



Waterman Moylan
Engineering Consultants

Construction and Environmental Management Plan

SHD at Holybanks, Swords

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Comments

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1. Introduction

Waterman Moylan has been appointed by Cairn Homes Properties Ltd. to provide Construction and Environmental Management Plan (CEMP) for the implementation of the construction phase of the proposed development of their lands at Holybanks, Swords, Co. Dublin.

The proposal relates to a residential development of 621 no. units (145 no. 1-bed units, 278 no. 2-bed units, 187 no. 3-bed units and 11 no. 4-bed units) comprising 349 no. apartments, 118 no. houses and 154 no. duplex units. Building heights range from 1 no. to 7 no. storeys (over basement level). The scheme provides for public open space, communal open space areas, a crèche, residential amenities (including concierge, multi-purpose room, meeting room and gym), a new public park to the north of the site as an extension to Broadmeadow Riverside Park and services/bin store areas. The development provides for a total of 705 no. car park spaces (including houses), 856 no. secure bike parking spaces and 21 no. motorbike spaces at basement, under-croft, and surface level.

The proposed development also includes a Stormwater storage tank, located on the Celestica site to the east of Holybanks together with an outfall to the Broadmeadow River which will be laid along the Balheary Road. The Stormwater tank and outfall is required in order to alleviate known constraints in the foul water network that serves the Oldtown / Mooretown / Holybanks lands catchments. The details for the stormwater tanks and outfall have been agreed with Irish Water.

The plan sets out typical arrangements and measures which may be undertaken during the construction phase of the project to mitigate and minimise disruption/disturbance to the area around the site. The purpose of this report is to summarise the possible impacts and measures to be implemented and to guide the Contractor who will be required to develop and implement the Construction Management Plan on site.

Additionally, the report sets out to demonstrate how pollution of watercourses on the environment and surrounding area during and after the construction period will be prevented and/or mitigated. This plan details the implementation of measures in accordance with Environmental plans and Statements specified in Section 3 of this report.

This Construction and Environmental Management Plan (CEMP) is indicative only and should not be construed as representing the exact method or sequence in which the construction works shall be carried out.

As is normal practice, the Main Contractor for the project is responsible for the method in which the demolition and construction works are carried out and to ensure that best practices and all legal obligations including Local Authority requirements and Health and Safety legislation are complied with. The main contractor is also responsible for the design and installation of all temporary works required to complete the permanent works. This plan can be used by the Main Contractor to develop their final Construction Management Plan. The Applicant reserves the right to deviate from the contents of this report, while still complying with all relevant Local Authority requirements and legislation.

2. Site Location and Description

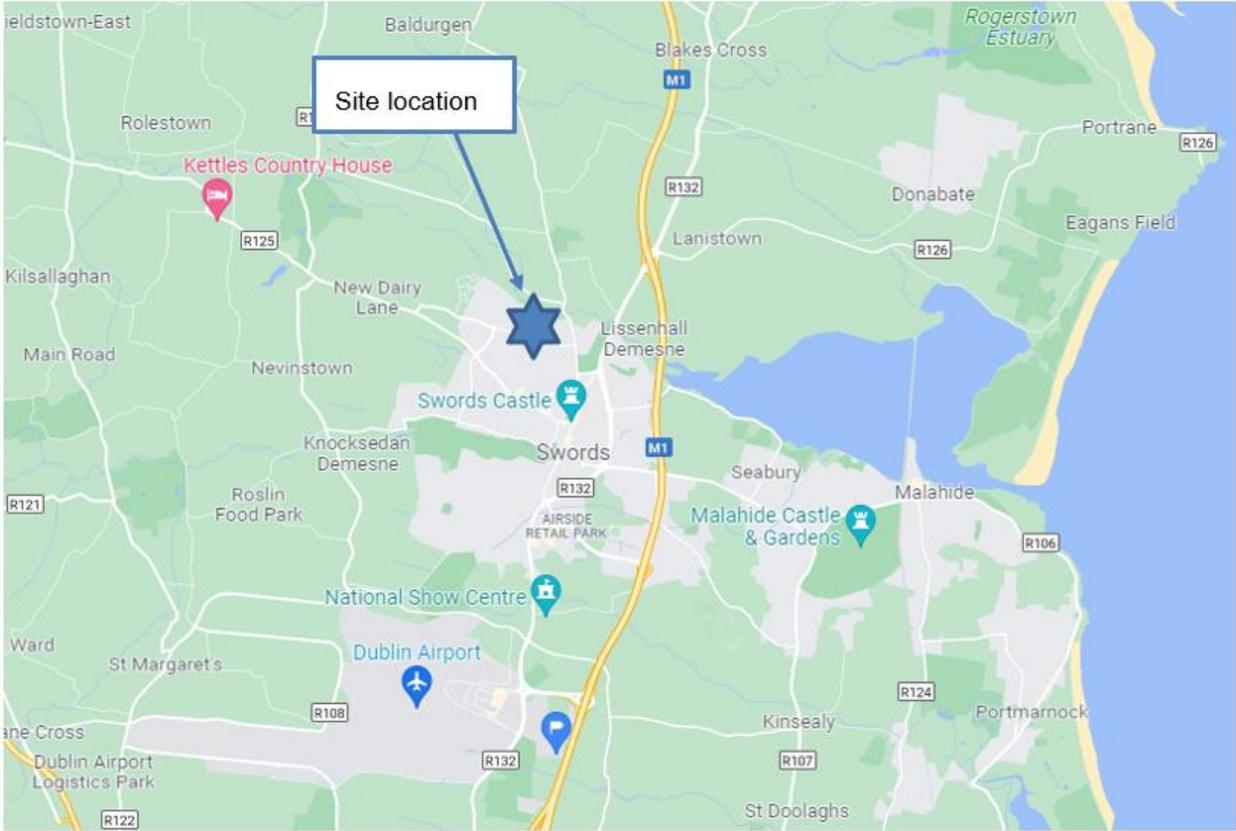
2.1 Site Location

The site is in Swords, Co. Dublin. The site is bound by Glen Ellan Road to the south, Jugback Lane/Terrace to the west, the former Celestica factory site to the east and the Broadmeadow River to the north.

In addition, as part of this application, a Stormwater Storage Tank is being proposed in the Celestica site which is directly adjacent east to the main subject site. The Celestica site is located on the junction of the Glen Ellan Road and the Balheary Road, Swords, Co. Dublin, as indicated in Figure 2 below.

