13 SURFACE WATER QUALITY AND DRAINAGE

13.1 Introduction

This section has been prepared to describe the existing hydrological environment of the proposed Pretty Bush Eco Park, Kilquade, Co. Wicklow, and to examine the aspects of the hydrological environment that could be affected by the activities associated with it. The development will be constructed through the operation of the site as an inert soils recovery facility.

This section also appraises the potential impact of the proposed development on the water quality of the local environment. The drainage of the associated development areas, including amenity tracks are considered, taking account of mitigation measures to reduce or eliminate any potential impacts.

13.1.1 Study Area

It is proposed to deposit up to 200,000 tonnes of surplus dredge spoil material, mainly silt, clay and gravel at a Wicklow County Council (WCC) owned site at Pretty Bush, Kilquade, Kilcoole, Co. Wicklow, arising from the flood defence works being carried on the River Dargle in Bray.

The placement of the dredge spoil material will raise existing ground levels to facilitate the development the Pretty Bush Eco Park as a recreational facility for the public.

The duration of the placement works is expected to be between 8- 15 months.

The existing site entrance will be developed initially to support the access and egress of the vehicles delivering material to site and subsequently to facilitate the future access of Council staff to the retained yard area. The entrance will comprise an appropriate designed entrance with boundary treatment.

The location of the proposed waste soils recovery facility which will be developed into the Pretty Bush Eco Park is shown in Figure 1-1. The proposed layout of the associated development areas at the facility is shown in Figure 3.8. The hydrological study area is shown in the figures associated with this section.

13.2 Methodology

The following sources of information were considered in this appraisal:

- The design layout of the proposed development.
- Published literature as described in Section 13.2.1 below.
- A desk-based assessment of the surface water hydrology and surface water quality in the catchments relevant to the proposed development, including an assessment of the watercourses adjacent to and near to the proposed development and those which will receive surface water run-off from the proposed development.

A field assessment of the existing hydrological environment, to both verify desk based assessment and record all significant hydrological features.

13.2.1 Relevant Guidance

The following guidelines were considered in the development of this section to identify relevant objectives relating to surface water:

- Environmental Protection Agency (EPA) guidance with respect to the preparation of an EIS (EPA 2002 and 2003) and draft Revised Guidelines (2015)

In addition to considering the relevant documents above the methodology for the baseline appraisal has been devised with due consideration of the following guidelines:

- Sustainable Development: A Strategy for Ireland, Department of the Environment, 1997
- Wicklow County Development Plan 2010-2016
- Variation No.3 to the Wicklow County Development Plan 2010 – 2016
- Wicklow County Development Plan 2016-2022 (Draft)
- Variation No.3 to the Wicklow County Development Plan 2010 - 2016
- Greystones-Delgany & Kilcoole Local Area Plan 2013 - 2019
- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a Framework for Community Action in the Field of Water Policy
- Flood Mapping Website http://www.floodmaps.ie
- OPW preliminary flood risk assessment (PFRA) indicative mapping website www.cfram.ie
- Eastern Catchment Flood Risk Assessment and Management Study (Eastern CFRAMS), Draft Flood Risk Management Plan, February 2010 and Flood Extent Mapping.
- Greater Dublin Strategic Drainage Study (GDSDS): Technical Documents of Regional Drainage Policies, March 2005
- Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites, Eastern Regional Fisheries Board (current guidance document adopted by IFI)
- The Planning System and Flood Risk Management - Guidelines for Planning Authorities - Department of Environment, Heritage and Local Government (DoEHLG) and the Office of Public Works (OPW) 2009
- Environmental Good Practice on Site - Construction Industry Research and Information Association (UK)
- Best Practice Guide BPGCS005 Oil Storage Guidelines
- Control of Water Pollution from Linear Construction Sites (C648) - Construction Industry Research and Information Association (UK) 2006
- Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors (C532) - Construction Industry Research and Information Association (UK) 2001
- Sustainable Construction Procurement. A Guide to Delivering Environmentally Responsible Projects (C571) - Construction Industry Research and Information Association (UK) 2001
- UK Pollution Prevention Guidelines (PPG):
    - PPG1: Understanding your environmental responsibilities – good environmental practice
    - PPG2: Above ground oil storage tanks
    - PPG3: Pollution Prevention Guidelines
    - PPG4: The disposal of sewage where no mains drainage is available
    - PPG5: Works in, near or liable to affect watercourses
    - PPG6: Working at construction and demolition sites
    - PPG8: Safe storage and disposal of used oil
    - PPG21: Pollution incident response planning
    - PPG26: Drums and intermediate bulk containers
- Advice Notes on Current Practice (in the preparation of Environmental Impact Statements), Environmental Protection Agency, 2003
- Design Manual for Roads and Bridges (TII Publications (Technical)) 2016
- Eastern River Basin District, River Basin Management Plan 2009-2015
- Water Framework Directive (2000/60/EC)
- Biological River Water Quality Data, (Environmental Protection Agency (EPA)

The Wicklow County Development Plan 2010-2016 states the following in relation to surface water discharges from site:

> *All new developments shall be designed to ensure:*
>
> - *the on-site collection of surface water separate from foul water;*
> - *surface water is appropriately collected on site to prevent flow onto the public roadway, adjoining properties or into the public foul sewer / sewage treatment plant;*
> - *the appropriate on-site disposal of surface water (where the scale and amount of water generated makes this feasible) e.g. through soakpits. For larger scale developments, it may be necessary to demonstrate through soil and subsoil tests that the site is capable of absorbing the surface water generated;*
> - *where on-site disposal is not feasible and discharge to surface waters is necessary, that the system has been designed in accordance with Sustainable Urban Drainage measures (SUDS) and in particular, that run-off has been attenuated to greenfield conditions;*
> - *discharges to water courses shall be channelled through adequately sized filters / interceptors for suspended solids and petrol/ oils prior to discharge.*

The draft Wicklow County Development Plan (2016-2022) states the following in relation to discharges of surface water from new developments:

> *WI10 Ensure the separation of foul and surface water discharges in new developments through the provision of separate networks.*
>
> *WI11 Ensure the implementation of Sustainable Urban Drainage Systems (SUDS) and in particular, to ensure that all surface water generated in a new development is disposed of on-site or is attenuated and treated prior to discharge to an approved surface water system.*

13.2.2 Consultation

The scope for this appraisal has been informed by pre-application consultation with the EPA, relevant departments within Wicklow County Council, prescribed bodies and other interested parties as summarised in Section 6 of this EIS.

The Eastern River Basin District noted that the second cycle of the Water Framework Directive (WFD) designates each local authority as the competent authority in its own right for the WFD.

Irish Water, in their response to the consultation, have asked that the EIS assesses the following:

- Consideration of development impact on the capacity and/or upgrade requirement of an existing supply;
- Consideration of surface water discharges to sewers;
- Any physical impacts on IW assets;
- Consideration of assimilative capacity of receiving waters;
- Impact on contribution catchments of water sources.

13.2.3 Desk Study

The desk top study involved an examination of the hydrological aspects of the following sources of information:

- Current and historic Ordnance Survey Ireland mapping, and ortho-photography.
- OPW Indicative Flood Maps.
- Catchment Flood Risk Assessment and Management (CFRAM) Studies Maps.
- Study of existing surface water/drainage features in the vicinity.
- Study of the proposed layout.
- Liaison with geotechnical specialists for details on soil conditions on the site.
- Review of designated areas within 10km of the proposed development.

- Study of planning documents for adjacent developments.
- History of flooding and status of drainage in the vicinity of the proposed development.
- Review of consultation with interested bodies and relevant Local Authorities.
- Study of development plans.

13.2.4 Field Assessment

A site walkover survey took place on 7 October 2015 to establish the pattern of existing drainage on the site for the proposed Pretty Bush Eco Park and to record any significant hydrological features.

The site walkover involved an initial review of available information gathered in the desk study phase followed by a site visit. During the site visit descriptions of the hydrological features were recorded as discussed in Section 13.3.4.

13.2.5 Evaluation Criteria

During each phase of the proposed development of the Pretty Bush Eco Park (construction, post construction operation as Eco-park), a number of activities will take place on site, some of which will have the potential to cause impacts on the hydrological regime and the quality of waters draining the site for proposed Eco Park. Most importantly these impacts will be assessed during the construction phase, during which the site will be operated as an inert soils recovery facility.

Assessment of Significance of Impact on the Receiving Environment

An impact rating has been developed for each of the phases of development. The sensitivity of the receiving environment was first identified. Then the magnitude of the potential impact was estimated. The sensitivity rating, together with the magnitude of the potential impact, provides an overall rating of the significance of the impact prior to application of mitigation measures.

Sensitivity of Receptors

The sensitivity of an environmental receptor is based on its ability to absorb an impact without perceptible change. The hydrological environment is considered to be of medium sensitivity due to the distances from the proposed development by hydrological links to the environmentally designated protected sites downstream. The nearest significant designated sites downstream of the proposed development are The Murrough Wetlands SAC (site code 002249) and The Murrough SPA (site code 004186) and pNHA (site code 000730), which are approximately 2.5 km to the south east of the development. These environmentally designated areas are discussed in more detail in Section 11 Ecology.

Assessment of Magnitude and Significance of Hydrological Impact

The appraisal of the impact magnitude incorporates the timing, scale, size and duration of the potential impact. The magnitude criteria for hydrological impacts are defined in Table 13-1.

Table 13-1: Assessment of Magnitude of Hydrological Impact

Magnitude	Criterion	Description and Example
Major	loss of attribute	long term changes to the hydrology and water quality: • loss of EU-designated salmonid fishery: • change in water quality status of river reach • loss of flood storage/increased flood risk • pollution of potable source of abstraction
Moderate	impact on integrity of attribute or loss of part of attribute	short to medium term changes to the hydrology and water quality: • loss in productivity of a fishery • contribution of significant sediment and nutrient quantities in the receiving water, but insufficient to change its water quality status

Magnitude	Criterion	Description and Example
Minor	minor impact on attribute	detectable but non-material and transitory changes to the hydrology and water quality - measurable change in attribute, but of limited size and/or proportion
Negligible	impact on attribute but of insufficient magnitude to affect the use/integrity	no perceptible changes to the hydrology and water quality: • discharges to watercourse but no loss in quality, fishery productivity or biodiversity • no increase in flood risk

Potential impacts are appraised as being of major, moderate, minor or negligible significance. The shaded boxes in Table represent impacts considered to be significant in terms of the impact appraisal.

Table 13-2: Significance of Criteria

Magnitude	Sensitivity			
	Very high	High	Medium	Low
Major	major	major	moderate	minor
Moderate	moderate	moderate	moderate	minor
Minor	minor	minor	minor	negligible
Negligible	negligible	negligible	negligible	negligible

A summary of unmitigated potential impacts and the associated significance rating due to the proposed development of the Pretty Bush Eco Park is provided in Table 13-11 in Section 13.4.5. The residual impacts following mitigation and the associated significance rating are provided in Table 13-12

As part of the evaluation of the site for the Pretty Bush Eco Park, a flood risk identification and assessment was carried out as discussed in Section 13.3.3.

The proposed Pretty Bush Eco Park falls under the category of 'Amenity open space, outdoor sports and recreation', it can be deemed water compatible, as interpreted from Table 3.1 of the guidelines produced by the Department of Environment, Heritage and Local Government (DoEHLG) – 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' (November 2009), the flood risk" to the development" need not be examined and a Justification Test is not deemed to be required. It should be noted that no 'essential infrastructure' [44]has been included in this development.

