Appendix A4.1 Road and New Site Access Design Technical Note

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Technical Note

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Client	Kildare County Council
Project Name	**Kerdiffstown Landfill Remediation Project**
Subject	**Road and New Site Access Design Technical Note**
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Introduction

The purpose of this Technical Note is to outline the design criteria applied to the provision of an at-grade roundabout on L2005 Kerdiffstown Road, and identify the likely benefits and disbenefits. Discussion of design criteria applied for a new adjacent footpath and cycleways provision is also undertaken to facilitate future public access to the end-use of the site, comprising a multi-use public park with sports facilities.

1.1 Background

The site is currently closed with only KCC personnel accessing the site to undertake day to day management, and security guards attend on shifts to provide 24 hour security to the site. Intermittent access is required from visitors or road tankers, accessing the site to extract and remove leachate from the site.

The current access requires crossing of the L2005, Kerdiffstown Road, which is circa 5.4m wide, with a speed limit of 60kph. No footpaths exist alongside this road adjacent to the site currently.

1.2 Proposed Project

Remediation of the site is proposed, which will require importation of a significant quantity of materials. These materials will be brought to site in Heavy Goods Vehicles (HGVs). An outline project safety review indicated that the current traffic flow, with sight line restrictions combined with the access arrangements to the site presented a hazard to all road users. With the possibility of HGVs passing the current carriageway width was also identified as a constraint. There is also likely to be an increase in road users, and with the current road configuration the possibility of congestion due to vehicles crossing Kerdiffstown Road in order to access the site.

In the Operational Phase road tankers may continue to require access in instances when on site management systems are offline for maintenance. It is anticipated that the end-use of the proposed Project as a public park with multi-use sports pitches will also generate traffic to access the park, though largely cars.

Taking cognisance of the above to enable safe access for the short-medium and long-term, improvements were to be considered. A new road alignment is required from the existing roundabout to the access road of Kerdiffstown Landfill site to accommodate the increased use of HGVs on Kerdiffstown Road. As well as the new road layout, provisions are to be made for an increase in pedestrian and cycle movement which will be incorporated by the introduction of a new shared use cycleway/footway adjacent to the new road layout.

Road and Junction Design

1.3 Existing Constraints

As shown in Figure 1 the section of Johnstown Road between the existing roundabout and the entrance to Kerdiffstown Landfill site is heavily constrained. The existing carriageway is approximately 5.4m wide and located between Mike Brown Caravans site and two residential properties to the east and four residential properties to the west.