Swords Celtic Football Club and its associated sports grounds are located to the north, on the opposite side of the Broadmeadow River. The Swords Business Campus is also located to the east of the site on the opposite side of Balheary Road. The site location is shown in Figure 1 below.

Figure 1 Site Location



2.2 Existing Site

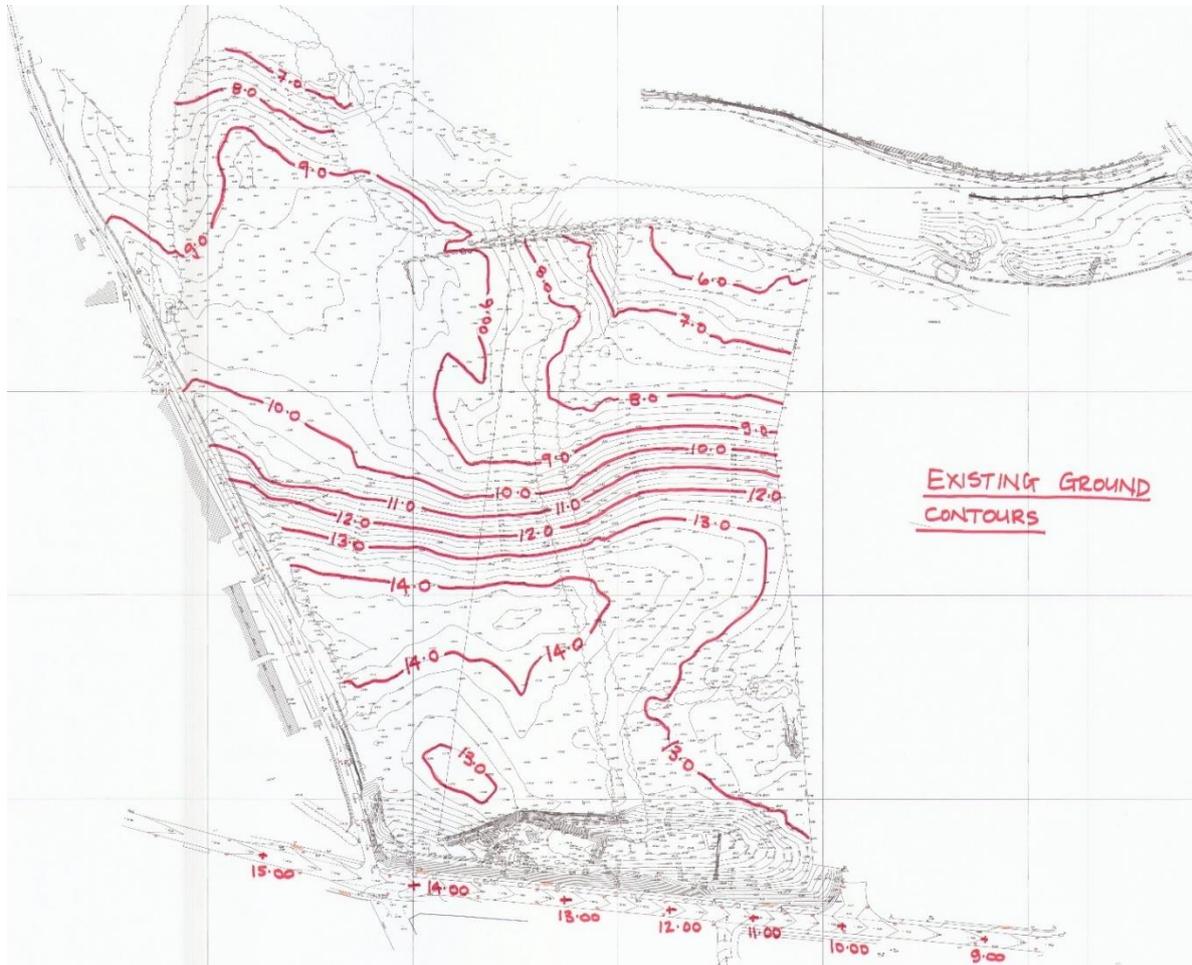
The overall site area is approximately 14.17ha. The site is currently greenfield as shown in Figure 2 below.

Figure 2 Existing Development



The site generally falls from south to north towards the Broadmeadow River. The ground levels to the southwest are in the order of 14.0m falling to 5.6m at the northeast. See Figure 3 below illustrating the existing ground contours.

Figure 3 Existing Ground Contours



The existing ground topography in the area of the proposed storage tank location ranges from 6.30m-6.90m, with gentle gradients falling from west to east and from north to south. The site for the proposed tank is brownfield, with some existing below ground infrastructure identified that will require removal and/or relocation.

2.3 Proposed Construction Works

The proposed work will consist of the following:

- Site preparation;
- Erection of security fencing/perimeter fencing;
- Setting up a secure site compound including wash down area;
- Site clearance including topsoil stripping;
- Construction of infrastructure including access road, footpaths, drainage and services;
- Provision of road upgrades and pedestrian links;
- Construction of 621 no. residential units comprising a mix of housing typologies, duplexes and apartments along with an ancillary childcare facility (506.5sq.m) and a range of residential amenity facilities (573 sq.m).
- Construction of a stormwater storage tank on the existing foul sewer network to mitigate against risk of overflow/surcharging to surface of the existing foul sewer network.

3. Surface Water Impacts

As mentioned above, the subject site drains to the Broadmeadow river which flows through the Malahide Estuary, a Special Area of Conservation (SAC 000205) and Special Protection Area (SPA 4025). A Natura Impact Statement carried out by Openfield Ecological Services is submitted under a different cover. Protection of the watercourse during the construction stage of the subject development is required in order to avoid any negative impact to Natura 2000 sites. Additionally, retained trees and hedgerows on-site shall also be protected. Temporary measures will be put in place to remove sediments, oils and pollutants.

Surface water run-off from surface construction activities has the potential to become contaminated. The main contaminants arising from construction activities include:

- Suspended solids: arising from ground disturbance and excavation;
- Hydrocarbons: accidental spillage from construction plant and storage depots;
- Faecal coliforms: contamination from coliforms can arise if there is inadequate containment and treatment of onsite toilet and washing facilities; and
- Concrete/cementitious products: arising from construction materials.