Any potential increase in surface water run-off due to the development in areas deemed to be already at risk of flooding will however be examined as part of the impact evaluation and mitigation measures will be proposed where required.

In all cases where required, a cumulative flood risk assessment will be undertaken.

[44] 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.

13.3 Existing Environment

13.3.1 Site in Context

The site entrance is located on the L5542 local Kilquade road approximately 100 m east of the junction with the R761 Killincarrig (Delgany – Kilcoole) regional road, in the townlands of Priestsnewtown and Knockroe, approximately 1 km north of Kilcoole village and 1 km south of Delgany village. Greystones and Bray towns are located approximately 3 km and 8 km north of the site, respectively.

The location of the site is shown on Figure 13-1.

13.3.2 General Description of the Catchments

The Standard Average Annual Rainfall (SAAR) is 752 mm in the area of the proposed development at the townland of Knockroe (based on rainfall data from Flood Studies Update opw.hydronet.com). For this appraisal, 752 mm is adopted as the average annual rainfall for the development site.

From the Met Éireann data of extreme rainfall return periods at Knockroe, the M5-60 (5 year return period, 60-minute duration rainfall) is found to be 18.6 mm. This figure is also adopted for the M5-60 at the Pretty Bush site.

The site is located within Hydrometric Area No. HA 10 (Ovoca-Vartry) of the Irish River Network System and is situated within the Eastern River Basin District (ERBD). The site falls within the following River sub-basin, as shown in Figure 13.2:

- Kilcoole Stream_010 (IE_EA_10K010580)

The Kilcoole Stream rises at an elevation of 120 m OD in the town of Kilpedder to the west of the site. It flows in a south-easterly direction and enters the Irish Sea to the east of Kilcoole.

The site at Pretty Bush is located within this catchment (based on data from Flood Studies Update opw.hydronet.com). The site area is 0.056 km^2 (5.6 ha). The total catchment area of the Kilcoole Stream is 7.57 km^2. The southern end of the development site is approximately 500m from the Kilcoole Stream. The study area drains to the Kilcoole Stream via a stream through the west of the site, as well as a ditch along the eastern boundary of the site of the proposed Pretty Bush Eco Park.

13.3.3 Existing Flood History

Flooding was being reported in the Three Trouts Stream to the north of the site on 14 November 2003. The site at Pretty Bush is not influenced by and does not affect the catchment associated with the Three Trouts Stream. Flooding is also noted as occurring at “The Breaches” in Kilcoole which is downstream of Kilcoole town, close to the estuary. In January 2005 this area experienced severe flooding, this resulted from a blockage of a culvert under the Dublin – Rosslare railway line. This flooding did not affect the study area of this site.

There is no history of flooding reported at the proposed development site at Pretty Bush, nor have any ‘benefitting lands’[45]or ‘drainage districts’[46]been identified by the OPW in the vicinity of the site. As such the footprint of the site is not deemed to be at risk of flooding.

The OPW has produced indicative flood mapping to assist in a preliminary flood risk assessment (PFRA) on its website, www.cframs.ie. These maps were produced from a number of sources. This mapping shows that the

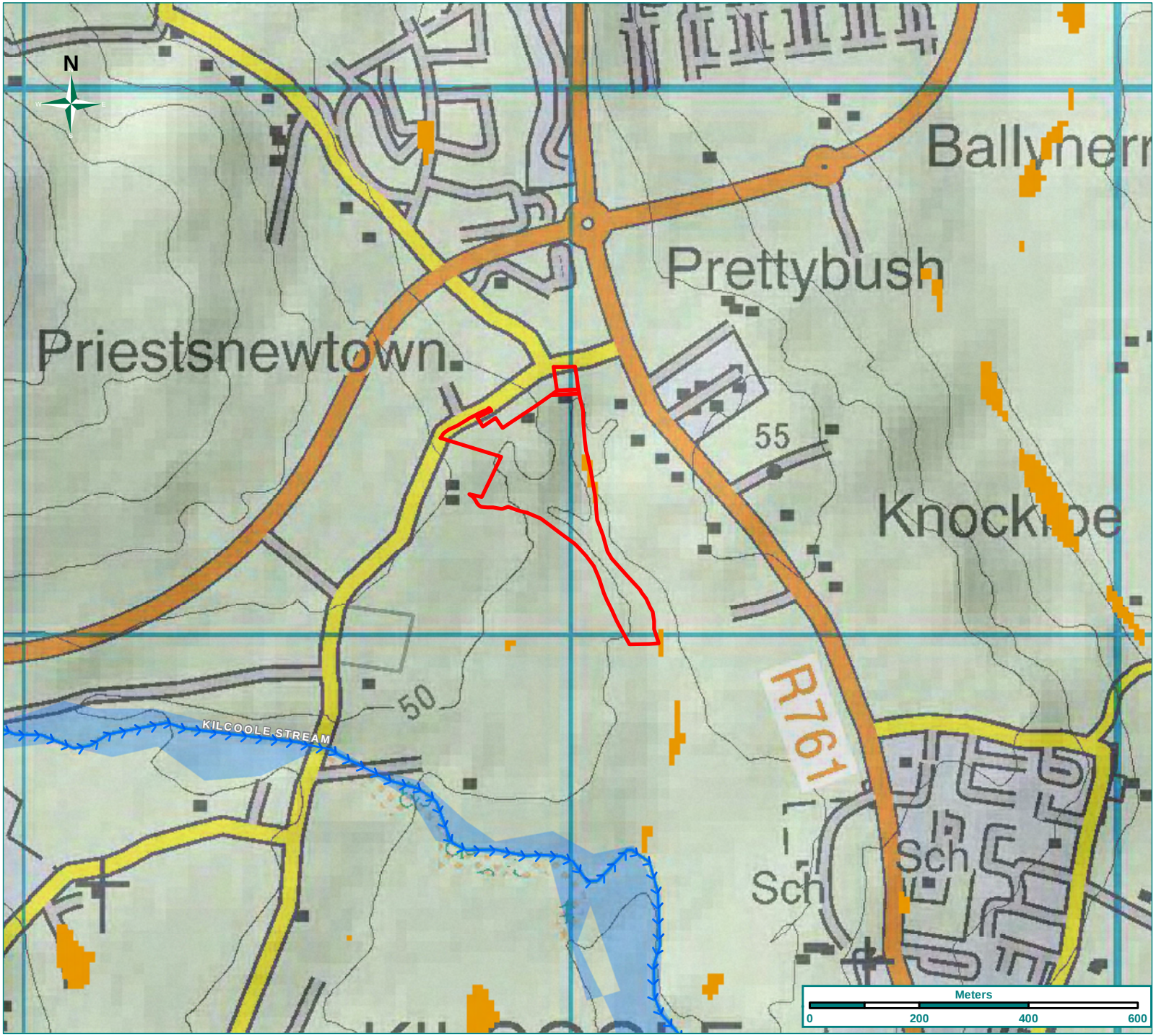
[45] A dataset prepared by the Office of Public Works identifying land that might benefit from the implementation of Arterial (Major) Drainage Schemes (under the Arterial Drainage Act 1945) and indicating areas of land subject to flooding or poor drainage.
[46] A dataset prepared on behalf of the Drainage Districts (Local Authorities with statutory responsibility for maintenance under the Arterial Drainage Act, 1925). These maps identify land that might benefit from the implementation of Arterial (Major) Drainage Schemes and indicate areas of land subject to flooding or poor drainage.

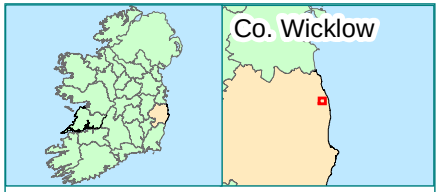
site is outside of the low-lying areas near the Kilcoole Stream which fall into Flood Zone 'A' area for the 1 in 10 year, 1 in 100 year and 1 in 1000 year return period flood (Fluvial - Indicative 1% AEP (100-yr) Event).

Areas that could be subject to pluvial flooding are also shown on this mapping. The process for developing the pluvial flood extent maps for the PFRA was based on 'dropping' various depths and intensities of rainfall over a range of durations, and modelling how that rainfall would flow over the land and, in particular, pond in low-lying areas.

PFRA mapping shows some pluvial flooding coinciding with the ditch that runs along the eastern boundary of the site, however the area of the proposed development is not subject to pluvial flooding. This can be seen in the data presented on Figure 13-1.

The draft Eastern Catchment Flood Risk Assessment and Management (CFRAM) mapping prepared by the OPW (included in Appendix 19) for Kilcoole and Newcastle Fluvial Flood Extents demonstrates that there is no flooding within the site. Downstream of the site, where a ditch runs into the Kilcoole Stream, flooding is highlighted in the 1 in 10-year zone some 300 metres from the southern site boundary.





Legend

- OPW Historic Flood Points
- Study Boundary
- Rivers
- PFRA/CFRAMS: 1% AEP Fluvial Flood Extent
- PFRA/CFRAMS: 1% AEP Pluvial Flood Extent
- PFRA/CFRAMS: 0.5% AEP Coastal Flood Extent

Date 13/07/2016

Wicklow County Council

Name Of Job

Waste Licence, Planning & EIS for Waste Soils Recovery Facility

Title Of Figure

OPW Flood Information Map

Scale Used 1:10,000 @ A4

Figure No. 13.1

Rev A

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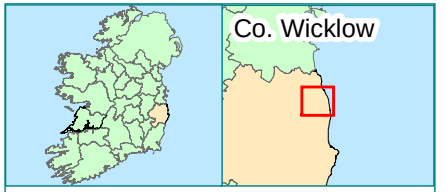

Legend

- Study Boundary
- Rivers
- WFD Transitional Waterbodies
- WFD Coastal Waterbodies

WFD River Sub-basins

- Complete Coastal River Catchment
- EA_Coastaly1_Delgany1
- EA_Coastaly1_Newcastle1
- EA_Coastaly1_Newtownmountkennedy1
- EA_Dargle169_Dargle1_Lower
- EA_Dargle169_DargleTRIB_Killough
- EA_Vartry170_Vartry2
- EA_Vartry170_Vartry3
- EA_Vartry170_Vartry4_Upper
- Revised WFD_River Sub-basins (based on EPA website)

Date 13/07/2016

Wicklow County Council

Name Of Job

Waste Licence, Planning & EIS for Waste Soils Recovery Facility

Title Of Figure

Waterbody Catchment Map

Scale Used 1:50,000 @ A4

Figure No. 13.2

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13.3.4 Internal Site Drainage

The development site contains a stream which is spring-fed, rising at the north of the site. This stream runs from the north-west of the site towards the south-east, through a valley in the site. This stream has been observed during site walkovers to contain low flows throughout the year, and runs to the south of the site where it drains towards the Kilcoole Stream.

A second ditch runs along the eastern boundary of the site, within the buffer zone identified at the eastern boundary of the site which drains a large portion of the site as well as lands to the east of the site. This ditch also collects runoff from the nearby Kilcarnig Road, which drains via a gully near the north-eastern end of the site and discharges into the ditch. The spring fed stream running North West – south east joins up with this second ditch at the south of the site where it continues to flow to the Kilcoole Stream.

