

Comhairle Chontae Chill Dara Kildare County Council



GRAND CANAL GREENWAY

PRELIMINARY METHODOLOGY FOR CONSTRUCTION



November 2018



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1.0 General

The proposal entails the upgrading of the existing navigation towpath which is also a National Waymarked Trail (The Grand Canal Way) along the Barrow Navigation. The Greenway will traverse County Kildare from the Dublin Border to the Offaly border and forms part of a larger project which will see the greenway extend from the Docklands in Dublin City to Shannon Harbour in Offaly. This will provide a shared cycle and walking recreation route which will in Kildare extend from Arthur's Way through Sallins, Roberstown and Allenwood and to the Kildare / Offaly boarder.

2.0 Greenway Surface Types

Tailored surface finishes shall be employed to ensure a durable and fit for purpose trail in accordance with National Trails Office Guidance. These surfaces will not only improve accessibility, but provide a more robust surface that will be able to withstand increased footfall and traffic. The proposed surface types to be used are as listed below;

- Type A: Compacted Stone and Dust (unbound)
- Type B: Bitmac / Asphalt (bound)
- Type C: Surface Dressing (bound)

The first type (Type A) which will be the predominately employed surface is an unbound surface of compacted stone and dust and is considered to be the most suitable finish for the majority of the Greenway given its primarily rural location. The second type (Type B) will be a bound surface of either asphalt or bitmac and will be constructed primarily to areas of road widening incorporating shared use surfaces and approximately 15m either side of approaches to road crossings. The third type (Type C) is surface dressing and will be applied to any existing deteriorated bound surfaces.



3.0 Design Rationale

3.1 Path Width

In accordance with Transport Infrastructure Ireland (TII) Publication DN-GEO-0347 - Rural Cycle Scheme Design - Section 4 Cycle Scheme Layout, Table 4.1, the Blueway preferred width shall be 3m. This width is the 'Desirable Minimum' for low volume traffic on a shared use two-way (cycle facility) with pedestrians. It is anticipated that both current and future use will fall into the 'Low Volume' category (less than 1500 users per day) and even it were to hit the 'High Volume' category (greater than 1500 users per day), the proposed path width of 3m falls into the 'One Step Below Desirable Minimum' category which is an acceptable 'relaxation' from Standard. It is important to note that relaxations are considered to conform to standards.

The design path width of 3m has been selected based on safety, operation, economic and environmental effects and sustainability. It is justified on the basis of the largely rural setting and the need to minimise the environmental impacts and also negate disproportional construction costs for the proposal. The preferred standard width of 3m may be locally reduced at ecologically sensitive areas or at 'pinch points' where existing fixed infrastructure would make the provision of a 3m wide path, unachievable or disproportionately expensive.

Verge widths either side of the path will vary but will generally conform to standard, TII Publication DN-GEO-0347 - Rural Cycle Scheme Design - Section 4 Cycle Scheme Layout, Table 4.2, varying from in excess of 1.0m to a minimum of 0.25m in width.

The proposed design width meets the National Trails Office guidance for Shared Use Trails / Greenways - Blueways.

3.2 Surface Finish

In accordance with TII Publications DN-GEO-0347 - Rural Cycle Scheme Design - Section 8.10 Construction Details, the preferred surface for the Greenway shall be an unbound dust surface (Type A), given the rural nature of the proposal, where the surface is required to give a sense of the environment. Also given the

rural setting of the Greenway proposal, the facilities attractiveness is equally as important as the comfort of the user. Therefore the unbound surface is the preferred option to minimise environmental impacts along the towpaths as it provides more natural aesthetics and blends with the rural environment. The unbound surface will complement and enhance the existing areas that it passes through whilst being sensitive to the surrounding environment.

The proposed design surface meets the National Trails Office guidance for Shared Use Trails / Greenways - Blueways.