These pollutants pose a temporary risk to surface water quality for the duration of the project if not properly contained and managed.

4. Mitigation Measures

The following Mitigation Measures are to address potential impacts to water quality and are required to protect the River Broadmeadow and subsequently the Malahide Estuary located downstream of the river. All works will be undertaken with reference to the following guidelines:

- CIRIA C532: Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (Masters-Williams et al., 2001);
- CIRIA C692: Environmental Good Practice on Site, (Audus et al., 2010)
- BPGCS005: Oil Storage Guidelines;
- CIRIA C648: Control of Water Pollution from Linear Construction Projects: Technical Guidance (Murnane et al., 2006a)
- CIRIA C648: Control of Water Pollution from Linear Construction Projects: Site Guide (Murnane et al., 2006a)
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI 2016)
- Guidelines for Planning Authorities – Architectural Heritage Protection – Guidance on Part IV of the Planning and Development Act 2000. (Part 2, Chapter 7) and ICOMOS Principles.
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Water, Inland Fisheries Ireland (IFI, 2016)

The mitigation measures outlined in the report are in keeping with those outlined in the biodiversity chapter of the EIAR/NIS, however, any additional measures identified as necessary in either of these reports shall be incorporated into the CEMP by the contractor before commencing work on site. Emergency contact numbers for the Local Authority Environment Section, Inland Fisheries Ireland, the Environmental Protection Agency and the National Parks and Wildlife Service will be displayed in a prominent position within the site compound. These agencies will be notified immediately in the event of a pollution incident.

The schedule of mitigation presented within Table 1 summarises measures that will be undertaken to reduce impacts on ecological receptors within the zone of influence of the proposed development.

Table 1 Schedule of Surface Water Mitigation Measures

No.	Risk	Possible Impact	Mitigation	Result of Mitigation
1	Hydrocarbons from carparking area entering the watercourse.	Water quality impacts Reduction in habitat quality Mortality of aquatic key ecological receptors/qualifying interests	Designated parking at least 50m from any watercourse.	Ensures no soil disturbance or hydrocarbons leak near aquatic zone
2	Pollutants from site compound areas entering the watercourse.	Water quality impacts Reduction in habitat quality Mortality of aquatic key ecological receptors/qualifying interests	The site compound will be located at least 50m from any watercourse.	Prevents pollution of the aquatic zone from toxic pollutants

3	Pollutants from material storage areas entering the watercourse.	Water quality impacts Reduction in habitat quality Mortality of aquatic key ecological receptors/qualifying interests	Fuels, oils, greases and other potentially polluting chemicals will be stored in bunded compounds at the Contractor's compound or a location at least 50m from any body of water. Bunds are to be provided with 110% capacity of the storage container. Spill kits will be kept on-site at all times and all staff trained in their appropriate use. Method statements for dealing with accidental spillages will be provided by the Contractor for review by the Employer's Representative.	Prevents contamination of aquatic zone by toxic pollutants
4	Concrete/cementitious materials entering the watercourse from washdown.	Water quality impacts Reduction in habitat quality Mortality of aquatic key ecological receptors/qualifying interests	A designated wash down area within the Contractor's compound will be used for cleaning of any equipment or plant, with the safe disposal of any contaminated water.	Prevents contamination of aquatic zone by suspended solids or pollutants, ensures invasive species material is not transported off-site
4	Concrete/cementitious materials entering the watercourse from concrete pours.	Water quality impacts Reduction in habitat quality Mortality of aquatic key ecological receptors/qualifying interests	Pouring of cementitious materials will be carried out in the dry.	Prevents contamination of aquatic zone by suspended solids or pollutants, ensures invasive species material is not transported off-site
5	Leaching of contaminated soil into groundwater.	Water quality impacts Reduction in habitat quality Mortality of aquatic key ecological receptors/qualifying interests	Spill kits will contain 10 hr terrestrial oil booms (80mm diameter x 1000mm) and a plastic sheet, upon which contaminated soil can be placed to prevent leaching to groundwater	Prevents contamination of aquatic zone by petrochemicals
6	Pollutants from equipment storage/refuelling area entering the watercourse.	Water quality impacts Reduction in habitat quality Mortality of aquatic key ecological receptors/qualifying interests	Any refuelling and maintenance of equipment will be done at designated bunded areas with full attendance of plant operative(s) within contained areas at least 50m from any watercourse	Prevents contamination of aquatic zone by petrochemicals
7	Runoff from exposed work areas and excavated material storage areas entering the watercourse.	Water quality impacts Reduction in habitat quality Mortality of aquatic key ecological receptors/qualifying interests	Contractor to prepare a site plan showing the location of all surface water drainage lines and proposed discharge points to the sewer. The plan will include the location of all surface water protection measures, including monitoring points and treatment facilities.	Prevents contamination of aquatic zone by suspended solids or pollutants.

5. Construction & Demolition Waste Management Plan

Construction and Operational Waste Management Plans have been prepared by Awn Consulting and it can be found as an Appendix 16.1 and 16.2 of the EIAR report.

6. Management of Environmental Impacts

6.1 Roles and Responsibilities

6.1.1 Main Contractor

The main Contractor will have overall responsibility for the implementation of the project Construction Surface Water Management Plan (CSWMP) during the construction phase. The appointed person from the Main Contractors team will be appropriately trained and assigned the authority to instruct all site personnel to comply with the specific provisions of the CSWMP. At the operational level, a designated person from each subcontractor on the site shall be assigned the direct responsibility to ensure that the operations stated in the CSWMP are performed on an ongoing basis.

Copies of the Construction Surface Water Management Plan will be made available to all relevant personnel on-site. All site personnel and sub-contractors will be instructed about the objectives of the CSWMP and informed of the responsibilities which fall upon them because of its provisions.

The responsibilities of the appointed person will be as follows;

- Updating the CSWMP as necessary to reflect activities on site.
- Advise site management (including, but not limited to, the site Construction Manager) on environmental matters;
- Ensure pre-construction checks for protected species, if any, are undertaken;
- Review method statement of the sub-contractors to ensure that it incorporates all aspects of CSWMP
- Provide toolbox talks and other training, and ensure understanding by all involved of all mitigation measures;
- Assess the effectiveness of mitigation, check the weather forecast and site conditions where trigger levels are required;
- Ensure adherence to the specific measures listed in the Planning Conditions;
- Provide advice on the production of written method statements and site environmental rules and on the arrangements to bring these to the attention of the workforce;
- Investigate incidents of significant, potential or actual environmental damage, ensure corrective actions are carried out and recommend means to prevent recurrence; and,
- Be responsible for maintaining all environmental-related documentation.
- Ensure plant suggested is environmentally suited to the task in hand; and
- Coordinate environmental planning of the construction activities to comply with environmental authorities' requirements and with minimal risk to the environment. Give contractors precise instructions as to their responsibility to ensure correct working methods where the risk of environmental damage exists.