Ground levels will be raised following the deposition of material at Pretty Bush. Materials deposited will comprise of silt, gravel and clays and detailed drainage design will be carried out to ensure that during the construction and operational phases, the site continues to drain following the existing drainage regime.

13.3.5 Existing Water Quality

An outline of the background behind the Water Framework Directive (WFD) is presented below together with an assessment of the historic and existing water quality of watercourses nearby the proposed site.

Water Framework Directive

Background

The WFD (2000/60/EC) was adopted by the (then entitled) European Community in 2000. This Directive was transposed into Irish law from December 2003 by, *inter alia*, the European Communities (Water Policy) Regulations 2003, (S.I. No 722 of 2003) and subsequent amendments.

The WFD established a new, strengthened system for the protection and improvement of water quality and water-dependent ecosystems. It has influenced the management of water resources and has affected conservation, fisheries flood defence, planning and development. It has endeavoured to ensure that all impacts on water resources – physical modification, diffuse and point source pollution, abstraction or otherwise – are controlled.

The overriding purpose of the WFD when adopted was to achieve at least “good status” in all European waters by 2015 and to ensure that no further deterioration occurred in these waters. European waters are classified as groundwaters, rivers, lakes, transitional and costal water. The WFD has been implemented in Ireland by dividing the island of Ireland into eight river basin districts. These districts are natural geographical areas that occur in the landscape. The proposed site is located within the Eastern Rivers Basin District.

Water Framework Directive Waterbody Status

The European Communities Environmental Objectives (Surface Water) Regulations 2009 (S.I. No. 272 of 2009), as amended in 2012 (S.I. No. 327 of 2012) and 2015 (S.I. No. 386 of 2015) give effect to the criteria and standards used for classifying surface waters in accordance with the WFD. There are five categories of surface water status: ‘High’, ‘Good’, ‘Moderate’, ‘Poor’ and ‘Bad’.

A surface waterbody must achieve both good ecological status and good chemical status before it can be considered to be of good status. The chemical status of a waterbody is assessed based on certain chemical pollutants. The ecological status is assessed based on Biotic Indices or Quality (Q) Values. The EPA Biological Quality Rating System for Rivers (Q Rating System) and its relationship with the WFD Status is shown in Table 13.3.

Table 13-3: EPA Q Rating System and WFD Status

Q-Value	Water Quality	WFD Status
Q5	Pristine	High
Q4-5	Very good	
Q4	Good	Good
Q3-4	Slightly Polluted	Moderate
Q3	Moderately Polluted	Poor
Q2-3	Moderate to Poor	
Q2	Poor	Bad
Q1-2	Poor to bad	
Q1	Bad	

In accordance with the regulations, water classified as 'High' or 'Good' must not be allowed to deteriorate. Water classified as less than good must have been restored to at least good status by 2015.

The regulations also state that, for the purpose of classification, a status of less than good is assigned in the case of a waterbody where the environmental objectives for an associated protected area requiring special protection by virtue of obligations arising from specific national legislation for the protection of water, or for the conservation of habitats and species directly dependent on water, are not met.

Water Framework Directive Risk Assessments

A baseline risk assessment was completed of the water bodies within each River Basin District in 2005. This assessment involved using information on water pollution indicators, point and diffuse pollution sources, water abstraction and existing commercial activities. The risk assessment indicated whether the waterbody would meet the criteria for "good status" or would be considered "at risk" of not meeting the standards by 2015. This assessment was presented in a characterisation report submitted to the European Union in March 2005. The assessment provided the baseline information to prepare the River Basin Management Plan and Programme of Measures necessary to comply with the WFD standards. The assessment of many of the indicators was updated in 2008.

Current WFD Status and Risk Assessment

A risk assessment was carried out in 2005 on each waterbody catchment, as defined under the WFD. Some of these assessments were updated in 2008. The results of the assessments are available on the WFD website (www.wfdireland.ie). No results are available for the surface waterbody catchment into which the site drains, as the Kilcoole Stream which is the primary surface waterbody in this catchment was not designated under the WFD.

Results are also unavailable for the catchment south of the Kilcoole stream. The Ballyronan stream is the primary surface waterbody in this catchment and is located approximately 2 km south of the southern end of the site and approximately 1 km south of the Kilcoole stream. Similar to the Kilcoole stream, the Ballyronan stream is not designated under the WFD.

However, results are available for the following surface waterbody catchments which are located nearby the site:

- Delgany (IE_EA_10_1461)
- Newtownmountkennedy (IE_EA_10_1575)

The river waterbody Delgany (reference IE_EA_10_1461) is located approximately 1 km to the north of the northern end of the site and flows in an easterly direction.

It is currently considered to be of an overall 'Moderate' status, while it was previously classified as 'at risk', primarily from diffuse sources, of failing to achieve good status by 2015.

The river waterbody Newtownmountkennedy (reference IE_EA_10_1575) is located approximately 2.5 km to the south of the southern end of the site and flows in an easterly direction. It is also currently considered to be of an overall 'Moderate' status, while it was previously classified as 'at risk', primarily from diffuse sources, of failing to achieve good status by 2015.

Specific status elements results relating to the above two river waterbodies are presented in Table 13-4.

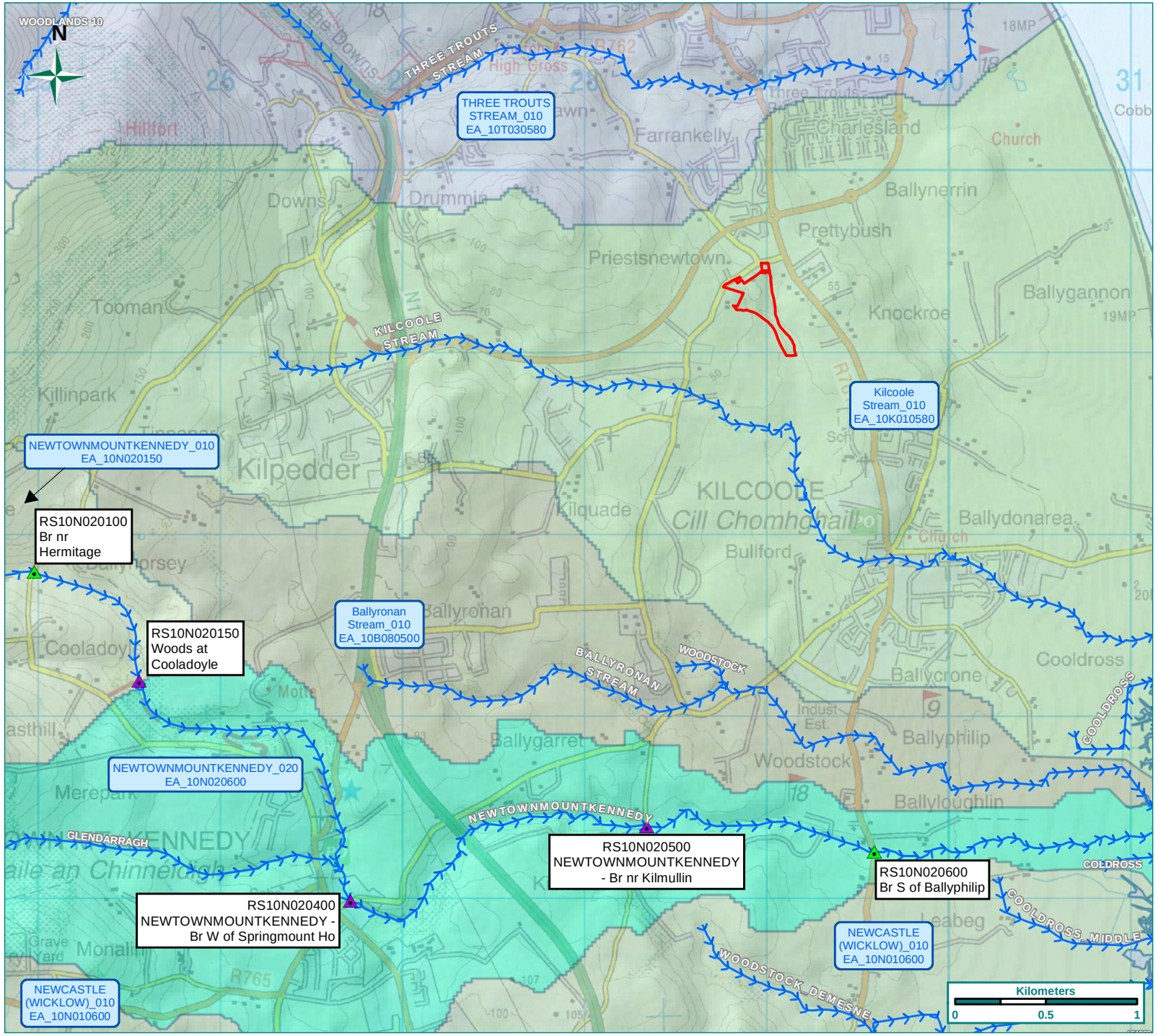
Table 13-4: Status element results for Delgany and Newtownmountekennedy River waterbodies

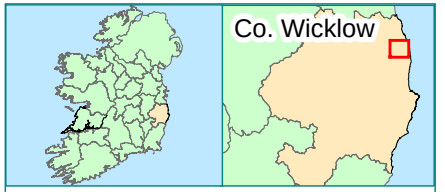
	Delgany	Newtownmountekennedy
Macroinvertebrate status	Not assessed	Moderate
General physico-chemical status	Moderate	Good
Fish status	Not assessed	Moderate
Overall ecological status	Moderate	Moderate

Water Framework Directive Monitoring Data

A water quality monitoring programme was established by the EPA under the WFD to determine the status of the waterbodies, as discussed above. Chemical and biological/ecological quality of surface waters are monitored at numerous locations throughout the country.

As previously outlined, the Kilcoole stream is not designated under the WFD. Therefore, no monitoring of this stream takes place under the WFD. However, the nearby Newtownmountkennedy River is monitored for the WFD. The locations of the monitoring stations on this river are shown in Figure 13-5 and recent biological monitoring results from these stations are discussed following this.





Legend

- Study Boundary
- Rivers
- WFD River Sub-basins (Revised)

EPA Monitoring Stations

- Investigive
- Operational
- Pre WFDI
- Surveillance
- Surveillance & Operational

Date 08/01/2016

Name Of Client

Wicklow County Council

Name Of Job

EIS for proposed Kilquade Waste Soils Recovery Facility

Title Of Figure

EPA Water Quality Monitoring Stations with Revised WFD River Sub-basins

Scale Used 1:30,000 @ A4

Figure No. 13.3

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Biological Water Quality Monitoring Results

The EPA scheme of Biotic Indices or Quality (Q) Values was developed to determine the status of organic pollution in Irish rivers by assessing the occurrence of macroinvertebrate taxa of varying sensitivity to pollution. The Q values recorded at monitoring stations on the Newtownmountkennedy River are outlined in Table 13-5.

Table 13-5: EPA measured Q-values on the Newtownmountkennedy River

Station ID	Location	Biological Quality Rating, Q rating							
		1990	1994	1997	2000	2003	2006	2009	2012
10N020600	Br S of Ballyphillip	4	3	3-4	3	3	3-4	3	3-4
10N020500	Br N of Kilmullin	2-3	3	3-4	3	3	-	-	3-4
10N020400	Br W of Springmount Ho	4	-	-	-	-	-	-	4
10N020150	Woods at Cooladoyle	-	-	-	-	-	-	-	4
10N020100	Br nr Hermitage	5	4-5	4-5	4-5	5	4-5	4	4-5

A Q-value rating of 3-4 represents 'Moderate' water quality status under the WFD. It also indicates that the waterbody is "slightly polluted" and in an "unsatisfactory condition[44]".