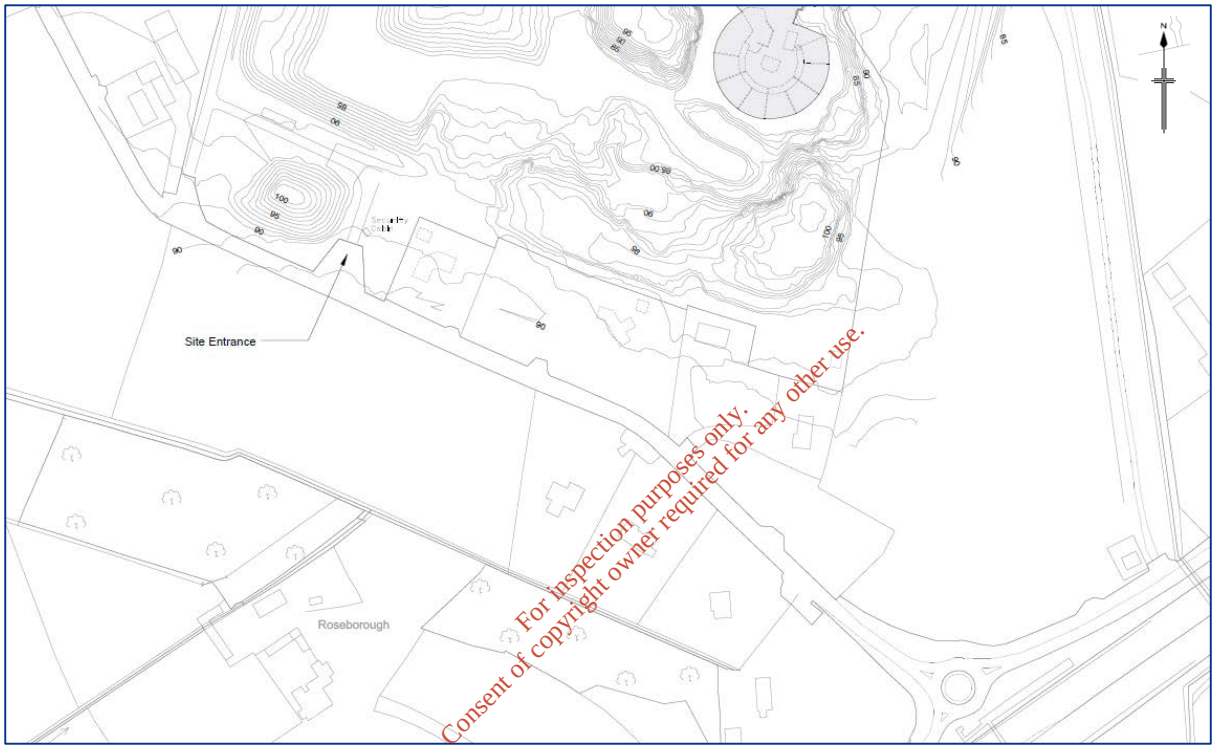

Figure 1: Existing Constraints at Kerdiffstown Landfill Site Access Location

1.4 Design

A number of options were considered for the reconfiguration of the access. However, on balance it was considered that a roundabout offered the most practical access arrangements.

The new road access arrangements are shown on the following drawings:

- 32EW5604-00-029 New Site Access Proposed Road Layout
- 32EW5604-00-030 New Site Access Proposed Pedestrian Access and Cycleway
- 32EW5604-00-031 Site Access Design Profiles

This technical note should be read in conjunction with the above drawings.

1.5 Engineering Standards

The roundabout has been designed in accordance with the National Road Authority Design Manual for Roads and Bridges (NRA DMRB) (DN-GEO-TD16 Geometric Design of Roundabouts). The geometric design parameters for all other roads are set out in the Design Manual for Urban Roads and Streets (DMURS) (Section 4.4.6 Alignment and Curvature). A summary of the desirable minimum standards for a 60kph and 30kph Design Speed is shown below in Table 1.

Location	Design Speed (kph)	Horizontal Curvature (Radius, m)	Vertical Curvature (K Value)		Stopping Sight Distance (m)
		Desirable Minimum Radius	Desirable Minimum Crest	Desirable Minimum Sag	Desirable Minimum
Johnstown Road	60	136 (Super-elevation of 2.5%) 178 (Adverse Camber of 2.5%)	8.2	9.2	65
Landfill Access Road	30	26 (Adverse Camber of 2.5%)	N/A	2.3	24

Table 1: KLRP Geometric Parameters

1.6 Design Alignment

1.6.1 Kerdiffstown Roundabout

The 'Kerdiffstown Roundabout' is a three-arm compact roundabout and is located approximately 40 metres south of the existing minor priority junction into Kerdiffstown Landfill site and has an Inscribed Circle Diameter (ICD) of 32 metres. The roundabout connects Johnstown Road east and west arms as well as the site access road.

1.6.2 Johnstown Road East Arm

Johnstown Road east arm is 351 metres long and begins at the southern extent of Johnstown Road approximately 20 metres north of the existing roundabout. The alignment ties in on a straight before transitioning into a right hand horizontal curve with adverse camber. The alignment continues through a sweeping left hand horizontal curve with adverse camber and immediately transitioning into a right hand horizontal curve with super-elevation and connecting into the proposed roundabout at the site.