6.1.2 Construction Waste Manager

A Construction Waste Manager shall be appointed from the Contractor's Staff and have overall responsibility for the implementation of the project Waste Management Plan (WMP) during the construction phase. The Construction Waste Manager will be appropriately trained and assigned the authority to instruct all site personnel to comply with the specific provisions of the WMP. At the operational level, a designated person from the main contractor and each subcontractor on the site shall be assigned the direct responsibility to ensure that the operations stated in the WMP are performed on an ongoing basis.

Copies of the Waste Management Plan will be made available to all relevant personnel on-site. All site personnel and sub-contractors will be instructed about the objectives of the Waste Management Plan and informed of the responsibilities which fall upon them as a consequence of its provisions. Where source segregation, selective demolition and material reuse techniques apply, each member of staff will be given instructions on how to comply with the Waste Management Plan. Posters will be designed to reinforce the key messages within the Waste Management Plan and will be displayed prominently for the benefit of site staff.

6.1.3 Environmental Officer

The Environmental Officer will be responsible for, but not limited to, the following activities:

- Ensuring that the requirements of the CEMP are developed and environmental system elements (including procedures, method statements and work instructions) are implemented and adhered to with respect to environmental requirements;
- Reviewing the Environmental responsibilities of other managed Contractors in scoping their work and during Contract execution;
- To ensure that advice, guidance and instruction on all CEMP matters are provided to all their managers, employees, construction contractors and visitors on-site;
- Report to the Construction manager on the environmental performance of the Line Management, Supervisory Staff, Employees and Contractors; and,
- Advise site management (including, but not limited to, the site Construction Manager) on environmental matters.

6.1.4 Project Environmental Consultant

The Project Environmental Consultant will be responsible for, but not limited to, the following activities:

- Preparation of the CEMP, environmental control plans, supporting procedures;
- Advise site management (including, but not limited to, the site Construction Manager) on environmental matters;
- Ensure adherence to the specific measures listed in the Planning Conditions and in the Natura Impact Statement (NIS) Mitigation matters;
- Provide advice on the production of written method statements and site environmental rules and on the arrangements to bring these to the attention of the workforce;
- Investigate incidents of significant, potential or actual environmental damage, ensure corrective actions are carried out and recommend means to prevent recurrence; and,
- Be responsible for maintaining all environmental-related documentation.

6.1.5 Project Ecologist

The Project Ecologist is required to:

- Undertake pre-construction checks for protected species
- Review method statement of the contractor to ensure that it incorporates all aspects of CEMP
- Provide toolbox talks and other training, and ensure understanding by all involved of all mitigation measures
- Assess the effectiveness of mitigation, check the weather forecast and site conditions where trigger levels are required
- Check for adequacy of infiltration where water is being pumped

6.1.6 Site Supervisor

Site Supervisors are required to:

- Read, understand and implement the CEMP;
- Know the broad requirements of the relevant law in environmental matters and take whatever action is necessary to achieve compliance. Where necessary seek the advice of the Environmental Officer;
- Ensure that the environmental matters are taken into account when considering contractors' construction methods and materials at all stages;
- Be aware of any potential environmental risks relating to the site, plant or materials to be used on the premises and bring these to the notice of the appropriate management;
- Ensure plant suggested in environmentally suited to the task in hand;
- Coordinate environmental planning of the construction activities to comply with environmental authorities requirements and with minimal risk to the environment. Give contractors precise instructions as to their responsibility to ensure correct working methods where the risk of environmental damage exists;
- Where appropriate, ensure Contractors method statements include correct waste disposal methods;
- Be aware of any potential environmental risks relating to the Contractors and bring these to the notice of the appropriate management

6.1.7 Site Personnel

All Contractors, and other site personnel, on the project, will adhere to the following principal duties and responsibilities:

- To co-operate with the construction management team and the Environmental Officer in the implementation and development of the CEMP at the site;
- To conduct all their activities in a manner consistent with regulatory and best environmental practice;
- To participate in the environmental training programme and provide management with any necessary feedback to ensure effective environmental management at the site; and,
- Adhere to the requirements of the site environmental rules.

6.2 Hours of Working

Typical working hours for the site would be 08.00 to 19.00 Monday to Friday and 08.00 to 14.00 Saturday. No Sunday work will generally be permitted. The above working hours are typical; however, special construction operations may need to be carried out outside these hours to minimise disruption to the surrounding area.

Weather restrictions may apply, i.e. no cement pouring during heavy rainfall. To be determined by the project ecologist.

6.3 Pre-Construction Plan

6.3.1 General Set up and Pre-Commencement Measures

The following measures will be carried out by the Main Contractor:

1. A full condition survey of the public infrastructure that will be utilised or affected by construction traffic, before the commencement of any work on the site, will be carried out. This condition survey to include an inventory of the road network intended to be used by vehicles, weight restrictions to be imposed on vehicles, a full colour photographic record of the road network intended to be used, a full written account of the existing condition and structural integrity of the infrastructure detailing all existing defects and features. Copies of these survey reports would be provided to the third-party owners.
2. Prior to any site works commencing, the main contractor will investigate/identify the exact location of and tag all existing services and utilities around and through the site with the assistance of the relevant Fingal County Council (FCC) technical divisions and utility companies.
3. The developer will appoint a Project Manager to manage the construction process on-site.
4. No waste, dirt, debris or other material shall be deposited on the public road or verge by machinery or vehicles travelling to or from the site during the construction phase. The contractor to arrange vehicles leaving the site to be kept clean.
5. Site security lighting will be located and designed so as not to result in glare on the public road or to impact negatively on any nearby dwellings.
6. Prior to any site works commencing, the contractor shall carry out a Site Investigation (SI). The Site Investigation report shall include detailed information on groundwater levels to allow for a risk assessment of potential adverse impacts of stabilised soils and/or recycle aggregates to groundwater. Additionally, the SI report should also include an evaluation of the re-use properties of the soils including laboratory trial mixes to evaluate the performance of the soils following the addition of lime and/or cement. Site investigation should include WAC testing as well as Irish EPA suite to evaluate the soil suitability for off-site disposal at a Soil Recovery Facility.