A Q-value rating of 4 represents 'Good' water quality status under the WFD. It also indicates that the waterbody is "unpolluted" and in a "satisfactory condition[45]".

The Newtownmountkennedy River is considered to be mostly of 'Moderate' ecological quality. The nearest station to the site, Station ID 10N020600, is the furthest downstream station and is located approximately 3 km to the south of the site. The EPA Q-value at this station was recorded as 3-4 in 2012.

The Newtownmountkennedy River improves to a 'Good' ecological quality at upstream areas. A Q-value of 4-5 having been recorded in 2012 at the furthest upstream station, Station ID 10N020100.

Chemical Water Quality Monitoring Results

Chemical water quality monitoring of the streams which drain the site was recently carried out for this project. Both streams converge together before discharging into the Kilcoole stream to the south of the site.

Monitoring of two surface water monitoring points, namely SW1 and SW2 (with SW2 being located at the confluence of both streams that drain the site), was carried out in September 2015. The locations of these monitoring points are shown in Figure 13.5.

Results of the monitoring carried are presented in Table 13-6 overleaf. The stream where the monitoring took place is not classified as a salmonid water and water is not abstracted for drinking water supply. However, the European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988), the European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations 1989 (S.I. No. 294 of 1989) and European Communities Environmental Objectives (Surface Waters) Regulations (S.I. No. 272 of 2009) are used as standards for surface water quality. These standards are presented in Table 13-6 so that a comparison can be made with the surface water quality monitoring results obtained.

[44] "Condition" refers to the likelihood of interference with beneficial or potential beneficial uses. EPA website.
[45] "Condition" refers to the likelihood of interference with beneficial or potential beneficial uses. EPA website.

Table 13-6: SW1 and SW2 surface water monitoring results and standard values

Parameter	Unit	SW1 result	SW2 result	Surface Water Regulations[1]			Salmonid Regulations[2]	EQS[3]
				A1*	A2**	A3***		
Total Suspended Solids	mg/l	2.5	<2	50	-	-	≤25	-
Total Alkalinity as CaCO3	mg/l	119	219	-	-	-	-	-
BOD	mg/l	<1	<1	5	5	7	≤5	≤2.6 (95%ile)
Total Organic Carbon	mg/l	6.06	5.24	-	-	-	-	-
Ammoniacal Nitrogen as N	mg/l	<0.2	<0.2	0.16	1.17	3.11	0.77	≤0.140 (95%ile)
COD	mg/l	10.9	12	-	-	40	-	-
Conductivity @20C	µS/cm	0.304	0.467	1000	1000	1000	-	-
Cadmium	µg/l	<0.1	<0.1	5	5	5	-	-
Chromium	µg/l	1.33	3.08	5	5	5	-	32
Copper	µg/l	1.11	0.878	50	100	1000	50	-
Lead	µg/l	0.053	0.431	5	5	5	-	-
Manganese	µg/l	0.147	0.832	5	300	1000	-	-
Zinc	µg/l	4.63	1.36	3000	5000	5000	≤30	-
Mercury	µg/l	<0.01	<0.01	1	1	1	-	-
Sulphate	mg/l	16.8	17.6	200	200	200	-	-
Chloride	mg/l	27.7	34.3	250	250	250	-	-
Ortho-Phosphate as PO4	mg/l	0.109	0.0087	0.5	0.5	0.7	-	-
TON as N	mg/l	19.6	1.8	50	50	50	-	-
Phosphorous	µg/l	29.3	20.3	500	700	700	-	-
Calcium	mg/l	36.4	87.2	-	-	-	-	-
Sodium	mg/l	18.9	27.1	-	-	-	-	-
Magnesium	mg/l	8.16	7.63	-	-	-	-	-
Potassium	mg/l	4.09	4.21	-	-	-	-	-
Iron	mg/l	<0.019	<0.019	0.2	2	2	-	-
pH	pH units	7.92	8.17	5.5-8.5	5.5-9.0	5.5-9.0	≥6 and ≤9	6.0-9.0

Notes:
1 S.I. No. 294/1989: European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1989.
2 S.I. No. 293/1988: European Communities (Quality of Salmonid Waters) Regulations, 1988.
3 Environmental Quality Standard (EQS): S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations, 2009.
* Category A1: Simple physical treatment and disinfection, e.g. rapid filtration and disinfection.
** Category A2: Normal physical treatment, chemical treatment and disinfection, e.g. prechlorination, coagulation, flocculation.
*** Category A3: Intensive physical and chemical treatment, extended treatment and disinfection, e.g. chlorination to break-point, coagulation, flocculation, decantation, filtration, adsorption (activated carbon), disinfection (ozone, final chlorination).

It is evident from the results presented in Table 13-6 that the surface water quality of the stream which drains the site is good. Neither surface water regulation nor salmonid regulation standards were exceeded for any of the surface water parameters which were analysed.

Ambient chemical water quality monitoring has also been carried out on the Kilcoole stream in recent years. This monitoring has been completed so as to meet the requirements outlined in the EPA Waste Water Discharge License D0416-01; a license for the secondary Wastewater Treatment Plant (WWTP) which serves the Kilpedder agglomeration.

Monitoring of the influent to and effluent from the WWTP takes place, while monitoring has also been carried out at two monitoring points along the Kilcoole stream. The locations of these monitoring points are outlined in Table 13-7.

Table 13-7: Surface water monitoring points and locations on the Kilcoole stream

Monitoring Point	Location with respect to the WWTP	Irish Grid Reference
aSW1u	Upstream	326733E 208925N
aSW1d	Downstream	326921E 208995N

Results of the monitoring carried out at the above two locations have been presented in the 2013 and 2014 Annual Environmental Reports for the Waste Water Discharge License D0416-01. These results are presented in Tables 13.8 and 13.9.

Table 13-8: 2013 upstream and downstream monitoring results

Date	pH (pH units)	DO (mg/l)	BOD (mg/l)	Ortho phosphate (mg/l-P)	Ammonia (mg/l-N)
Upstream					
06/03/13	7.1	10.7	<0.1	0.018	<0.012
16/05/13	7.4	10.9	<0.6	0.017	<0.012
03/07/13	7.7	10.0	<0.7	0.020	<0.002
04/09/13	7.9	9.4	0.6	0.020	<0.002
06/11/13	7.2	10.4	0.76	0.012	<0.001
Downstream					
06/03/13	7.66	10.6	<2	0.081	0.252
16/05/13	7.77	9.8	<0.9	0.064	0.076
03/07/13	7.90	9.4	<0.9	0.049	0.138
04/09/13	7.47	10.0	1.0	0.089	0.390
06/11/13	7.26	10.5	2.2	0.205	0.720

Note:
Items highlighted in bold are in exceedance of A1 values but comply with A2 values as set out in the EC (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1988 [S.I. No. 294 of 1989]

Table 13-9: 2014 upstream and downstream monitoring results

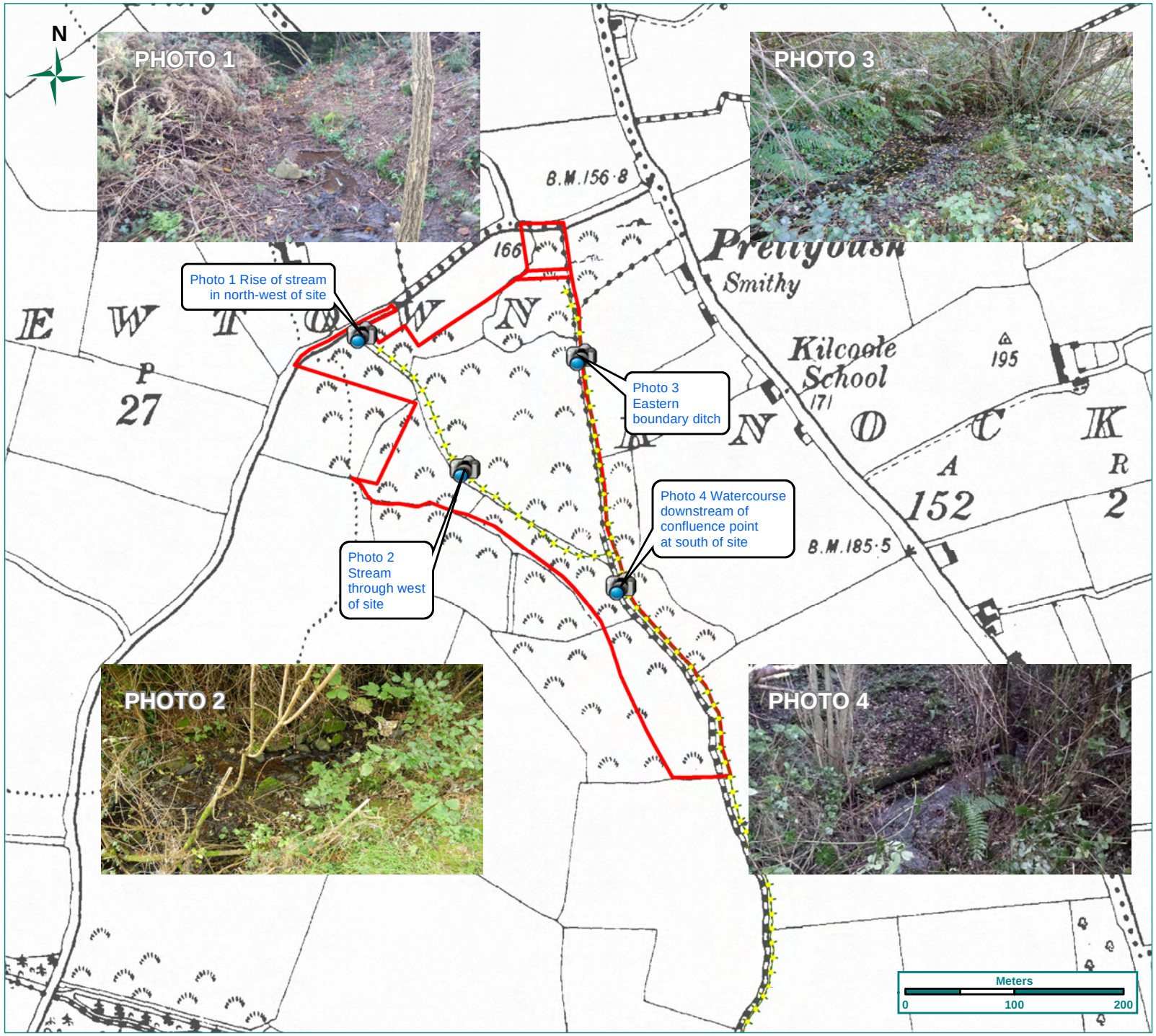
Date	pH (pH units)	DO (mg/l)	BOD (mg/l)	Ortho phosphate (mg/l-P)	Ammonia (mg/l-N)
Upstream					
08/01/14	7.08	11.0	<0.8	0.015	<0.009
05/03/14	7.27	11.3	<0.5	0.013	<0.016
06/05/14	7.55	10.5	<0.4	0.016	<0.003
02/07/14	7.43	9.9	<0.9	0.043	<0.009
03/19/14	7.49	10.1	<0.7	0.010	<0.007
05/11/14	7.27	10.7	<0.5	0.015	<0.008
Downstream					
08/01/14	7.38	10.8	<0.9	0.066	0.189
05/03/14	7.69	11.0	<0.7	0.040	0.089
06/05/14	7.69	10.1	1.1	0.062	0.230
02/07/14	7.69	9.8	<0.8	0.075	0.029
03/19/14	7.77	8.9	1.6	0.108	0.318
05/11/14	7.65	10.5	1.2	0.082	0.119

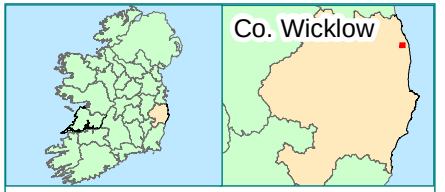
Note:
Items highlighted in bold are in exceedance of A1 values but comply with A2 values as set out in the EC (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1988 [S.I. No. 294 of 1989]

It is evident from the above results that the WWTP has impacted to some extent on some surface water quality parameters. Recorded values of BOD, Ortho-Phosphate and Ammonia were noticeably higher at the monitoring point downstream of the WWTP in both 2013 and 2014 than they were at the monitoring point upstream of the WWTP during these years.