3.3 Signage

3.3.1 Route Signage

Greenway route signage will be provided at strategic locations along the length of the trail as indicated on the drawings. The route signage boards will be located at main access points onto the route in towns and villages and shall be similar to that indicated in Figure A below and as detailed on Drawing No 400/18/230. Installation of these signs will involve minor excavation works to facilitate the installation and concreting in of support posts.



Figure A - Typical Route Signage

3.3.2 Marker/Distance Posts

Marker/distance posts shall also be located at approximately 5km intervals along the length of the route. These shall be similar to that indicated in Figure B below and as detailed on Drawing No 400/18/230. Installation of these marker/distance posts will involve minor excavation works to facilitate the installation and concreting in of support posts.



Figure B – Marker/Distance Post

3.4 Lighting

Lighting of more urban sections of the Greenway route, e.g. through Sallins, was considered during the preliminary design stage. However given the likely negative environmental impacts of lighting, particularly to Bat populations and the largely rural nature of the route there will be no street lighting provided along the trail as this would create considerable environmental issues.

3.5 Construction Materials

Materials for construction of the works will be imported and stockpiled within the site boundaries at the local and regional road access points.

4.0 Access Routes

Access to construct the path shall be gained via existing national, regional and local road access points along the length of the Greenway as listed below

- Henry Bridge
- Ponsonby Bridge
- Church Ave, Sallins
- Millbank, Sallins
- Digby Bridge
- Bonyngne Bridge
- North west of Binn's Bridge
- Local access road from Roberstown to Lowtown
- Bond Bridge
- Shee Bridge



- Regional Road at Shee Bridge (R403)
- Regional Road at Shee Bridge (R414)
- Hamilton's Bridge
- Regional Road at Abbeylough Bridge (R403)
- Ticknevin Bridge

5.0 Environmental Management

Due to the sensitive nature and environmental designations of the area in which the work is to be undertaken, the appointed construction contractor will be required to develop and implement an Environmental Management Plan (EMP). This EMP will set out all requirements and conditions identified from the environmental studies, and planning conditions, such as timing, mitigation measures and site procedures. An independent Ecological Clerk of Works (ECoW) shall also be appointed and will be on site on a full time basis to oversee works and to advise on issue which arise.

6.0 Construction Methodology

Prior to construction the 3m wide route of the Greenway shall be demarcated a timber post and tape fence shall be erected offset 300mm from the edge of the proposed trail, works shall only occur within this corridor. Construction of the Greenway will involve excavation of a small quantity of soil, in all circumstances, excavation depths and volumes will be minimised. Excavation works will be carried out in small progressive stages with all topsoil re-used where possible. Suitable soil for the reinstatement of the edges of the trail and for landscaping purposes will be stored on site. This practice will minimise the risk of the introduction of invasive species and reduce material importation costs. Also importantly this topsoil will contain a species-rich seed bank and should be utilised where possible, as backfill or landscaping and allowed to regenerate naturally. All soil storage will be located at suitable locations and suitably far from the canal, outside of species rich areas, ecologically sensitive areas, areas prone to flooding or with tall herb vegetation and covered to avoid sediment run off and wind blow. The soil storage areas will be selected by the supervising engineer and the Ecological Clerk of Works (ECoW) and the site generally will be regularly monitored by construction staff for signs of run-off, such as silt in



surrounding vegetation, to safe guard the canal. Where necessary measures will be implemented to prevent this, these will take the form of a silt fence or a silt fence. Where required a silt fence may be constructed by the erection of a stock proof fence with a geotextile membrane affixed to it, the bottom of which to be buried in the ground, thereby allowing water to pass through while retaining the sediment. Excavated soil, that is not re-used will be removed from site and disposed of to a Local Authority approved waste facility.

Where additional topsoil and quarried stone is required on site, it will be sourced from stock screened for the presence of any invasive species and where it is confirmed that none are present.