6.3.2 Site Security and Hoarding Lines

Hoarding lines and site security will be set up within the development site as required.

Hoarding and security fencing will be required on the public roads during the construction works and for the construction of the new realigned entrance to the site. Before construction commencing, a detailed construction traffic management plan will be prepared and submitted by the appointed contractor to FCC.

The traffic management plan will identify staging areas, delivery of materials, strategy for large concrete pours, removal of demolition waste, traffic routes etc.

Access gates will be operated by a flagman who will divert incoming/outgoing vehicles/pedestrians and general traffic as necessary.

6.3.3 Designated Storage Area & Site Compound

A site compound(s) including offices and welfare facilities will be set up by the main contractor in locations to be decided within the subject site.

The main contractor will be required to schedule the delivery of materials daily. The main contractor will be required to provide a site compound on the site for the secure storage of materials.

Measures will be implemented throughout the construction stage to prevent contamination of the soil and surrounding watercourses from oil and petrol leakages and significant siltation. Suitable bunded areas will be installed for oil and petrol storage tanks. Designated fuel filling points will be put in place with appropriate oil and petrol interceptors to protect from accidental spills. Spill kits will be provided by the Contractor to cater for any other spills.

6.3.4 Cut Off Trenches

To prevent silt runoff from the development site the contractor will excavate a number of temporary cut off trenches (away from root protection zones) along the northern development boundary in advance of stripping topsoil. These cut off trenches will be connected to a temporary settlement pond to prevent the ingress of silt to the River Broadmeadow. Straw bales will be placed within the cut off trenches at strategic locations and at the outfall from the settlement pond.

6.3.5 Deliveries, Site Access and Construction Routes

The Holybanks development is bounded to the south by Glen Ellan Road. Glen Ellan Road intersects with Balheary road. A roundabout is located to the east of Balheary road where the R132 intersects with the R125 which connects the R132 to the M1 southbound to the north. Deliveries and access to the construction site will typically be made via Glen Ellan Road as can be seen in Figure 4 below.

A restriction on using any of the surrounding residential roads for Construction traffic will be put in place.

Due regard will be paid to minimising any impacts by construction vehicles on the existing developments in the area. Should routes become an issue, then the position will be reviewed by the Project Team and changes made.

Particular emphasis will be placed on;

- The issue of instructions and maps on getting to site to each supplier sub-contractor to avoid 'lost' construction traffic travelling on unapproved routes;
- Ongoing assessment of the most appropriate routes for construction traffic to and from the site;
- Interface with the operation of local traffic;
- Use of a banksman and/or traffic lights to control the exit of construction vehicles; and
- No construction traffic waiting on the public roads.

A detailed Construction Management Plan will be prepared by the contractor before construction which will outline site logistics and indicate the following:

- Site Access Locations;
- Site Boundary Lines;
- Tower Crane Locations;
- Vehicle Entry and exit routes from the site;
- Unloading areas;
- Site Offices and welfare facilities;
- Material Storage areas; and
- Banksman Locations.

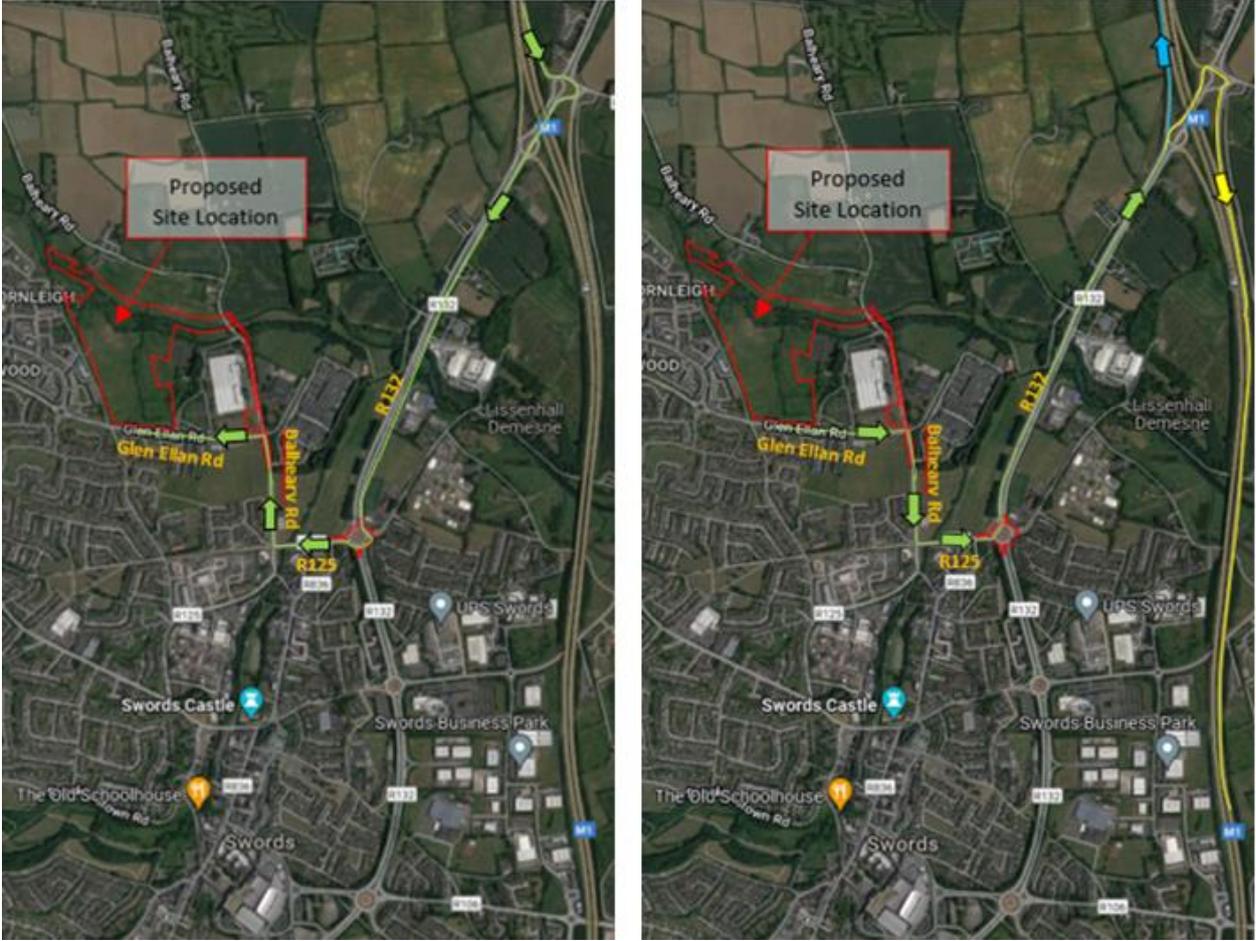
Materials will be ordered and delivered to site on an "as needed" basis to prevent oversupply to site. Deliveries will be managed upon arrival to the site and systems should be provided to avoid any queuing of delivery vehicles.