1.6.3 Johnstown Road West Arm

Johnstown Road west arm is 111 metres long and ties into the northern extent of Johnstown Road. The alignment incorporates a left hand horizontal curve with super-elevation and connects into the proposed roundabout at the site.

1.6.4 The Site and Compound Access Roads

The access road to the site ties into the existing access road within the site and is approximately 70 metres long. It connects from a straight road into a right hand horizontal curve with adverse camber before it ties into the proposed roundabout. The access road junction to the new Landfill Infrastructure Compound ties into the site access road at Ch.45m.

The plan and profiles of the at-grade roundabout design are provided in Drawing Numbers 32EW5604-00-029 and 32EW5604-00-031.

Summary

A summary of the key benefits and disbenefits for provision of an at-grade roundabout to access the proposed Project is given in Table 2.

Benefits	Disbenefits
a) Removes safety issue with right turning traffic associated with the minor priority junction; b) Reduced landscape and visual impacts compared to other design options, primarily due to on-line and at-grade design; c) Reduced land-take compared to other options; d) Increased operational performance; e) Reduced impact on residential and commercial property on the east and west of Johnstown Road; and f) Higher standard of engineering design to existing layout.	g) Construction programme risk and time disbenefits compared to minor priority junction; h) Introduction of a roundabout can increase driver stress for divers not accessing landfill site; i) Road lighting required; and j) Localised increase in emissions of pollutants affecting air quality in the vicinity of the roundabout.

Table 2: Summary of Key Benefits and Disbenefits of an at-grade roundabout

Pedestrian and Cycle Access Design

1.7 Existing Constraints

The site is located to the north of Johnstown and east of Sallins along Kerdiffstown Road. The N7 presents a significant severance of non-motorised access from the settled areas of Johnstown and Naas to the south. This is mitigated by the presence of a pedestrian bridge directly south of the proposed project site connecting to Johnstown, and by shared use pathways along the frontage roads both north and south of the N7 and at the roundabouts at N7 Junction 8, as well as links to an underpass further east to Kill. Due to a low parapet design, the pedestrian bridge is unsafe for cyclists, who are required to walk bicycles across.

In the immediate proposed project site vicinity, a footway connects the pedestrian bridge to an uncontrolled crossing at an existing roundabout to the south of the site (north of the N7). The uncontrolled crossing is immediately adjacent to the give way line for the eastern arm of the junction, which does not meet current crossing guidance.

A shared use path on the north side of the existing roundabout provides access eastward to N7 Junction 8, and onwards to an underpass leading to Kill. The path narrows considerably in the westward direction along the existing Kerdiffstown Road and abruptly ends 95 metres north-west of the uncontrolled crossing location. Pedestrians and cyclists at this point must use the existing single lane carriageway, sharing with motorised vehicles. This condition persists until the road (named Church Avenue at this point) connects to the built up areas of Sallins, about 250 metres east of the R407.

There is no existing dedicated pedestrian or cycle access to the site at present. Figure 2 shows the carriageway and footpath cessation to the south-east of the site on Kerdiffstown Road.

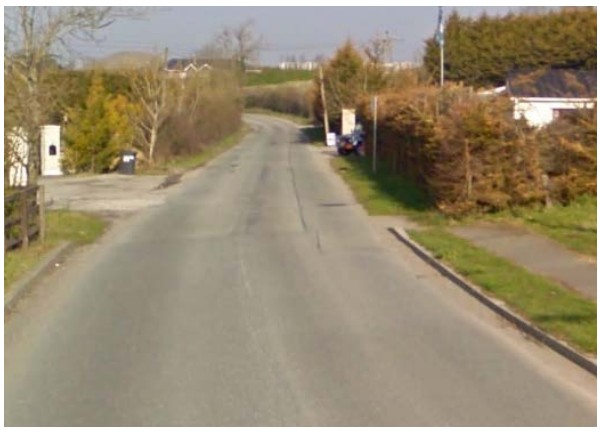

Figure 2: Existing Kerdiffstown Road (looking north-west), showing footpath cessation to the right.