The construction of the Greenway will be carried out by machinery of a suitable size. It is envisage that a 5 ton mini digger and a 3 ton dumper are sufficiently sized to complete the majority of the construction. Where there is a requirement for larger plant e.g. during bridge construction, agreement shall be reached between the Contractor the supervising engineer and the Ecological Clerk of Works (ECoW) prior to its arrival on site. Strict procedures for plant inspection, maintenance and repairs shall be detailed in the contractor's method statement. Machinery shall be checked for leaks prior to arrival on site and a daily site plant inspection prior to use will be conducted. Where defects are identified that plant shall not be used until the defect has been satisfactorily fixed.

All machinery will be thoroughly cleaned and disinfected prior to arrival and departure from site, through pre-agreed Bio security Protocols, to prevent the spread of invasive species. The method shall be detailed in the contractor's method statement and agreed by both the supervising engineer and the Ecological Clerk of Works (ECoW). Sites of known infestation shall be clearly marked prior to commencement of works and avoided during construction. The importance of preventing the spread of these species will form part of a tool box talk to all personnel prior to construction stage.

All plant refuelling will take place on site using mobile fuel bowsers. All mobile fuel bowsers shall be bunded to 110% capacity to prevent spills, tanks for



bowsers and generators shall be double skinned. When not in use all valves and fuel trigger guns from fuel storage containers will be locked. All refuelling operations will be carried out by dedicated, trained and competent personnel. Plant refuelling will be carried out as far as practicable from watercourses. A spill kit and drip tray shall be on site at all times and available for all refuelling operations. Equipment shall not be left unattended during refuelling. All pipe work from containers to pump nozzles will have anti siphon valves fitted.

Detailed construction methodologies for each of the surface types are contained below in the section relating to Construction Methodologies for Surface Types.

7.0 Construction Methodology for Surface Types

7.1 Type A: Compacted Stone and Dust

Figure 7.1

7.1.1 Locations

Generally all rural areas of the trail

7.1.2 Material Specification

Geotextile



Autoway 120 or alternative equivalent product grade (Terram 2000, Lotrak 16/15)

Sub -Base layer

Granular sub-base in accordance with Clause 804 of NRA Specification.

Surface layer

0/6mm crushed limestone or quarry dust.

7.1.3 Construction Sequence (Refer Figure 7.1)

(a) Formation Tray Excavation (Desirable Width of 2.8m. Note width will vary from a maximum 2.8m wide and reduce to suit existing restricted access widths for example at lock houses and lock gates)

(b) Overlay to Existing Path (Desirable Path Width of 2.5m. Note width will vary from a maximum 2.5m wide and reduce to suit existing restricted access widths for example at lock houses and lock gates)

- Using a suitable excavator, excavate the ground to expose sub-soil and grade out irregularities to form 2.8m wide formation tray (width of formation tray to be approximately 300mm wider than the path width) to maximum depth of 100mm below ground level. (Actual depth will depend on depth of sub-base being used, which will depend on ground conditions. Where possible new construction will overlay existing).
- Formation tray should be rectangular in section with vertical sides and level base.
- Stripped vegetation and excavated topsoil to be stacked neatly either side of formation tray to be used for reinstatement of path shoulders.
- If soft spots are present, excavate the area below formation level until the sub-grade is stable. Back fill with stone to formation level and compact.
- There would be no excavation requirements in regard to the overlay of the existing surface other than to address issues with soft spots as detailed above.

Geotextile Installation (including Geogrid if required)



- Lay and secure geotextile sheet information tray or on top of the existing ground. Overlap joining sheets by 1.0m.
- If required in soft ground - Lay and secure geogrid on top of geotextile sheet. Overlap joining sheets by 1.0m.