In the event that large concrete pours are required which may result in congestion at the entrance to the site the deliveries will be organised such that concrete trucks will queue at a pre-determined staging point (such that they do not cause an obstruction to general traffic in the area) and will then be called in by radio as appropriate to the site, via a pre-determined route and to the required access gate.

Set procedures and designated wash-out areas will be provided.

All delivery vehicles will be coordinated as required at the relevant access point.

Figure 4 Construction Routes to/from the development



Set procedures and designated wash-out areas will be provided, or vehicle wash-out will be prohibited if a suitable wash-out area is not identified, refer to section 4.5 for more details.

The Main Contractor will ensure that surface and ground waters are adequately protected from contamination by stored materials.

All delivery vehicles will be coordinated as required by a flagman on duty at the relevant access point.

All large pours will be carefully coordinated with the roads department at Fingal County Council.

The main contractor will be required to schedule the delivery of materials daily. If necessary, the main contractor will be required to provide a secure material staging compound on the site.

The primary item of the plant will be tower cranes which are to be located within the curtilage of the site for the duration of the works.

6.3.6 Parking

A site compound including offices and welfare facilities as well as a small amount of parking will be available on-site for contractors and site visitors. The site is well served by public transport including Swords Express Bus and Dublin Bus with a stop adjacent to the development.

No parking of construction-related vehicles will be permitted on the adjoining road network (Glen Ellan Road) and adequate parking facilities will be made available within the Construction Compound for all site workers during construction.

For those who wish to cycle to and from the development, dedicated cycle parking will be provided for the duration of the works within the site. Shower facilities and lockers will also be provided, and cycle links will be maintained at all times.

A Construction Stage Mobility Plan will be prepared by the contractor alongside the Construction Management Plan before starting on site.

6.4 Construction Plan

6.4.1 Vehicle Washdown

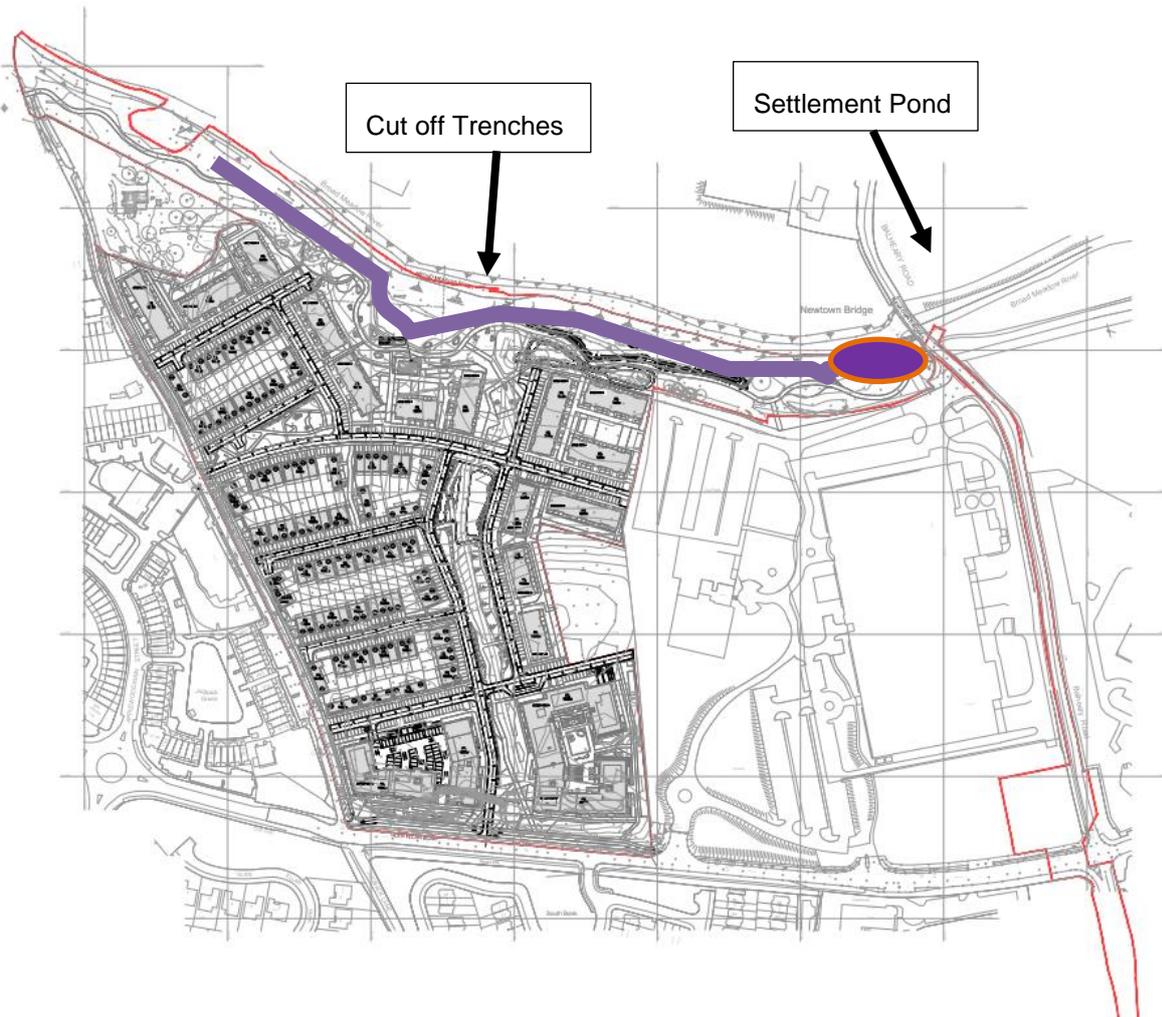
Where possible the permanent connection to the public foul sewer will be used temporarily for the construction phase. Vehicle wash down water will discharge directly, via suitable pollution control and attenuation, to the foul sewer system.

