	23	46	13
13:00-14:00	**24**	**24**	**48**	**14**
14:00-15:00	15	15	30	9
15:00-16:00	22	24	46	13
16:00-17:00	10	12	22	6
17:00-18:00	0	2	2	1
18:00-19:00				

It must be noted that the trip generation during the AM network peak (08:00 – 09:00) is relatively low with only 5% of total daily trips. The trip generation during the PM network peak (18:00 – 19:00) is not available for this site as it exceeds the site's opening hours (closes at 18:00). The network peaks are highlighted in purple.

The following provides a breakdown of the vehicle composition for average daily trips at the Leeds site during weekday operation. It illustrates private motor cars account for 87% of daily trips and therefore the site does not add significant HGV pressure on existing road networks.

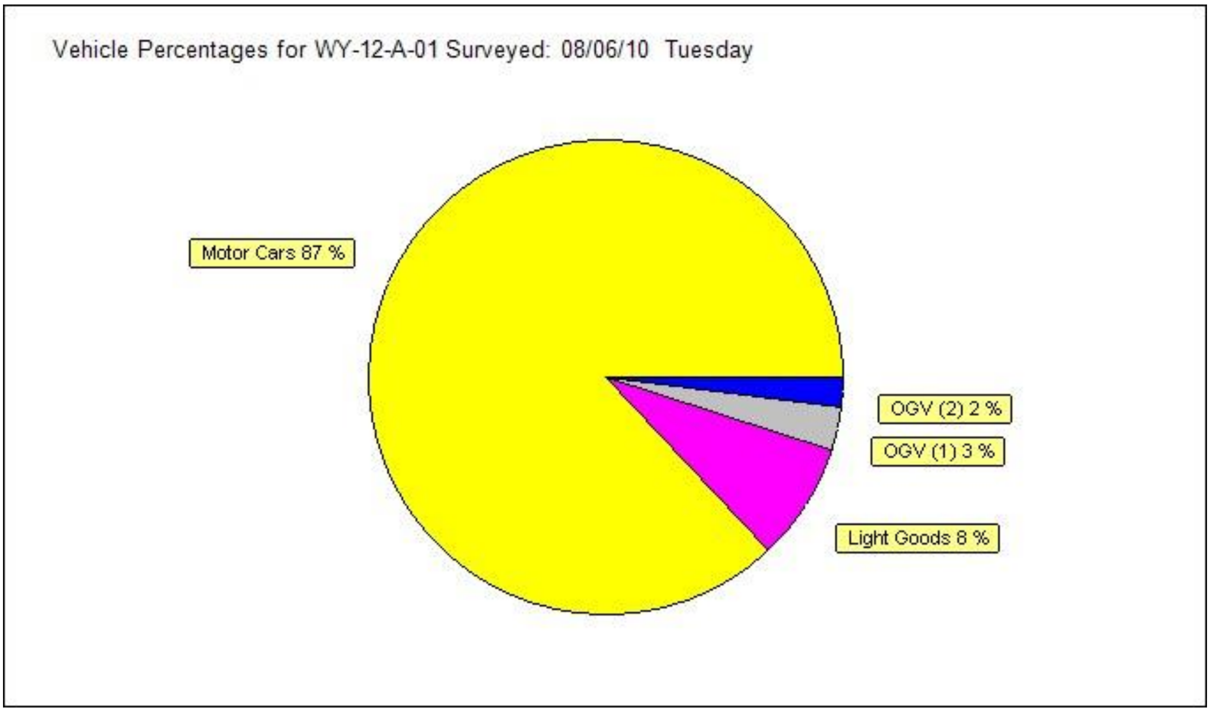

Figure 14: Leeds: WY-12-A-01 Daily Trips Vehicle Composition

5.6 Limerick- TRICS Site Number: LI-12-A-01

The following provides a breakdown of the average daily trips at the Limerick site during weekday operation. It illustrates that the AM peak is between 09:00 and 10:00, highlighted in blue, with 37 trips (includes arrivals and departures). The PM peak is then between 12:00 and 13:00, highlighted in green, with 26 trips (includes arrivals and departures).

Table 5.6: Limerick: LI-12-A-01 Daily Trips

Time Period	Arr 98	Dep 98	Totals 196	% of Daily Trips
07:00-08:00				
08:00-09:00				
09:00-10:00	**19**	**18**	**37**	**19**
10:00-11:00	14	13	27	14
11:00-12:00	16	15	31	16
12:00-13:00	**14**	**12**	**26**	**13**
13:00-14:00	9	10	19	10
14:00-15:00	7	7	14	7
15:00-16:00	8	4	12	6
16:00-17:00	11	14	25	13
17:00-18:00	0	5	5	3
18:00-19:00				

It must be noted that the trip generation during the AM network peak (08:00 – 09:00) is not available for the site as it is outside the site's opening hours (opens at 09:00). The trip generation during the PM network peak (18:00 – 19:00) is also not available for this site as it exceeds the site's opening hours (closes at 18:00). The network peaks are highlighted in purple.