Despite this, recorded water quality is of a generally good standard, with A1 standard values as set out in the European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1988 [S.I. No. 294 of 1989] exceeded only for Ammonia at the downstream monitoring point on occasions during 2013 and 2014.

While no EPA monitoring takes place along the Kilcoole stream, the above monitoring results indicate that, similar to the Delgany and Newtownmountkennedy river waterbodies, the Kilcoole stream can be considered to be of a 'Moderate' status.





Legend

- Study Boundary
- Ditch Lines
- Location of Photographs of Hydrological Features

Date 14/07/2016

Name Of Client

Wicklow County Council

Name Of Job

EIS for proposed Kilquade Waste Soils Recovery Facility

Title Of Figure

Surface Water Features in the Vicinity of the Site

Scale Used 1:5,000 @ A4

Figure No. 13.4

Rev A

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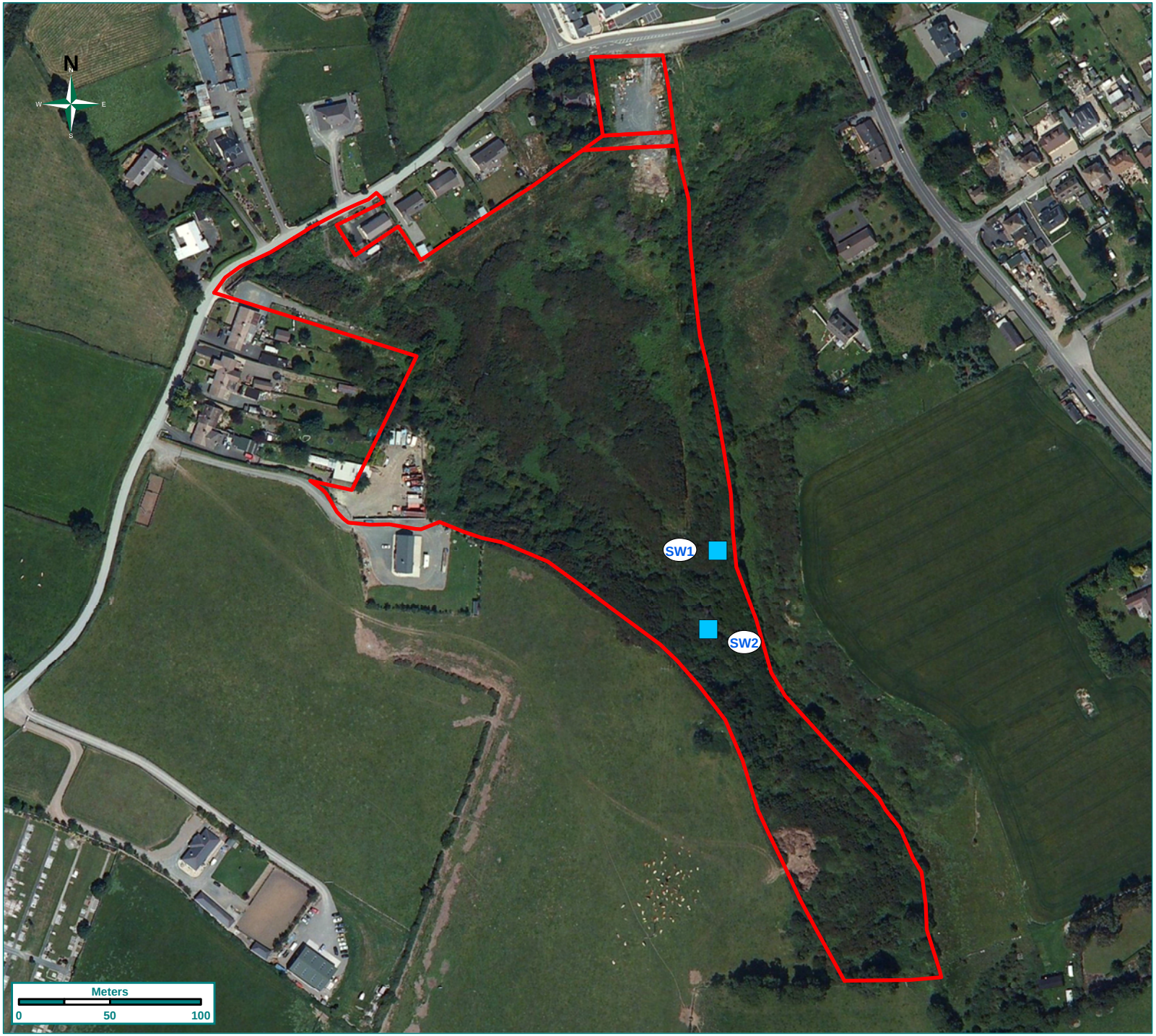

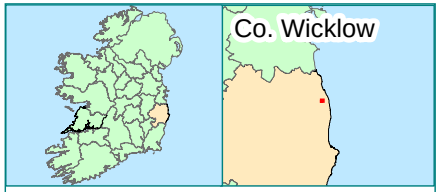

Legend

Study Boundary

Surfacewater Monitoring Location

SW1: 728961, 709250
SW2: 728956, 709207

Date 06/05/2016

Wicklow County Council

Name Of Job

Waste Licence, Planning & EIS for Waste Soils Recovery Facility

Title Of Figure

Baseline Surface Water Monitoring Locations

Scale Used 1:3,000 @ A4

Figure No. 13.5

Rev A

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13.4 Potential Impacts

The potential impacts on the hydrological regime at the site and the quality of waters draining the site are assessed in the following sections for the activities associated with each phase of the proposed development. The potential impacts are assessed in accordance with the evaluation criteria outlined in Section 13.2.5. The unmitigated potential impacts are summarised in Table 13-11 in Section 13.4.5. The drainage of the proposed development is then considered, taking account of mitigation measures to reduce or eliminate any residual impacts.

The potential impacts in relation to an increase in flooding, cumulative flood risk with neighbouring developments, as well as specific impacts during the various phases of the development are outlined below.

13.4.1 Do Nothing Impact

If the proposed development does not proceed, the site will remain as a disused wild, overgrown area for the foreseeable future. It is not anticipated that the 'do nothing' scenario would cause any impacts to the hydrological environment.

13.4.2 Potential Impacts during Construction

During the construction period, the development has the potential to lead to impacts on hydrology and water quality unless appropriate mitigation is applied. The construction period will consist of the following activities:

- Site clearance works
- Material Placement Activities
- Entrance & Local Road improvement
- Eco-park Development (landscaping/planting)

Due to the proposed removal of vegetation, the disturbance of the existing materials on the site, and the importation of soils to the site, the potential impacts of silt-laden runoff on the site is examined below.

Potential Direct Impacts

The potential direct impacts from the proposed works include the breakout of silts and soils via runoff from the site, thus impacting on the water quality of receiving waters and an increase in the rate of runoff from the site due to the construction of amenity tracks and hardstanding areas.

New access tracks and other new, hard surfaces have the potential to contribute to a low level increase in run-off, as indicated in Table 13-10 overleaf, which shows the estimated changes in the volume of runoff corresponding to a 1-in-100 year, 30-minute duration storm at the proposed Pretty Bush facility.

The estimated increase in run-off from the site during the 30-minute storm with a 1 in 100 year return period is calculated as being 3.0% above the existing scenario. This is based on the footprint of the site and the decreased surface permeability of the site due to the construction of paths and hardstanding areas of the site.

When the increase in runoff towards the Kilcoole Stream is assessed, taking into account the catchment which drains to the Kilcoole Stream, the percentage increase in flow rate within the stream due to the increase in hardstanding area at Pretty Bush Eco Park is less than 0.1%.

The magnitude of the impact does not take into account the proposed mitigation measures. The impact significance will be assessed in Section 13.4.5.

Table 13-10: Increase in Surfacewater Run-off

Kilcoole Stream - Full Catchment											
		Catchment Area	Overland flow area x 0.3 Imp. Factor	New hardcore tracks	x 0.5 Imp. Factor	Total Run-off Imp. Area	Q flow coefficient Mod. Rational Method	Rainfall Intensity for 1 in 100 yr storm of 30 mins. X 1.1 for Climate Change, Met Eireann*	Run-off	Increase in Run-off from site.	% Increase in Run-off
Catchment	Scenario	ha	ha	ha		ha		mm/hr	m3/s	m3/s	
Increase in run-off to Kilcoole Stream	Existing	757	227.10			227.10	2.78	71.72	45.280		
	Post Development		227.03	0.25	0.12	227.15	2.78	71.72	45.289		
	Increase in Run-off									0.010	
	% Increase in Run-off										0.02
Notes:											
Factor of 1.1 is applied to rainfall intensity to allow for climate change in accordance with GDSDS											
Rainfall intensity for 1 in 100 year return period storm is from opw.hydronet. 30 minute 100yr rainfall is 32.6mm. Doubled for rainfall intensity is 65.2mm, and increased by 10% for climate change = 71.72											
Q100 flow derived using the Modified Rational method Q = 2.78 x (Rainfall Intensity) x (Contributing Impervious Area)											
Main River Catchment highlighted as follows:		Kilcoole Stream									
Kilcoole Stream - Runoff from Site Only											
		Catchment Area	Overland flow area x 0.3 Imp. Factor	New hardcore tracks	x 0.5 Imp. Factor	Total Run-off Imp. Area	Q flow coefficient Mod. Rational Method	Rainfall Intensity for 1 in 100 yr storm of 30 mins. X 1.1 for Climate Change, Met Eireann*	Run-off	Increase in Run-off from site.	% Increase in Run-off
Catchment	Scenario	ha	ha	ha		ha		mm/hr	m3/s	m3/s	
Increase in run-off to Kilcoole Stream	Existing	5.6	1.68			1.68	2.78	71.72	0.335		
	Post Development		1.61	0.25	0.12	1.73	2.78	71.72	0.345		
	Increase in Run-off									0.010	
	% Increase in Run-off										2.97
Notes:											
Factor of 1.1 is applied to rainfall intensity to allow for climate change in accordance with GDSDS											
Rainfall intensity for 1 in 100 year return period storm is from opw.hydronet. 30 minute 100yr rainfall is 32.6mm. Doubled for rainfall intensity is 65.2mm, and increased by 10% for climate change = 71.72											
Q100 flow derived using the Modified Rational method Q = 2.78 x (Rainfall Intensity) x (Contributing Impervious Area)											
Main River Catchment highlighted as follows:		Kilcoole Stream									