Sub-Base Layer

- Using either a drag box or suitable excavator lay the required depth of Clause 804 granular sub-base upon the geotextile sheet to falls and levels, to form 1:50 (2%) camber or 1:40 (2.5%) cross-fall in maximum layer depths of 150mm. (Existing Ground Conditions Hard Material-Depth 50mm Soft Material-Depth 300mm and Normal Material-Depth 200mm).
- Compact sub-base layer thoroughly using a roller until full compaction is achieved.
- Once sub-base layer is compacted, check levels of the surface at regular intervals along the compacted sub-base layer for consistent even surface regularity. Any part of the sub-base layer deviating from the required level must be raked off or topped up with additional Clause 804 granular sub-base and re-compacted to the correct levels.

Surface Layer

- Using either a drag box or suitable excavator lay 25mm depth of 6mm limestone dust to falls and levels, to form 1.5m to 2.5m wide path surface with 1:50 (2%) camber or 1:40 (2.5%) cross-fall along the centre line of compacted sub-base layer.
- Compact surface layer thoroughly using a roller until full compaction is achieved.
- Once rolling is finished, check levels of the surface at regular intervals along the compacted surface layer for consistent even surface regularity. Any part of the surface layer deviating from the required level must be raked off or topped up with additional 6mm limestone dust and re-compacted to the correct levels.

Landscaping



- Using available topsoil and turfs (if necessary imported topsoil) from excavations cover path base edges butting turfs tightly together to cover exposed roots and topsoil. Landscaped verges and edges should be finished level with path surface and taper down and away from the path surface to allow surface water to run off onto adjacent verges.
- Finish with a fine layer of topsoil.
- All plant and machinery shall be cleaned appropriately prior to movement off site. All site access and egress shall be controlled in accordance with legislative requirements to ensure the spread of the invasive species is minimised.

7.2 Type B: Bitmac / Asphalt

Figure 7.2

7.2.1 Locations

Urban sections of the trail, sections of road widening for shared use and approaches to road crossings.

7.2.2 Material Specification



Geotextile

Autoway 120 or alternative equivalent product grade (Terram 2000, Lotrak 16/15)

Sub-Base layer

Granular sub base in accordance with Clause 804 of NRA Specification.

Base layer

60mm Dense Bitumen Macadam base course to Clause 901.

Surface layer

40mm hot rolled asphalt to Clause 910 or Dense Bitumen Macadam wearing course to Clause 901.

7.2.3 Construction Sequence (Refer Figure 7.2)

- (a) Formation Tray Excavation (Desirable Width of 2.8m. Note width will vary from a maximum 2.8m wide and reduce to suit existing restricted access widths for example at lock houses and lock gates)
- (b) Overlay to Existing Path (Desirable Path Width of 2.5m. Note width will vary from a maximum 2.5m wide and reduce to suit existing restricted access widths for example at lock houses and lock gates)
 - Using a suitable excavator, excavate the ground to expose sub-soil and grade out irregularities to form 2.8m wide formation tray (width of formation tray to be approximately 300mm wider than the path width) to maximum depth of 100mm below ground level. (Actual depth will depend on depth of sub-base being used, which will depend on ground conditions. Where possible new construction will overlay existing).
 - Formation tray should be rectangular in section with vertical sides and level base.
 - Stripped vegetation and excavated topsoil to be stacked neatly either side of formation tray to be used for reinstatement of path shoulders.
 - If soft spots are present, excavate the area below formation level until the sub-grade is stable. Back fill with stone to formation level and compact.



- There would be no excavation requirements in regard to the overlay of the existing surface other than to address issues with soft spots as detailed above.

Geotextile Installation (including Geogrid if required)

- Lay and secure geotextile sheet information tray or on top of the existing ground. Overlap joining sheets by 1.0m.
- If required in soft ground - Lay and secure geogrid on top of geotextile sheet. Overlap joining sheets by 1.0m.