The following provides a breakdown of the vehicle composition for average daily trips at the Limerick site during weekday operation. It illustrates private motor cars account for 87% of daily trips and therefore the site does not add significant HGV pressure on existing road networks.

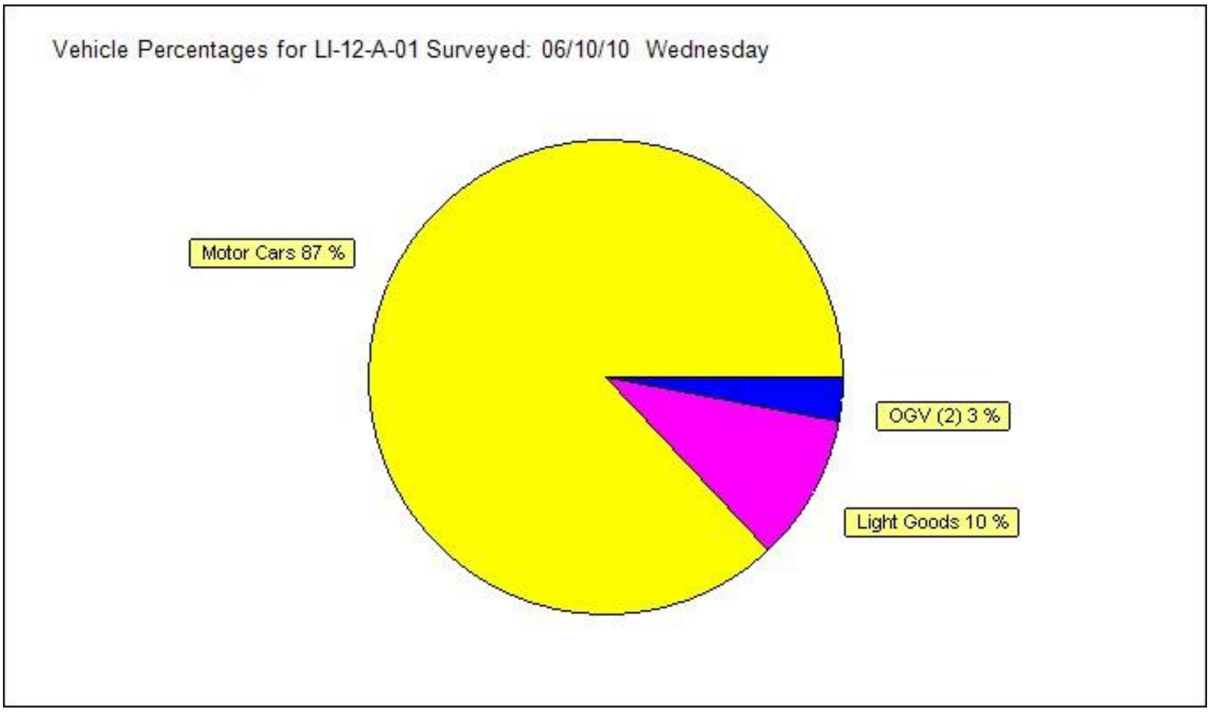

Figure 15: Limerick: LI-12-A-01 Daily Trips Vehicle Composition

5.7 Ballyogan

Statistics were not available for the site at Ballyogan from TRICs and are therefore based on the operator’s survey findings from site. As such, statistics are not available for hourly trips, instead daily trips are analysed. This is illustrated on Table 5.7.

Table 5.7: Ballyogan Trip Statistics

Details	Statistic
Total Daily Trip for Weekdays	50,967
Operational Days	215
Average Arrivals to site Per Operational Weekday	237.06
Average Departures from site Per Operational Weekday	237.06
Total Trips to and from site per Weekday	**474**

These statistics are incorporated into an analysis in Section 6 to illustrate how Ballyogan, a site within the Greater Dublin area, compares to the average civic amenity centre daily trips.

6. TRICS and Site Analysis Results

Table 6.1 provides a calculated, ranked, comparison table for each of the sites average daily trip rate and trip total generation statistics. Daily trip statistics where used as the basis for comparison as this provided the best opportunity to compare available traffic statistics with a local site: Ballyogan.