1.8 Proposed Pedestrian and Cycle Access Design

1.8.1 General Shared Use Pathway Arrangement

The option taken forward is to reconfigure the access road to the site as a 7m single carriageway, with an additional dedicated shared use cycle and pedestrian space adjacent to connect the existing pedestrian bridge and area pathways to the new site access point. The design parameters for the shared use cycleway/footway are set out in the National Cycle Manual (NCM; Section 1.5.2 Width Calculator and Section 1.9.3 Shared Facilities). The guidance specifies that a shared use cycle/pedestrian facility should have a minimum combined width of 3.0m. The design also follows NCM guidance for verge/outside edge width adjacent to a 60kph road.

The new cycle/pedestrian facility will include a 0.75m verge and a 4.0m shared use path. There is one known width constraining point where the pathway would narrow to 3.8m for a very short distance (approximately 1.0m) though still complies with the minimum shared use path standards in the NCM. The verge and shared use pathway will be grade separated from the carriageway by a kerb. Wooden bollards matching those along the shared use paths either side of the N7 near Junction 8 would be installed in the verge to discourage parking, as per the example shown in Figure 3.

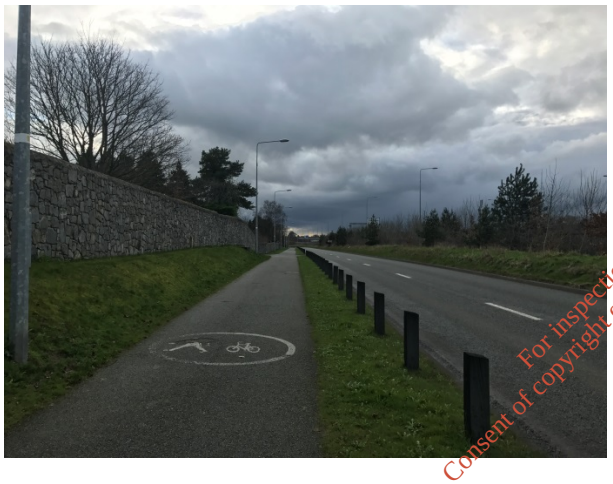

Figure 3: Wooden Bollards in Verge (typical of local area)

Near its southern extent, the proposed cycle/pedestrian facility would taper to match existing shared use path widths east from the existing roundabout.

1.8.2 Additional Pathway Using Existing Carriageway

The proposed site access point will include a roundabout at the site entrance, offline from the existing Kerdiffstown Road. It is proposed that a section of the existing carriageway be retained to provide space for a shared use path south of the new site access roundabout, re-joining the existing road north-west of the site access point. The road north of the proposed site access would operate beyond this point in its present state, and pedestrians and cyclists would be required to share the space with motorised vehicles. The proposed pathway would be carried westward to a point where good visibility between non-motorised users and vehicles on the carriageway can be ensured.

This shared use pathway would be 4.0m wide, exceeding minimum NCM guidelines, and would implement bends at both ends to slow cycle traffic and square up to the carriageway before cyclists and pedestrians cross or re-join the existing carriageway. Bollards will also be included to the north-west to encourage cyclists to slow and look for traffic before proceeding from the pathway to the existing carriageway.

1.8.3 Uncontrolled Crossings

Two uncontrolled crossings are proposed – one on the eastern arm of the existing roundabout adjacent to the pedestrian bridge over the N7, and another at the southern arm of the new site access roundabout. These would be located 20 metres back from the give way line at each roundabout to ensure good visibility and stopping

distance for motor vehicles. Crossings should be 4.0m wide. See Figure 4 for an example of this type of uncontrolled crossing on a 60kph road in the vicinity of the site.