Sub Base Layer

- Using either a drag box or suitable excavator lay the required depth of Clause 804 granular sub-base upon the geotextile sheet to falls and levels, to form 1:50 (2%) camber or 1:40 (2.5%) cross-fall in maximum layer depths of 150mm. (Existing Ground Conditions Hard Material-Depth 50mm Soft Material-Depth 300mm and Normal Material-Depth 200mm).
- Compact sub-base layer thoroughly using a roller until full compaction is achieved.
- Once sub-base layer is compacted, check levels of the surface at regular intervals along the compacted sub-base layer for consistent even surface regularity. Any part of the sub-base layer deviating from the required level must be raked off or topped up with additional Clause 804 granular sub-base and re-compacted to the correct levels.

Base Layer

- Using mini paving machine lay 60mm depth of dense bitumen macadam base course to Clause 903 and to falls and levels, to form 2.5m wide path surface with 1:50 (2%) camber or 1:40 (2.5%) cross-fall.
- Compact layer thoroughly using a roller and continue rolling until full compaction is achieved.

Surface Layer



- Using mini paving machine lay 45mm depth of hot rolled asphalt or dense bitumen macadam wearing course to Clause 903 and to falls and levels, to form 2.5m wide path surface with 1:50 (2%) camber or 1:40 (2.5%) cross-fall.
- Compact surface course layer thoroughly using a roller and continue rolling until full compaction is achieved.

Landscaping

- Using available topsoil and turfs (if necessary imported topsoil) from excavations cover path base edges butting turfs tightly together to cover exposed roots and topsoil. Landscaped verges and edges should be finished level with path surface and taper down and away from the path surface to allow surface water to run off onto adjacent verges
- Finish with a fine layer of topsoil.
- All plant and machinery shall be cleaned appropriately prior to movement off site. All site access and egress shall be controlled in accordance with legislative requirements to ensure the spread of the invasive species is minimised.

7.3 Type C: Surface Dressing



Figure 7.3

7.3.1 Locations

Existing deteriorated bound surfaces.

7.3.2 Material Specification

Tack Coat

Cationic Bitumen Emulsion in accordance with Clause 920 of the NRA Specification and BS 434.

Base layer

Regulating course to Clause 907 to fill potholes and surface irregularities and create necessary cross-falls and cambers.

Surface layer

Single layer of chippings (3mm) applied to a surface dressing adhesive of resin or hot sprayed coat of bitumen emulsion to Clause 919.

7.3.3 Construction Sequence (Refer Figure 7.3)

Surface Preparation (Desirable Path Width of 2.5m and varies depending on width of existing bound surface)

- Clean existing surface of weed growth and debris and apply tack coat were required to Clause 920.

Base Layer

- Using mini paving machine lay regulating course to fill potholes and achieve falls and levels, to form 2.5m wide surface (will vary depending on width of existing bound surfaces) with 1:50 (2%) camber or 1:40 (2.5%) cross-fall.
- Compact layer thoroughly using a roller and continue rolling until full compaction is achieved.



- Once rolling is finished, check levels of the surface at regular intervals along the compacted regulating layer for consistent even surface regularity. Any part of the regulating course layer deviating from the required level must be regulated with additional material and re-compacted to the correct levels.

Surface Layer

- Spray surface dressing adhesive of resin or hot sprayed coat of bitumen emulsion on the regulated surface and apply the 3mm chippings in accordance with Clause 919.
- Compact surface course layer thoroughly using a roller until full compaction is achieved.
- Loose chippings to be swept and removed from the finished surface before opening for use.

Landscaping

- Using available topsoil and turfs (if necessary imported topsoil) from excavations cover path base edges butting turfs tightly together to cover exposed roots and topsoil. Landscaped verges and edges should be finished level with path surface and taper down and away from the path surface to allow surface water to run off onto adjacent verges
- Finish with a fine layer of topsoil.
- All plant and machinery shall be cleaned appropriately prior to movement off site. All site access and egress shall be controlled in accordance with legislative requirements to ensure the spread of the invasive species is minimised.