Potential Indirect Impacts

The relatively low increase in run-off has however the potential to cause soil erosion and consequent sediment release into the receiving watercourses. Possible potential indirect impacts on hydrology and surface water quality during construction activity include:

- Increased sediment loading of streams from personnel and traffic activities which may adversely impact water quality;
- Walkways constructed close to watercourses could allow the migration of silt laden run-off into watercourses and consequently have an adverse impact on water quality;
- Silt carried on the wheels of vehicles leaving the site could be carried onto the public road;
- Suspended solids could potentially lead to siltation and physical effects on flora and fauna in aquatic habitats.
- Refueling activities could result in fuel spillages which may enter directly into the nearby watercourses through surface water runoff pathways or alternatively do likewise through groundwater pathways to these watercourses. Inputs of fuel to nearby watercourses would increase pollutant levels and adversely impact on water quality;
- There is the potential for fuel spillages/leaks from storage tanks which will be stored on site for plant machinery. Such spillages/leaks would adversely impact water quality as outlined above;
- The removal of the vegetated material and construction of new walkways may also lead to an increase in the rate of run-off along the route of the walkways. This increase in the rate of run-off could lead to a minor increase in the flow rate off-site, and potentially an increase in both flooding and pollutant levels downstream;
- Inappropriate site management of stockpiles could lead to loss of suspended solids to surface waters and a subsequent adverse impact on surface water quality;
- Inappropriate management of the drainage of material storage areas could lead to loss of suspended solids to surface waters and a subsequent adverse impact on surface water quality;
- Blockage of cross-drains could lead to consequent flooding and concentration of flows;
- Flows from the new drainage system could be impeded, should blockages occur in the existing drains;
- The open drain at the eastern boundary of the site presents a risk to the safety of site personnel and the public;
- The placement of dredge spoil material has the potential to obstruct existing overland flowpaths;
- A blockage in the proposed construction stage drainage system could allow a break out of silt laden run-off to reach adjacent watercourses or streams, impacting negatively on surface water quality;
- Inappropriate management of material stockpiles could result in accidental break outs of silt on site leading to the loss of suspended solids to surface waters and a subsequent adverse impact on surface water quality;
- The re-profiling of the stream through the west of the site, in the absence of appropriate mitigation measures, may result in a breakout of silt or erosion of materials placed along the route of the ditch, impacting negatively on surface water quality;
- Proposed interceptor drains on the uphill side of construction works will have to convey all of the contributing run-off from the land above. Failure to construct these drains will result in mixing of overland flow with run-off from material placement works, which will compromise the efficacy of the settlement ponds during the construction stage.

Potential Cumulative Impacts

The increase in the rate of surface water run-off due to the temporary disturbance to ground to layout the walkways and the surfacing of these trails and the central amenity area with a semi permeable material within the waterbody catchment, together with any additional adjacent developments, could lead to a minor cumulative increased risk of both adverse water quality impacts and flooding downstream.

Measures to mitigate against silt-laden runoff include:

- Interceptor ditches to divert clean overland flows and prevent mixing of these waters with construction runoff;
- Construction of settlement ponds to allow silt particles to settle before flows are discharged off-site into the adjacent watercourse;
- Construction of appropriate interceptor and runoff drains around stockpiles and around all areas of the site where earthworks are taking place;
- Construction of silt traps and check dams in all temporary and permanent drainage;

Assuming the proper implementation of the mitigation measures noted above, it is not anticipated that there will be any significant cumulative impacts on any downstream development or any sites downstream of ecological/environmental importance.

13.4.3 Potential Impacts during Eco-Park Operation

It is not envisaged that the post construction operation of the site as an Eco-park will alter the hydrological regime of the area. The preliminary drainage system has been designed to continue to run efficiently during the post-construction period.

As part of the Eco-park development and post construction, the settlement pond will be subject to minor works involving reshaping the pond slopes with a gentle gradient into a wildlife pond once the natural vegetation is well established, leaving any constructed permanent drainage in place to provide a continued drainage system for the surface water draining from the development. When operational, the site will have a negligible effect on surface water quality as there will be no further disturbance of soils post construction and only a minimum of trafficking for maintenance vehicles.

The main potential hydrological impact of the development is a minor (<0.1%) increase in run-off in the Kilcoole Stream following a storm event, due to the change in land use and a slight increase in impermeable ground conditions. Some infiltration will occur through the hardcore material of the walkway construction and the construction of site tracks and hardstanding areas will lead to a slight increase in hard standing area on the site. Surface water run-off will discharge to the drainage swales during rainfall events. During the post construction period the swales will have vegetated and will serve to further attenuate flows.

It is not envisaged that the limited maintenance activities taking place on the site, involving general maintenance of the site tracks and including maintenance of the drainage system and reinstated areas, will give rise to any significant impacts on the hydrological regime of the area or on the quality of the receiving waters.

13.4.4 Potential Impacts of a Risk of Flooding

There is no risk or history of flooding on the site, and no works are located within the indicative floodplain as shown in Figure 13-1.

There will be no appreciable obstruction to extreme event flows over the site as the site gradients will be generally maintained and the overland flow paths on the site will at all stages during the construction reach the adjacent stream at the eastern boundary as in the existing situation.

A flood risk assessment (FRA) was prepared for this site, to determine the impact of increased hard surfaces from this development on downstream flooding. The flood risk identification and assessment is included in Section 13.5.

13.4.5 Summary of Unmitigated Hydrological and Water Quality Impacts of the Development on Sensitive Receptors

A summary of unmitigated potential impacts due to the proposed development is provided in Table 13-11 over.

Table 13-11: Summary of Significance of Potential Hydrological and Water Quality Impacts on Sensitive Receptors

Activity	Potential Impact	Receptor	Sensitivity	Prior to Mitigation	
				Magnitude	Significance
Construction Phase					
Site Clearance Works	Erosion and sedimentation	Existing site watercourses & Kilcoole Stream	Medium	Minor	Minor
Waste Placement Activities	Erosion and sedimentation	Existing site watercourses & Kilcoole Stream	Medium	Minor	Minor
Entrance & Local Road Improvements	Increase in rate of run-off	Existing site watercourses & Kilcoole Stream	Medium	Negligible	Negligible
Eco-Park Development	Erosion and sedimentation	Existing site watercourses & Kilcoole Stream	Medium	Minor	Negligible
Post construction Operation as an Eco-park					
Site access tracks	Increase in rate of run-off	Existing site watercourses & Kilcoole Stream	Medium	Negligible	Negligible
Site access tracks and reinstated Eco Park fill material	Erosion and sedimentation	Existing site watercourses & Kilcoole Stream	Medium	Negligible	Negligible

It can be observed from Table 13-11 that the activities during the construction phase, if unmitigated, would have a minor to negligible impact on receiving watercourses in terms of an increase in run-off, a risk of sedimentation in sensitive catchments or the chemical pollution of watercourses from fuel spillages/leaks.

Post construction, the operation of the site as an Eco-park is not expected to have a significant effect on the receiving watercourses.

As discussed, the risk of an increase in flooding is of low significance due to the small percentage increase in run-off contributing to the catchments as a result of the proposed development at Pretty Bush.

13.5 Flood Risk Identification and Assessment

13.5.1 Flood Zones

As discussed in Section 13.3.3, no areas of the site are located within the floodplain as shown in the CFRAM mapping. There is no flood risk therefore to the completed site works during a flood event.

13.5.2 Estimated Increase in Flood Risk

The site lies within a catchment for the Kilcoole Stream which is 7.57 km^2 in size which includes the town of Kilpedder and all lands draining to the Kilcoole Stream. The total area of proposed walkways and hardstand areas constructed as part of the Pretty Bush Eco-Park on the site is 0.25 hectares, which will produce a negligible increase in runoff from the site during a 100-year extreme rainfall event. As such there will be no noticeable increase in flood risk as a result of the proposed development.

13.6 Proposed Drainage of Pretty Bush Eco Park

The proposed drainage for the Eco Park has been informed by the potential impacts, discussed in Section 13.4. In addition to draining the development, the drainage design has the capacity to introduce hydrological links from the proposed development to the receiving environment, during the construction of the development. An appropriate drainage design will be the primary mitigation measure for the Eco Park which will incorporate silt protection control measures and a reduction in the rate of surface water run-off from the proposed development. The proposed drainage for the development is set out below. The mitigation measures that follow in Section 13.7 refer to the drainage design and also include other best practice measures to mitigate any potential impacts from the development.

Two drainage routes exist through the site at present, and these will be preserved in the layout for Pretty Bush Eco Park. Both of these drainage routes convey overland flows towards the Kilcoole Stream. These are both described below.

The primary drainage route on the site runs from the north-west of the site towards the south-east. This watercourse will be re-profiled as it lies within the portion of the site where materials will be placed. The filled areas will be designed such that continuity is provided along this drain where it runs from the buffer zone towards the area subject to filling. A settlement pond will be constructed in-line with this stream at the downstream reach to allow any suspended solids to be removed from the runoff before being discharged off site.

Another watercourse in the form of a small ditch runs along the eastern boundary of the site from north to south, where it joins with the watercourse described above before draining towards the Kilcoole Stream. This watercourse is in the buffer zone and as such no material will be placed in its vicinity.

The proposed drainage system for the Eco Park is shown on Figure 13.6. In addition, further design detail in included in Appendix 20 to this EIS. Drainage ditches/swales are specified to convey overland flows southwards and reduce the potential for erosion on the imported material. It is anticipated that these ditches would be shallow (<400m) and have shallow side-slopes.

13.6.1 Proposed New Site Walkways and Hard Surfaces

The proposed new walkways and hardstanding areas will be drained as per the eco-park proposed drainage system via percolation and over the edge drainage to the reinstated surfaces, with a stilling pond at the end of the drainage run.

The settlement ponds will drain diffusely overland, over existing vegetated areas, within the site boundary. The settlement pond has been sized with a surface area of 18m x 14m and a depth of 1m.

In all it is proposed to construct 1.23km of new walkways as part of the Eco-Walk to be constructed on the site. The walkways will be permeable and of hoggin path, mulch or gravel construction.

The flood risk identification and assessment prepared for this development, and included in Section 13.5, determined that any increase in run-off would be of very low significance. It is nonetheless recommended that any potential for an increase in the velocity of the surface water run-off should be reduced. Walkways will drain via percolation or over the edge to the reinstated vegetated eco-park. Silt fencing will be provided at strategic locations, particularly at the location of any stockpiled material and close to drainage flow paths, to further protect the perimeter ditches of the site during the construction stage.

It is not expected that overland flows will be obstructed to any great extent as a result of the layout of the development. However, where required, interceptor channels will collect overland flows on the upslope side of the temporary haul roads and hard standing areas. The overland flow will then discharge diffusely on the downslope side.

There is the potential for increased sediment to enter the drains on site due to the uncompacted nature of the soils to be deposited on the site during the construction stage. Silt Protection Controls (SPCs) are proposed at the location of the drain crossings. It is recommended that the SPCs will consist of a minimum of silt traps containing filter stone and filter material staked across the width of the swales and upstream of the outfall to any watercourse.