Table 6.1: Total Trip Rates and Daily Trips Comparison

Rank	Site Ref	Mun. Waste	Description	Location	Area	Arrivals (Daily Trip Rate)	Depart (Daily Trip Rate)	Total Trip Daily Rate	Arr	Dep	Total Daily Trip Generation
1	LC-12-A-04	Yes-Permit	RECYCLING CENTRE	BLACKBURN	0.41	**1790.244**	**1770.732**	**3561.0**	734	726	**1460**
2	CH-12-A-01	Yes	RECYCLING CENTRE	CHESHIRE	0.3	**1276.667**	**1283.333**	**2560.0**	383	385	**768**
3	WO-12-A-02	Yes	CIVIC AMENITY	WORCESTER	0.21	**1161.905**	**1180.952**	**2342.9**	244	248	**492**
4	EB-12-A-02	Yes	RECYCLING CENTRE	EDINBURGH	0.62	**419.355**	**419.355**	**838.7**	260	260	**520**
5	**BALLY-OGAN**	**No**	**CIVIC AMENITY**	**DUN LAOGHAIRE**	**0.62**	**382.26**	**382.26**	**764.52**	**237**	**237**	**474**
6	WY-12-A-01	No	CIVIC AMENITY SITE	LEEDS	0.73	**210.959**	**215.068**	**426.0**	154	157	**311**
7	LI-12-A-01	No	RECYCLING CENTRE	NEAR LIMERICK	0.52	**188.462**	**178.846**	**367.3**	98	93	**191**

Based on the findings in Table 6.1, the four sites which accept municipal waste are ranked higher than the three sites that do not accept municipal waste. Therefore to get a robust and worst case trip generation the Leeds and Limerick sites should be removed from the list of sites.

7. TRICS Average AM and PM Trip Generation

Table 7.1 presents a calculated AM and PM trip rate of arrivals and departures throughout an average weekday for all six TRICS sites.

Table 7.1: Average Daily AM and PM Trip Rates (One Hectare Calculation Factor)

Time Range	Days	Ave. Area	Arrival Trip Rate	No. Days	Ave. Area	Departures Trip Rate	No. Days	Ave. Area	Total Trip Rate
06:00-07:00									
07:00-08:00	4	0.51	12.136	4	0.51	6.796	4	0.51	18.932
08:00-09:00	**6**	**0.47**	**35.125**	**6**	**0.47**	**35.484**	**6**	**0.47**	**70.609**
09:00-10:00	6	0.47	74.194	6	0.47	68.817	6	0.47	143.011
10:00-11:00	6	0.47	94.982	6	0.47	96.057	6	0.47	191.039
11:00-12:00	**6**	**0.47**	**99.642**	**6**	**0.47**	**96.057**	**6**	**0.47**	**195.699**
12:00-13:00	**6**	**0.47**	**104.301**	**6**	**0.47**	**95.341**	**6**	**0.47**	**199.642**
13:00-14:00	6	0.47	85.305	6	0.47	94.624	6	0.47	179.929
14:00-15:00	6	0.47	88.53	6	0.47	74.552	6	0.47	163.082
15:00-16:00	6	0.47	83.154	6	0.47	92.115	6	0.47	175.269
16:00-17:00	6	0.47	41.219	6	0.47	52.33	6	0.47	93.549
17:00-18:00	5	0.5	10.04	5	0.5	16.064	5	0.5	26.104
18:00-19:00	**2**	**0.52**	**14.563**	**2**	**0.52**	**21.359**	**2**	**0.52**	**35.922**
19:00-20:00									
Daily Trip Rates:			**743.191**			**749.596**			**1492.787**

In order to then provide a robust daily trip generation assessment for the Celbridge site, an assessment is also provided in Table 7.2 that is based only on sites which accept municipal waste: Blackburn, Cheshire, Worchester, and Edinburgh. This ensures that the assessment presents findings most comparable to the average daily trip generation Celbridge can expect due to its accepted waste streams.