6.4.2 Surface Water Run-off

On-site treatment measures will be installed to treat surface water run-off from the site prior to discharge to the receiving Broadmeadow River. This treatment will be achieved by the construction of cut off trenches south of the woodland area, accounting for tree root protection. Cut off trenches will incorporate straw bales to reduce sediment loading, settlement tanks/ponds, the installation of proprietary surface water treatment systems including class 1 full retention petrol interceptors and spill protection control measures. Settlement tanks/ponds will be sized to deal with surface run-off and any groundwater encountered. All measures will be approved before commencement with the Pollution Section of Fingal County Council.

A sampling chamber with shut down valve will be installed downstream of the settlement pond/tank and water quality monitoring will be carried out here prior to discharge to the river. The proposed surface water management measures for the site are shown in Figure 5. The proposed location of the trenches are indicative and its installation will need to be supervised by the project ecologist.

Figure 5 Proposed cut off trenches location



Pollutants arising from construction works pose a temporary risk to surface water quality for the duration of the project if not properly contained and managed.

The recommendations as outlined in the Inland Fisheries Ireland document, 'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (2016)', outline the following items to be considered for the protection of adjacent watercourses during the construction stage:

1. Fuels, oils, greases and hydraulic fluids must be stored in bunded compounds well away from the watercourse. Refuelling of machinery, etc., will be carried out in bunded areas.
2. Runoff from machine service and concrete mixing areas must not enter the watercourse.
3. Stockpile areas for sands and gravel will be kept to minimum size, well away from the watercourse.
4. Runoff from the above will only be routed to the watercourse via suitably designed and sited settlement ponds/filter channels.
5. Settlement ponds will be inspected daily and maintained regularly.
6. Temporary crossings will be designed to the criteria laid down for permanent works.

7. Watercourse banks will be left intact as much as possible. If they have to be disturbed, all practicable measures will be taken to prevent soils from entering the watercourses.

The main pollutants of site water are silt, fuel/oil, concrete and chemicals. See Table 2 for a list and brief description of pollution prevention measures.

Table 2 Pollution Prevention Measures

Source	Action
Detergents	Use of detergents will be carried out in designated areas draining to the foul sewer.
Fuel/Oil	Fuel/oil stores must be located away from the site drainage system and the edge of watercourses.
	Ensure adequate measures are identified to prevent or contain any spillage such as creating a fall away from any drainage grid or blocking drainage points.
	Prevent oil pollution by: <ul style="list-style-type: none"> • Suitable bunded storage of fuel/oil, and use of drip trays under plant, and • An oil separator, and/or • On-site spill-kit • Commercially available absorbent granules, pads or booms.
Material Storage	Store drums, oil and chemicals on an impervious base and within a secured bund.
	Ensure topsoil and/or spoil heaps are located at least 10m away from watercourses. Consider seeding them or covering them with tarpaulin to prevent silty runoff and losses due to wind.
Leaks and Spills	Storage facilities are to be checked regularly to ensure any leaks or drips are fixed to prevent loss and pollution.
	Ensure appropriate spill response equipment is located near to the material in case of containment failure or material spills, and ensure site staff know how to use it.
	Adequate stocks of absorbent materials, such as sand or commercially available spill kits and booms should be available at all times.
Litter	Provide waste bins on-site as appropriate.
Construction Vehicles	Provide vehicle wheel washing.
Concrete, Cement and Bentonite	Washout of these materials will be carried out in a designated, impermeable contained area. The washout water itself will be disposed of off-site or discharged to the foul sewer if authorised.

6.4.3 Surface Water Monitoring Parameters

In addition to daily visual inspections, a surface water monitoring programme, as outlined in Table 3 must be followed during construction to ensure maintenance of water quality protection. This is in line with Transport Infrastructure Ireland (TII)'s 'Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan'. It is considered that the parameter limit values (Guide/Mandatory) defined in the Fresh Water Quality Regulations (EU Directive 2006/44/EEC) should act as a trigger value for the monitoring of Surface Water.

Table 3 Monitoring Guidelines (Fresh Water Quality Regulations)

Parameter	Guide limit	Mandatory Limit	Frequency and Manner of Samplings
Temperature		1.5 °C	Weekly, and at appropriate intervals where the works activities associated with the scheme have the potential to alter the temperature of the waters.
Dissolved oxygen	50% of Samples \geq 9 (mg/l O ₂) 100% of Samples \geq 7 (mg/l O ₂)		Weekly, a minimum of one sample representative of flow oxygen conditions of the day of sampling
pH		6-9	Weekly
Nitrites	\leq 0.01 (mg/l NO ₂)		Monthly
Suspended Solids	\leq 25 (mg/l)		Monthly
BOD5	\leq 3 (mg/l)		Monthly
Phenolic Compounds			Monthly where the presence of phenolic compounds is presumed (An examination by test)
Petroleum Hydrocarbons	5 (mg/l)		Monthly (visual)
Non-Ionized Ammonia	\leq 0.005 (mg/l NH ₃)		Monthly
Total Ammonium	\leq 0.004 (mg/l NH ₄)		Monthly
Total Residual Chlorine		\leq 0.005 (mg/l HOCl)	At appropriate intervals where works activities associated with the scheme have the potential to alter the Total residual Chlorine of the waters
Electrical Conductivity			Weekly

6.4.4 Sediment Control

Construction runoff is heavily laden with silt which can block road gullies and reduce the hydraulic capacity in pipes and rivers, contributing to ponding and flooding. Continued development without appropriate controls will ultimately keep maintenance costs elevated, whether that be in cleaning gullies, jetting pipes or dredging. Sediment control plans will be implanted on-site to mitigate these issues.

Sediment basins and traps will be designed by the main contractor and installed before any major site grading takes place. Additional sediment traps and silt fences/straw bales will be installed as grading takes place to keep sediment contained on-site at appropriate locations.