Site drainage, including silt traps and stilling ponds, will be put in place in parallel with or ahead of construction, such that placement of materials and construction of new infrastructure will have a functioning drainage system in place.

13.6.2 Drainage of Temporary Site Compound

The proposed location of the Temporary Site Compound is shown in Figure 13-6. The compound will be set back from the drain that runs alongside the eastern site boundary.

Drains around the hard-standing areas of the site compound will be in the form of shallow swales to minimise the disturbance to sub-soils.

Filter drains may be used where trafficking by site staff is required to access the temporary site compound. The filter drains/swales will drain to a stilling pond. The proposed drainage layout is shown on Figure 13.5. The stilling pond will be backfilled following the construction period and the vacation of the temporary site compound.

Refuelling of plant during construction will be carried out at a dedicated refuelling station on site, which will be a minimum of 100m from any watercourse. The station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. Drip trays and spill kits will be kept available on site, to ensure that any spills from the vehicle are contained and removed off site. Only emergency breakdown maintenance will be carried out on site and appropriate containment facilities will be provided to ensure that any spills from breakdown maintenance vehicles are contained and removed off site.

Any diesel or fuel oils stored at the temporary site compound will be bunded. The bund capacity will be sufficient to contain 110% of the tank's maximum capacity. Where there is more than one tank within the bund, the capacity will be sufficient to accommodate 110% of the largest tank's maximum capacity or 25% of the total maximum capacities of all tanks, whichever is the greater. Design and installation of fuel tanks will be in accordance with best practice guidelines BPGCS005 (Oil Storage Guidelines).

Portaloos and/ or containerised toilets and welfare units with storage tanks will be used to provide toilet facilities for site personnel during construction. The sanitary waste will be removed from site by a licensed waste disposal contractor. All portaloo units located on site during the construction phase will be operated and maintained in accordance with the manufacturer's instructions, and will be serviced under contract with the supplier. All such units will be removed off-site following completion of the construction phase. There will be no permanent sanitary facilities provided for the proposed development.

13.6.3 Drainage of Stockpiled Material

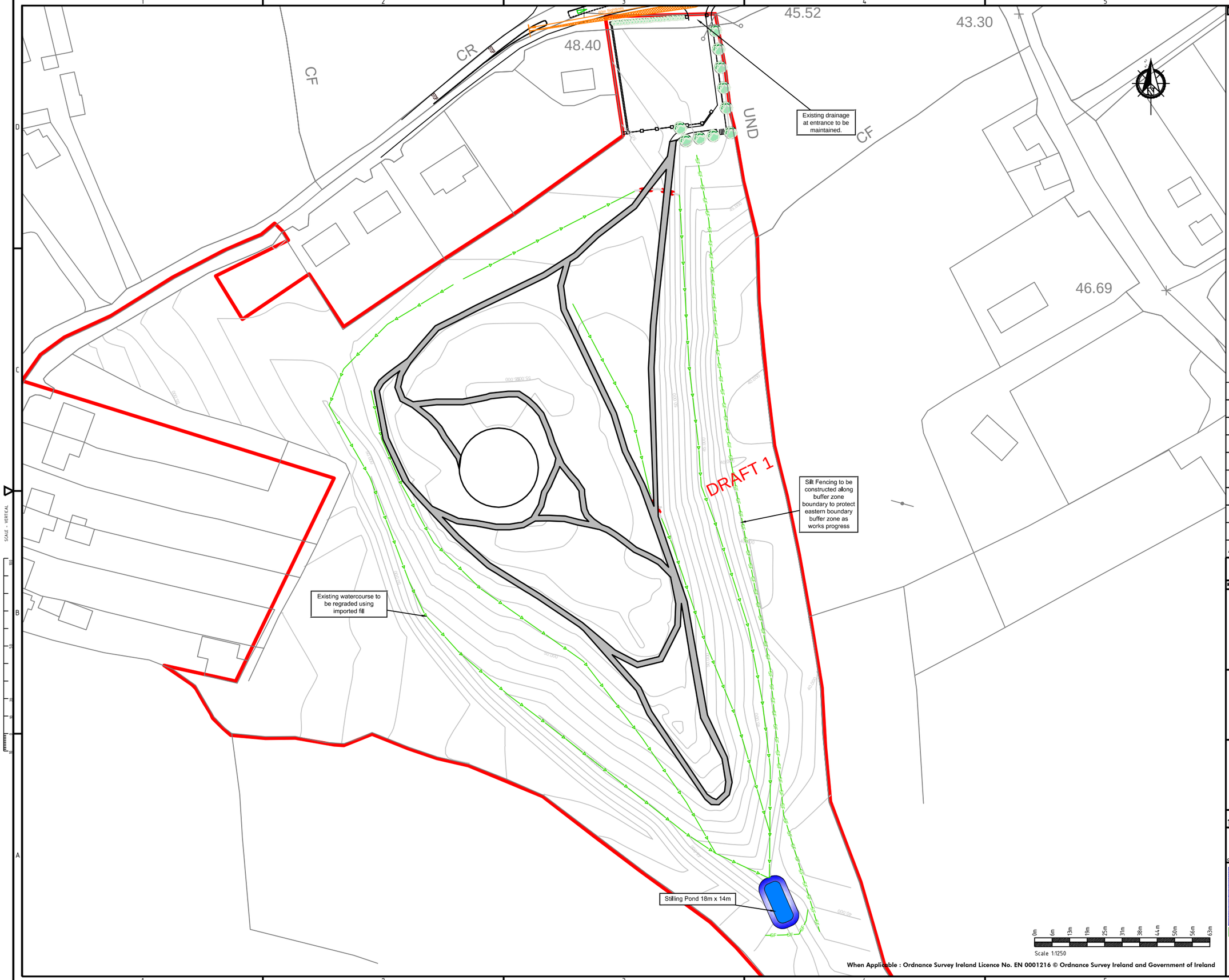
Any stockpiles of material will be set back a minimum of 50m from the stream at the eastern site boundary. It is proposed to drain all exposed surfaces and imported material to settlement ponds. At the upslope side of any stockpiles, interceptor drains will be constructed where required to prevent ingress of water into stockpiled material.

Stockpiles on site will be kept to a minimum of 2m in height, and will be profiled such that runoff from the stockpiles is directed towards a silt trap or 'dirty water' drain.

Reinstated areas and berms will be re-planted as per Section 3.3.6 of this EIS, and further measures will be undertaken, in the form of erosion control matting for example if deemed to be required.

13.6.4 Construction Stage Settlement Pond

A settlement pond will be provided at the south of the site as shown in Figure 13.5. This is sized at 18m x 14m, with a depth of 1m. Prior to discharge off-site, runoff from the imported materials on the site will pass via the site drainage system through this settlement pond in order to minimise the suspended solids and protect the receiving watercourses.



NOTES

1. Silt fencing is to be constructed where works are in proximity to the eastern boundary ditch buffer zone, and around all stockpiled material on site, in accordance with detail drawing LW15-247-01-0501-003

2. For settlement pond details, please see detail drawing LW15-247-01-0501-001

3. Drainage ditches shall include check dams and silt traps where necessary, as noted on drawing LW15-247-0501-002

LEGEND:

- Site Boundary
- Track
- Drainage Ditch
- Silt Fencing (Construction stage only)
- Stilling Pond with Diffuse Outflow
- Proposed cross drain
- Contours @ 1m Intervals

Rev.	Drawn	Chk'd	App'd	Rev Origin / Date	Description
A	GW	RDW	DM	Cork 12.07.16	ISSUE FOR EIS

Revision History: A — EIS

Name of Client

WICKLOW COUNTY COUNCIL

Name of Job

PRETTY BUSH ECO PARK

Title of Drawing

DRAINAGE LAYOUT

Scales Used 1:1250

This Drawing was printed to ISO Full Bleed A3 (420.00 X 297.00 MM)

Dwg. No. LW15-247-01-Figure 13.6

Rev. A

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ORIGINAL DRAWING SIZE A1 - (841 x 594)

SCALE HORIZ.

SCALE - VERTICAL

13.7 Mitigation Measures for Hydrology and Water Quality

13.7.1 Proposed Mitigation Measures for the Construction Stage of the Development

Proposed drainage measures to reduce and protect the hydrological regime and water quality from the potential impacts during the construction of the proposed development are as outlined above in Section 13.6. These include measures to prevent runoff erosion from vulnerable areas and consequent sediment release into the nearby watercourses to which the proposed development site drains. The mitigation measures proposed to reduce potential direct and indirect impacts are outlined below.

- The increase in the rate of run-off along the route of the site tracks and hard-standing areas will be mitigated by the proposed drainage system which includes the provision of stilling ponds and silt traps to reduce the concentration of suspended solids in the run-off from these areas, and the addition of silt fencing where deemed necessary;
- As discussed, stilling ponds will be put in place in advance as construction progresses across the site. The stilling ponds with a diffuse outflow will mitigate any increase in run-off. Erosion control and retention facilities, including stilling ponds will be regularly maintained during the construction phase. The three-stage treatment train (swale – stilling pond – diffuse outflow) proposed to retain and treat the discharges from hard surface areas as a result of the development will reduce any risk of flooding downstream;
- Imported materials will, as much as possible, be placed on site in their proposed location and will not require double-handling. Where this is not possible, material will be placed in designated temporary material storage areas;
- Temporary material storage areas will be monitored to manage any potential loss of suspended solids to surface waters. These areas will be surrounded by silt fences to filter sediment from the surface water run-off from excavated material;
- The proposed drainage of the material storage areas is being described in Section 13.6 above and includes the provision of a settlement pond to reduce the concentration of suspended solids in the run-off from this area, and the addition of silt fencing where deemed necessary. Overland flows will be diverted around this area;
- Cross-drains of 225mm diameter will be provided where deemed necessary convey surface water via drainage routes under proposed site tracks. Interceptor cut-off drains will be provided on the upslope side of the earthworks during the construction phase to prevent the mixing of overland flows with the construction stage 'dirty' runoff. These interceptor drains will discharge diffusely over land;
- The construction of roadside drains for site access road drainage follows existing flow paths on the regraded site where possible;
- Cognisance has been taken of the findings in Section 11 Ecology and Section 12 Soils and Geology in the location of stilling ponds to ensure that these facilities are located in suitable areas. The main stilling pond will be constructed at the south of the site, outside of the areas of 'Extreme' groundwater vulnerability;
- All open water bodies adjacent to proposed construction areas will be protected by fencing, including the proposed settlement pond;
- The conceptual site drainage has been designed to complement existing overland flow paths and site drainage. The drainage design will be developed in full at the detailed design stage;
- All personnel working on site will be trained in pollution incident control response. Emergency Silt Control and Spillage Response Procedures contained within the Site Drainage Management Plan of the Construction Environmental Management Plan (CEMP) will ensure that appropriate information will be available on site outlining the spillage response procedure and a contingency plan to contain silt.
- Adequate security will be provided during the construction phase to prevent spillage as a result of vandalism.
- A regular review of weather forecasts of heavy rainfall is required and a contingency plan will be prepared for before and after such events. As there is an increased risk of a break out of silt laden run-off during periods of high rainfall, no works will be carried out during these periods, if possible;
- A record will be kept of the regular visual examinations of watercourses which receive flows from the proposed development, during and for an agreed period after the construction phase.