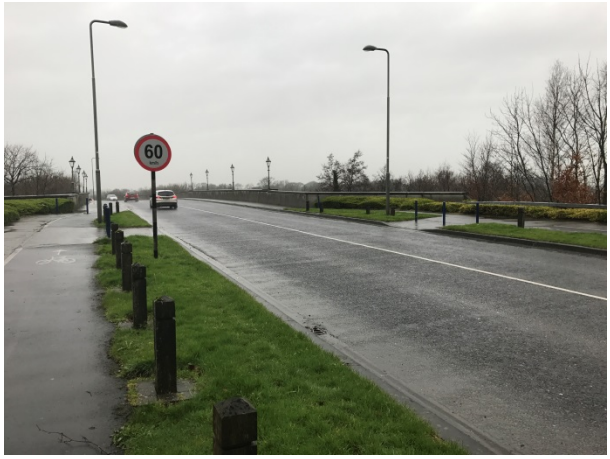

Figure 4: Uncontrolled crossing (typical of local area)

These uncontrolled crossing specifications follow guidance in TII's Geometric Design of Roundabouts (DN-GEO-03033, 2009) and NRA Pedestrian Crossing Specification and Guidance (2011). Dropped kerbs, tactile paving and overall crossing layout should meet standards as described in NRA Pedestrian Crossing Specifications and Guidance (2011) and drawing numbers PCS 001 (Uncontrolled Crossing Road Markings and General Layout) and PCS 013 (Uncontrolled Crossing Tactile Paving Detail).

1.8.4 Combination Transition from Carriageway to Shared Use Pathway

Provision is made for cyclists traveling south-east from Sallins to access the main shared use pathway between the proposed site entrance and the pedestrian bridge. This will utilise a combination transition (NCM, Section 4.10.4 Combination Transitions), which consists of a horizontal leftward movement from the carriageway toward the pathway, and a vertical transition to then lift the cyclist up to the grade of the shared use path. In addition, the design provides a right angle bend, yield marker, give way lines and an area of ladder tactile paving to indicate to cyclists to slow and give way to pedestrians and cyclists on the main pathway before proceeding. This combination transition is proposed to be installed south of the uncontrolled pedestrian crossing at the proposed new site access roundabout to reduce conflict.

1.8.5 Additional Ancillary Design Features

It is proposed that the access pathway between the new uncontrolled crossing at the existing roundabout and the pedestrian bridge be widened to 2.2 metres to match the width of the pedestrian bridge.

Signage informing cyclists to dismount and walk bicycles across the existing pedestrian bridge is proposed to be included at both north and south ends of the bridge. This would be prudent as the pedestrian bridge includes parapets of insufficient height for safe cycling. Signage must follow the NRA's Traffic Signs Manual. It is recommended that this be a restrictive sign type with supplementary information regarding the walking of bicycles across the bridge. Gradients for the proposed cycle/pedestrian facility are per the National Cycle Manual as follows: 1:20 (5%) preferred; maximum gradient of 1:12.5 (8.3%) allowable for short distances only and intermediate landing mitigation may be needed. To maintain effective drainage a crossfall of 1:40 is recommended and minimum longitudinal gradient of 1:200 (0.5%). Care should be taken at curves to ensure proper drainage. This will be confirmed during a detailed design stage.

Discussion

1.9 Key Features of Roundabout

The key features of an at-grade roundabout at the site access are:

- Constructability: The majority of the construction and associated works would be at the level of the existing Johnstown Road which would have constructability benefits. Traffic management will can also be implemented easily which will help maintain the access to the site during the works.
- Noise and Vibration: Construction noise and vibration impacts associated with constructing of the new road layout; however, the at-grade roundabout does not require significant excavation or structures which will have less impact on noise and vibrations. Traffic noise is expected to be comparable to the existing condition. However, based on experience on similar projects that involve roundabouts, the acceleration and deceleration of traffic on the approaches to a roundabout can sometimes lead to a perceived, rather than actual, change in traffic noise.
- Landscape and Visual: The introduction of street lighting on the roundabout and associated approach roads in an area that is currently not lit will have localised adverse landscape and visual impacts. There is significant property conflict from the existing roundabout to the entrance of the site. However, as the works are largely on-line and at-grade, there will be limited loss of property throughout the route. Landscape and visual impacts are anticipated to be less significant than all other previous design options.
- Air Quality: Traffic acceleration and deceleration as a result of the roundabout would increase vehicle emissions, compared to free flowing traffic on Johnstown Road. This would affect local air quality in the vicinity of the roundabout. However, it is still expected that pollutant concentrations in the vicinity of the site will be below threshold levels.
- View from the Road: The roundabout is located slightly above the existing ground level. All other road alignments are predominantly on-line and at-grade so no adverse impact is anticipated.
- Relaxations and Departures from Standard: The geometric design of the roundabout incorporates a relaxation in accordance with the NRA DMRB. TD 16 states that the exit and entry radius should be between 15m and 20m, however, due to auto track analysis using 16.5m HGV vehicles, the exit radius on Johnstown west arm has been increased to 40m. All other roads are fully compliant with DMURS standards as described in section 2.2.

1.10 Key Features of Pedestrian and Cycle Access

The key features of improved pedestrian and cycleway access are:

- Constructability: The construction works are largely to be located on the current Kerdiffstown Road carriageway. However, as the footpath and cycleway are necessary to provide access to the end-use / park this can be accommodated as separate to the road construction.
- Noise and Vibration: Noise and vibration would be expected during a construction phase for a shared use pathway. During operation, noise and vibration would be minimal, aside from occasional maintenance of the facility and sounds generated by walkers and cyclists.
- Landscape and Visual: During construction, the cycle and pedestrian facility would impact on the landscape for removal of existing features impeding its path, grading, storage of construction material, paving, construction vehicles and personnel. Operationally, it would be a new paved feature on the landscape, and part of a significantly wider public accessway than currently exists at this

	site. It would include a new linear grassy verge and vertical wooden bollards placed between the carriageway and pathway. It would include the presence of walkers and cyclists, presumably in greater numbers than currently use this road, as well as infrequent vehicles used for the maintenance of the pathway.
• Air Quality:	Construction would include localised emissions impacting on air quality in the form of construction vehicles. It is presumed that most construction vehicles would be petrol or diesel-based. During operation, pathway users would not impact air quality. Occasional maintenance vehicles could have a localised and limited effect on air quality, depending on their type.
• View from the Road:	During construction, road users would see activities including land clearance, grading, materials storage, paving and the presence of construction vehicles and personnel. Operationally, road users would see a new shared use facility adjacent to the roadway, separated by a grassy verge and wooden bollards. Receptors may also see pedestrians and cyclists using the facility, and the occasional maintenance vehicle.
• Relaxations and Departures from Standard	The shared use cycle/pedestrian path follows National Cycle Manual guidance for shared use facilities, which dictates a minimum shared width of at least 3.0m and defined widths for verge. No particular guidance exists for the wooden bollards specified for placement in the grassy verge between the shared use pathway and the new carriageway. These are intended to match similar features in the local landscape along other shared use pathways, particularly parallel to the N7 either side of Junction 8. All other features (crossings, transitions) meet current guidance.

Risk, Opportunity, Uncertainty and Inflation

It should be noted that the at grade roundabout and associated roads design is not a detailed developed design at this time (March 2017), and as such design development may pinpoint additional risks and opportunities which are yet to be identified.

Other References

Chapter 15 of the Environmental Impact Statement, prepared for the proposed Project includes further details with respect to current and projected traffic numbers.

Drainage design will be a requisite of the detailed design stage, though has been assessed at a high level to inform the outline design presented herein.

A Road Safety Audit is to be undertaken with respect to the proposed access design. The outcome of this may further inform the design.