Table 7.2: Average Daily AM and PM Trip Rates for Sites Which Accept Municipal Waste (One Hectare Calculation Factor)

Time Range	Days	Ave. Area	Arrival Trip Rate	No. Days	Ave. Area	Departures Trip Rate	No. Days	Ave. Area	Total Trip Rate
06:00-07:00									
07:00-08:00	3	0.44	11.278	3	0.44	4.511	3	0.44	15.789
08:00-09:00	**4**	**0.38**	**57.792**	**4**	**0.38**	**58.442**	**4**	**0.38**	**116.234**
09:00-10:00	4	0.38	107.143	4	0.38	98.052	4	0.38	205.195
10:00-11:00	**4**	**0.38**	**153.247**	**4**	**0.38**	**155.195**	**4**	**0.38**	**308.442**
11:00-12:00	4	0.38	155.844	4	0.38	151.299	4	0.38	307.143
12:00-13:00	**4**	**0.38**	**164.935**	**4**	**0.38**	**150**	**4**	**0.38**	**314.935**
13:00-14:00	4	0.38	133.117	4	0.38	149.351	4	0.38	282.468
14:00-15:00	4	0.38	146.104	4	0.38	120.779	4	0.38	266.883
15:00-16:00	4	0.38	131.169	4	0.38	148.701	4	0.38	279.87
16:00-17:00	4	0.38	61.039	4	0.38	77.922	4	0.38	138.961
17:00-18:00	3	0.41	20.161	3	0.41	26.613	3	0.41	46.774
18:00-19:00	**2**	**0.52**	**14.563**	**2**	**0.52**	**21.359**	**2**	**0.52**	**35.922**
19:00-20:00									
Daily Trip Rates:			**1156.392**			**1162.224**			**2318.616**

8. AM And PM Peak Network Trip Generation

The latest version of the Trip Rate Information Computer System (TRICS v 7.5.2) was used to calculate the quantum of vehicle trips likely to be generated by a development of the scale and type proposed – 1 hectare. The full outputs from the TRICS analysis is shown in Table 7.2, whilst the trip rates and the resulting trip generations for the peak periods are illustrated in Tables 8.1 and 8.2 below.

Table 8.1: Proposed Trip Rates Per Hectare

Development	TRICs Land Use	AM Peak Hour (08:00 – 09:00)		PM Peak Hour (18:00 – 19:00)	
		Arrivals	Departures	Arrivals	Departures
Civic Amenity Centre	07 V - Library	57.792	58.442	14.563	21.359

Table 8.2: Proposed Trip Generations

Development	Development Size	AM Peak Hour (08:00 – 09:00)		PM Peak Hour (18:00 – 19:00)	
		Arrivals	Departures	Arrivals	Departures
Civic Amenity Centre	1 hectare	58	58	15	21
Peak Hour Totals		116		36	

Table 8.2 demonstrates that the anticipated trip generations associated with the development are 116 and 36 trips respectively during the morning (08:00 – 09:00) and evening (18:00 – 19:00) peak hour periods.

9. Summary

Summarising the above analysis, a number of key trends have become apparent that will provide useful technical information in relation to the Celbridge Civic Amenity Centre proposal.

To begin with, it is of significant note that average trends indicate that the AM peak for civic amenity sites (accepting and not accepting municipal waste combined) is between 11:00 and 12:00, as highlighted in blue on Table 7.1, with a trip rate of 195.70. The PM peak of between 12:00 and 13:00, as highlighted in green in Table 7.1, has a trip rate of 199.64. These development peaks are outside of Celbridge's network AM peak (08:00 -09:00) and PM peak (18:00 – 19:00) hours. Figure 16 plots the combined total hourly trip rates for the six combined TRICS sites to illustrate development trip generation.