7.4 Bank Repairs

Sections of the river bank are frequently undermined following the erosive effects of the river during the winter period. The sections will be repaired where it is deemed necessary in order to undertake the construction of the trail. Rock armour will be built as required from a suitable foundation on the river bed. This armour will be built at a suitable angle to ensure stability and in line with the existing bank. This may require localised excavation of the existing bed and



bank. The rock armour will be bedded and in-filled with lean mix concrete to provide a stable structure. The rock will terminate at a level not greater than 200mm from the existing top bank (path) level. The edge strip between the proposed path and the top of the bank will be filled with 200mm topsoil and bank material sourced at the site.

7.4.1 Material Specification

- Rock (0.25 to 1 tonne)
- Lean mix concrete (bedding and infilling)
- Topsoil and bank material (sourced on location)

7.4.2 Construction Sequence

- Prepare site, and place appropriate traffic diversion / protection measures;
- Excavate and trim bank to suitable foundation material;
- Place / build rock armour to form a stable face, in profile with the existing bank;
- Infill and bed the rock with lean mix concrete, ensuring a minimum 200mm raked joints between rocks;
- Complete rock top surface to ensure a relatively even line, not greater than 200mm from top of the bank;
- Finish with 200mm deep site sourced topsoil and grass seed.

7.5 Footbridge Construction

The existing crossing points at Binns's Bridge, Bonyngge Bridge and Sallins Bridge was initially assessed in conjunction with Kildare County Council's Municipal District Engineers and was assessed to be unsafe for various reasons e.g. inadequate width of the bridge, poor visibility and the level of complexity required for safe pedestrian crossing. In addition east of the 18th Lock a further crossing point is considered necessary as the Greenway must at this point change from the southern bank (east of the 18th Lock) to the northern bank (west of the 18th Lock). This crossing point is considered necessary as the northern bank east of the 18th Lock adjoins the public road network and is considered unsafe for the Greenway to share the public road at this point.



Therefore in order to mitigate the risks and provide a suitable safe crossing point on the canal it was determined that a footbridge at these locations is required. The purpose of the proposed footbridges is to provide users of the Greenway with an easy and safe crossing point on the canal and thereby avoiding unavoidable hazards highlighted during the assessment of the above locations.

The concept is to provide footbridges and access ramps, where required which compliment the surrounding environment. In this regard the swing bridges proposed are considered to have minimal impact on the rural setting within which they are set. The footbridge at Sallins shall have a minimum height over the water surface of 3.5m to provide adequate air draft for boats using the canal. The span of the bridges will vary from location to location depending on local conditions at that point with access ramps to meet accessibility for all requirements. The bridge and access ramps shall be a composite steel/timber structure manufactured off site. The foundations and abutments shall be constructed in-situ with the bridge and ramps craned into position and secured to the support abutments and footings. Refer to Drawing No 400/18/227 for details.

7.5.1 Construction Sequence

- Prepare site, and place appropriate pedestrian and traffic controls/diversions along the canal banks.
- Drive an appropriate pile arrangement for the two main bridge abutments (steel H-Piles 2-4nr per abutment) and the four other ramp supports. This operation shall be conducted from the bank of the canal with no interference to the water body of the canal.
- Excavate canal bank to formation level for the construction of the two main reinforced concrete bridge abutments and the four other ramp supports. This operation shall be conducted from the bank of the canal with no interference to the water body of the canal.
- Fix the steel reinforcement for the two bridge abutments and the four other ramp supports. This operation shall be conducted from the bank of the canal with no interference to the water body of the canal.



- Erect formwork for the two main bridge abutments and the four other ramp supports and seal to ensure no leachate of concrete. Pour the concrete as required for each of the abutments and supports.
- Strip the concrete shutters once the concrete has set and clad the exterior exposed faces of the concrete abutments and supports with natural stone.
- Deliver the footbridge and ramps to the site and crane into position securing the bridge and ramps to the abutments as required.