Water samples will be taken and water quality will be monitored in accordance with the Waste Licence for the site, as outlined in Section 13.7.4;

- The developer will ensure that erosion control, namely silt-traps, silt fencing and swales are regularly maintained during the construction phase;
- During the construction period an emergency facility will be provided to control the discharge from the stilling ponds. This will mitigate the risk of any accidental spillage on site affecting watercourses;
- A suitably qualified person will be appointed by the developer to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process. The maintenance phase of the development will include regular monitoring of the drainage system and maintenance as required;
- Where haul roads pass close to watercourses, silt fencing will be used to protect the streams. Silt traps will also be provided at outfalls from roadside swales to existing drains. Silt traps will be kept upstream of outfalls to allow a buffer zone to the outfall;
- Re-profiling of the stream in the west of the site, using suitable material, shall take place in dry weather only as far as possible, in order to minimise the disturbances to any waters which may flow through this ditch;
- The re-profiling of the stream through the site shall be carried out in small stages and shall start at the upstream end, working towards the downstream end. No material will be placed at the rise of the stream, and re-profiling works will take place outside of the designated buffer zones only. The diverted stream channel bed shall be constructed using suitable stone material to protect imported material from erosion. Measures such as erosion control matting will be utilised where necessary to protect the stream banks while vegetation establishes;
- Any flows present in the existing stream during re-profiling works shall be diverted via overland temporary pipes around areas where active works are taking place;
- A settlement pond shall be constructed in line with the re-profiled stream during the construction phase to ensure that any suspended solids from the placed material are removed from the runoff before being discharged off site;
- Section 12 (Soils and Geology) of this EIS has been consulted in the consideration of the drainage layout;
- Where new cross-drains are proposed on this site to convey surface water underneath proposed amenity walkways, these will be sized at a minimum of 225mm diameter to avoid blockages;
- Roadside swales will serve to attenuate any increase in surface water run-off due to new hardcore tracks or existing track widening;
- Refuelling of plant during construction will only be carried out at designated refuelling station locations on site. Each station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. Only emergency breakdown maintenance will be carried out on site. Drip trays and spill kits will be kept available on site, to ensure that any spills from the vehicle are contained and removed off site;
- Any other diesel, fuel or hydraulic oils stored on site will be stored in bunded storage tanks – the bund area will have a volume of at least 110% of the volume of such materials stored;
- Portaloos and/ or containerised toilets and welfare units will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from site via a licenced waste disposal contractor;

All of the mitigation measures detailed above will ensure that the water quality status of the receiving waterbodies is not affected by the proposed development and the WFD management plan objectives will be achieved subject to no other sources of pollution having a detrimental impact.

An Outline Construction Environmental Management Plan (CEMP) has been prepared and is included in Appendix 2. This contains a Site Drainage Management Plan which will be finalized in accordance with this outline plan following appointment of the contractor for the main construction works.

13.7.2 Proposed Mitigation Measures during post construction operation of the Pretty Bush Eco-park

It is not envisaged that the post construction period will involve any significant impacts on the hydrological regime of the area. Further, the maintenance of the Pretty Bush Eco Park will incorporate effective maintenance of the drainage system, as required.

Wicklow County Council will have the responsibility for maintaining the drainage system at the finished site. The maintenance regime will include inspecting the following:

- drains and cross-drains for any blockages
- outfalls to existing field drains and watercourses
- existing roadside swales for any obstructions
- swales and stilling ponds
- progress of the re-establishment of vegetation

The re-graded stream through the west of the site will be monitored for scour and erosion during the operation and maintenance of the Eco Park. If erosion is observed in the channel, preventative action will be taken which may include the use of erosion control matting, silt fencing, or the introduction of measures to reduce the flow velocity, such as silt traps or check dams.

The maintenance regime will also include implementing appropriate remedial measures as required after the above inspections and testing the water quality at the outfalls at appropriate intervals.

Maintenance will be in accordance with CIRIA C697 (SuDS and Maintenance Manual). Daily visual inspections will be undertaken during the construction period, followed by fortnightly visual inspections until the vegetation has been re-established satisfactorily. Monthly monitoring will continue following the completion of construction until full re-vegetation has occurred, as outlined in Section 13.7.4.

13.7.3 Proposed Mitigation Measures for Flooding

A flood risk assessment has been undertaken for this development and it is included in Section 13.3.3. The flood risk assessment concludes that the proposed development has a minimal impact on flood risk in the surrounding area and therefore the increased risk of flooding as a result of the proposed development is negligible.

13.7.4 Proposed Mitigation Measures for Water Quality

Monitoring of the surface waters on site will be carried out in accordance with the waste licence for the site, once obtained from the EPA. The surface water quality parameters to be monitored and the frequency at which these parameters will be monitored will be in accordance with the details specified in this licence.

Regular monitoring of the surface waters on site will help to ensure that water quality is maintained and that all proposed mitigation measures to protect water quality are working effectively.

It is envisaged that regular visual inspections of drains and outfalls will be performed during the construction period to ensure that suspended solids are not entering the streams of the site, to identify any obstructions to channels, and to allow for appropriate maintenance of the drainage regime. If at any point exceedances of applicable parameters are noted, construction work will be stopped and remediation measures will be put in place immediately. Monitoring will continue to occur during the post-construction stage of the Eco-park until such time as monitoring identifies no impacts resulting from the Eco-park, when the licence for the site shall be surrendered, in agreement with the EPA.

13.8 Cumulative Impacts

A planning search has been carried out for developments located within the vicinity of Pretty Bush Eco Park. This is detailed further in Section 2 of this EIS. Of the developments located within 5km of the site, one shares a river sub-catchment (Kilcoole Stream_010 IE_EA_10K010580) with the Pretty Bush Eco Park. This planning application, number 071352, is for a mixed use development at Charlesland, Greystones, Co. Wicklow.

Preliminary assessment demonstrates that the Pretty Bush Eco Park and the proposed development at Charlesland are not hydrololigically linked, as the proposed Charlesland development does not drain towards the catchment of the Kilcoole Stream. As such there is no cumulative impact when the Pretty Bush Eco Park is assessed alongside other proposed developments in the area.

13.9 Residual Impacts after Mitigation

The residual significance of the effects of the development of the site on sensitive downstream receptors is expected to be low taking account of mitigation measures as outlined in Sections 13.6 and 13.7.

The residual impact is summarised in Table 13-12 below, using the impact assessment outlined above in Section 13.2.5 and taking account of mitigation measures in Sections 13.6 and 13.7 of this document.

Table 13-12 indicates that, following the implementation of mitigation measures, the residual risk to the receiving watercourses would be negligible during the construction period and negligible during the maintenance stage of the facility. Implementation and efficacy of the mitigation measures will be monitored throughout the construction and operation phases.

In the unlikely event of failure of the stilling ponds as a result of a blockage for instance, it can be seen from Table 13-12Error! Reference source not found. that this would only have a minor effect on the receiving ditch to the east of the site.

Mitigation systems will, where required, be in place before development works commence.

A flood risk identification and assessment was undertaken in Section 13.3.3 and it was found that the site is not subject to flood risk from either fluvial or pluvial flooding. The existing drainage patterns on the site will be maintained following the development of the Pretty Bush Eco Park.

As a result of the retention and treatment measures to be applied, the development is expected to have a low hydrological and water quality impact on the receiving environment. In particular, the proposed development, if undertaken as proposed, will not have an adverse effect in terms of hydrology and water quality on the integrity of the following environmentally protected designated sites:

- The Murrough Wetlands SAC (site code 002249)
- The Murrough SPA (site code 004186) and pNHA (site code 000730)

An appraisal of the potential impact to these European sites was carried out within the Natura Impact Statement prepared as part of the planning application for this proposed development. The proposed development at Pretty Bush is not expected to contribute to any significant, negative cumulative effects with other existing or proposed developments in the vicinity in terms of hydrological impacts.

Mitigation measures are also proposed for development to treat the surface water runoff prior to discharge off-site, protecting the water quality in the receiving environment, as outlined in Sections 13.6 and 13.7 of this document. In circumstances where the proposed mitigation measures are implemented in full, a high degree of confidence can be assured that any effects on the receiving environment will be of low significance.

Table 13-12: Residual Hydrological Impacts Significance for Sensitive Receptors

Activity	Potential Impact	Receptor	Sensitivity	Before Mitigation		After Mitigation	
				Magnitude	Significance	Magnitude	Residual Significance
Construction Phase							
Site Clearance Works	Erosion and sedimentation	Existing site watercourses & Kilcoole Stream	Medium	Minor	Minor	negligible	negligible
Waste Placement Activities	Erosion and sedimentation	Existing site watercourses & Kilcoole Stream	Medium	Minor	Minor	negligible	negligible
Entrance & Local Road Improvements	Increase in rate of run-off	Existing site watercourses & Kilcoole Stream	Medium	Negligible	Negligible	negligible	negligible
Eco-Park Development	Erosion and sedimentation	Existing site watercourses & Kilcoole Stream	Medium	Minor	Negligible	negligible	negligible
Activity	Potential Impact	Receptor	Sensitivity	Before Mitigation		After Mitigation	
				Magnitude	Significance	Magnitude	Residual Significance
Post Construction Operation as an Eco-park							
Site access tracks	Increase in rate of run-off	Existing site watercourses & Kilcoole Stream	Medium	negligible	negligible	negligible	negligible
Site access tracks and reinstated Eco Park fill material	Erosion and sedimentation	Existing site watercourses & Kilcoole Stream	Medium	negligible	negligible	negligible	negligible

13.10Conclusion

With the implementation of suitable mitigation measures during the construction stage of the works at Pretty Bush Eco Park, Co. Wicklow, the receiving hydrological environment is expected to be subject to short-term negligible impacts during the proposed works. These impacts are not envisaged to result in adverse impacts on the existing hydrological environment in terms of water quality or flood risk.

Further, the particular requirements as outlined by Irish Water (IW) have been considered for this development and it can be concluded as follows:

There is no requirement for a water supply or any surface water discharges to sewers at the facility. There will be no physical impact on IW assets. The increase in run-off as a result of the development is considered to be negligible (<0.1% increase in catchment flows in the Kilcoole Stream downstream of the site), therefore the receiving waters will not be receiving additional contributions. The impact on contribution catchments of water sources has been assessed as negligible.

13.11References

Department of Environment, Heritage and Local Government and the Office of Public Works (OPW) - *The Planning System and Flood Risk Management - Guidelines for Planning Authorities, 2009*

Dublin Drainage Consultancy – *Greater Dublin Strategic Drainage Study (GDSDS): Technical Documents of Regional Drainage Policies*, 2005

Environmental Protection Agency - *Advice Notes on Current Practice (in the preparation of Environmental Impact Statements), 2003*

Office of Public Works - *Eastern Catchment Flood Risk Assessment and Management Study (Eastern CFRAMS), Draft Flood Risk Management Plan, February 2010 and Flood Extent Mapping.*
http://eastcfram.irish-surge-forecast.ie/

Office of Public Works – *Flood Studies Update (FSU) Web Portal*
http://opw.hydronet.com/

Office of Public Works – *National Flood Hazard Mapping Website*
http://www.floodmaps.ie

Office of Public Works - *Preliminary flood risk assessment (PFRA) indicative mapping website*
http://www.cfram.ie/pfra

Wicklow County Council - *Wicklow County Development Plan 2010-2016*