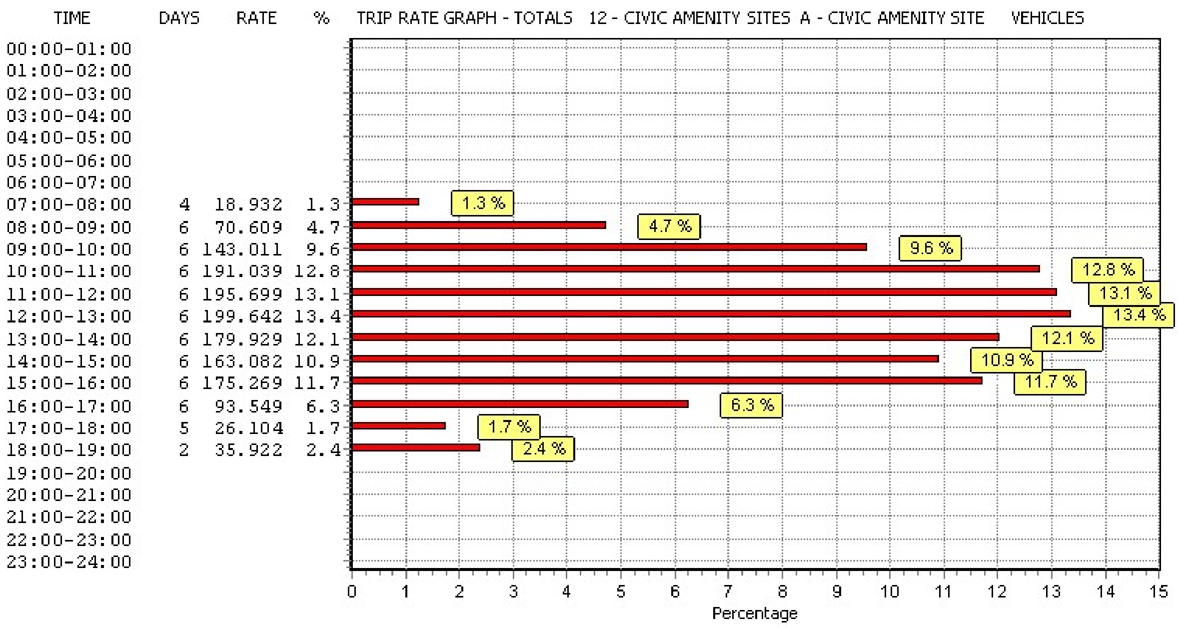

Figure 16: Total Average Hourly Trip Rates (Six TRICS Sites Accepting and Not Accepting Municipal Waste Combined)

Assessing only sites which also accept municipal waste, Table 7.2, also demonstrates that on average the AM development peak, between 10:00 and 11:00, and the PM development peak, between 12:00 and 13:00, falls outside the proposed site's network peaks (AM: 08:00 – 09:00 and PM: 18:00 – 19:00). Again, Figure 17 plots the combined total hourly trip rates for the four sites which accept municipal waste in order to demonstrate the impact on trip generation flows.

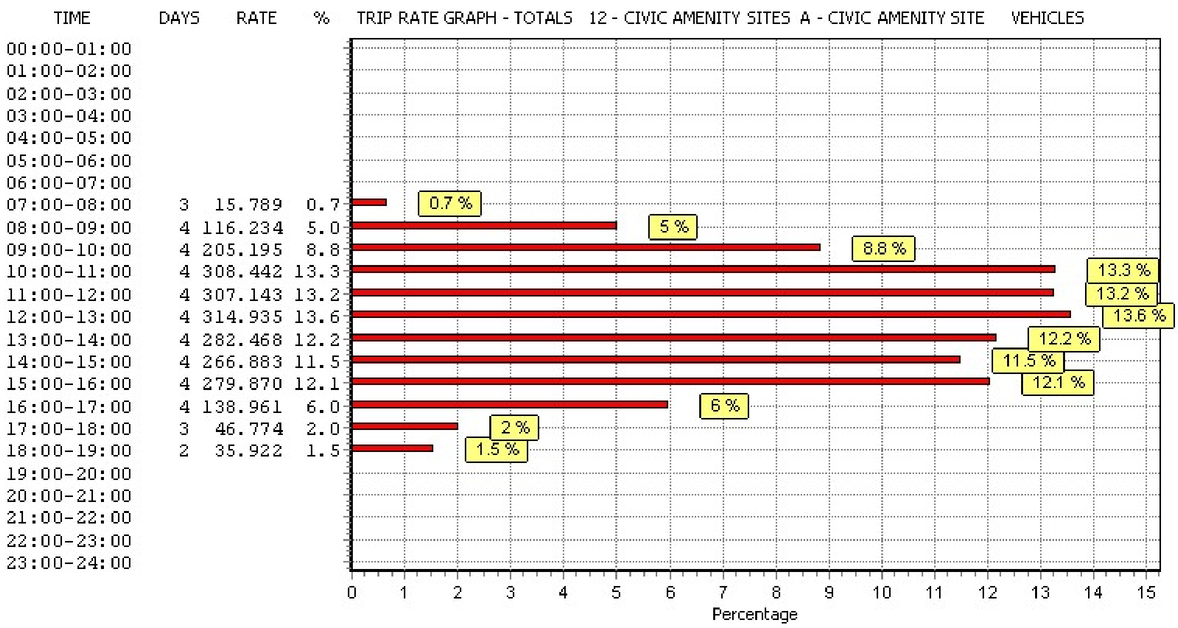

Figure 17: Total Average Hourly Trip Rates (Only Sites Which Accept Municipal Waste)

These findings together indicate that network flows should not see significant disruption due to traffic streams going to and from the proposed Civic Amenity Centre because development peaks are outside of the network peak hours.Finally, the analysis has also highlighted that private motors are the predominant trip takers to civic amenity centres, with 89% of the modal split, and therefore the site will not significantly increase HGV presence on the road network.