Key runoff-control measures will be located in conjunction with sediment traps to divert water from planned undisturbed areas away from the traps and sediment-laden water into the traps. Diversions will be installed above the areas to be disturbed before any grading operations. Any perimeter drains will be installed with stable outlets before opening major areas for development. Any additional facilities needed for runoff control will be installed as grading takes place.

During grading operations, temporary diversions, slope drains, and inlet and outlet protection installed in a timely manner will be very effective in controlling erosion and sediment build-up.

The main run-off conveyance system with inlet and outlet protection measures will be installed early and used to convey stormwater run-off through the development site without creating gullies or channels. Install inlet protection for storm drains as soon as the drain is functional to trap sediment on-site in willow pools and to allow the flood flows to enter the storm drainage system safely. Install outlet protection at the same time as the conveyance system to prevent damage to the receiving waters.

Sediment Control Measures

Sediment entrapment facilities are necessary to reduce sediment discharges to downstream properties and receiving waters. All run-off leaving a disturbed area will pass through a sediment entrapment facility before it exits the site and flows downstream.

- Straw Bales

Straw bales will be placed at the base of a slope to act as a sediment barrier. These are not recommended for use within a swale or channel. Straw bales are temporary in nature and may perform for only a period of weeks or months. Proper installation and maintenance are necessary to ensure their performance.

- Silt Fencing

A silt fence is made of woven synthetic material, geotextile, and acts to filter run-off. Silt fencing will be placed as a temporary barrier along the contour at the base of a disturbed area but is not recommended for use in a channel or swale. The material is durable and will last for more than one season if properly installed and maintained. Silt fencing is not intended to be used as a perimeter fence or in an area of concentrated flow. If concentrated flow conditions exist, a more robust filter will be considered.

- Silt Barriers

Silt barriers can also be temporarily installed in any road gullies of partially constructed roads to prevent sediment movement into downstream drainage systems or SUDS components.

When the catchment area is greater than that allowed for straw bale barriers or silt fences, the runoff will be collected in diversion drains and routed through temporary sediment basins.

- Diversion Drains

Diversion drains are simple linear ditches, often with an earth bund, for channelling water to the desired location. If the drains are being eroded they will be lined with geotextile fabric or large stones or boulders.

- Silt Traps

Will be placed at the base of a slope as a sediment barrier or as a temporary filter prior to discharge into a stream. Silt traps are deemed temporary and proper installation and maintenance is needed to ensure their performance.

6.4.5 Dust and Dirt Control

Nuisance dust emissions from construction activities are a common and well recognised problem. Fine particles from these sources are recognised as a potentially significant cause of pollution.

The main contractor will be required to demonstrate that both nuisance dust and fine particle emissions from the site are adequately controlled and are within acceptable limits.

Dust and fine particle generation from construction and demolition activities on the site will be substantially reduced through carefully selected mitigation techniques and effective management. Once particles are airborne it is very difficult to prevent them from dispersing into the surrounding area. The most effective technique is to control dust at the source and prevent it from becoming airborne since suppression is virtually impossible once it has become airborne.

The following are techniques and methods which are widely used currently throughout the construction industry and which may be used in the proposed development.

- The roads around the site are all surfaced, and no dust is anticipated arising from unsealed surfaces.
- Vehicles travelling on any unsurfaced site roads should have their speed restricted to 20 kph.
- Access gates to the site shall be located at least 10m from sensitive receptors where possible;
- A regime of 'wet' road sweeping will be set up to ensure the roads around the immediate site areas are clean and free from dirt/dust arising from the site, as is reasonably practicable. This cleaning will be carried out by approved mechanical sweepers.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods. During periods of very high winds (gales), activities likely to generate significant dust emissions should be postponed until the gale has subsided.
- Footpaths immediately around the site will be cleaned by hand regularly, with damping as necessary.
- High-level walkways and surfaces such as scaffolding will be clean-up regularly using safe 'wet' methods, as opposed to dry methods.
- Vehicle waiting areas or hard standings will be regularly inspected and kept clean by brushing or vacuum sweeping and will be regularly sprayed to keep moist, if necessary.
- Vehicle and wheel washing facilities will be provided at site exit(s) where practicable. If necessary, vehicles will be washed down before exiting the site.
- Netting will be provided to enclose scaffolding to mitigate the escape of airborne dust from the existing and new buildings.
- Vehicles and equipment shall not emit black smoke from the exhaust system, except during ignition at startup.

- Engines and exhaust systems should be maintained so that exhaust emissions do not breach stationary emission limits set for the vehicle/equipment type and mode of operation.
- Servicing of vehicles and plant should be carried out regularly, rather than just following breakdowns.
- Internal combustion plant should not be left running unnecessarily.
- Exhaust direction and heights should be such as not to disturb dust on the ground and to ensure adequate local dispersal of emissions.
- Where possible fixed plant such as generators should be located away from residential areas.
- The number of handling operations for materials will be kept to a minimum in order to ensure that dusty material is not moved or handled unnecessarily.
- The transport of dusty materials and aggregates will be carried out using covered/sheeted lorries. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.
- Material handling areas should be clean, tidy and free from dust.
- Vehicle loading should be dampened down and drop heights for material to be kept to a minimum.
- Drop heights for chutes/skids should be kept to a minimum.
- Dust dispersal over the site boundary should be minimised using static sprinklers or other watering methods as necessary.
- Stockpiles of materials should be kept to a minimum and if necessary, they should be kept away from sensitive receptors such as residential areas etc.
- Stockpiles where necessary, should be sheeted or watered down.
- Methods and equipment should be in place for immediate clean up of spillages of dusty material.
- No burning of materials will be permitted on site.
- Earthworks excavations should be kept damp where necessary and where reasonably practicable.
- Cutting on-site should be avoided where possible by using prefabrication methods.
- Equipment and techniques for cutting/grinding/drilling/sawing/sanding etc, which minimise dust emissions and which have the best available dust suppression measures, should be employed.
- Hoarding will be erected around site boundaries to reduce visual impact. This will also have the added benefit of preventing larger particles from impacting nearby sensitive receptors.
- Where scabbling is to be employed, tools should be fitted with dust bags, residual dust should be vacuumed up rather than swept away, and areas to be scabbled should be screened off.
- Wet processes should be used to clean building facades if possible. If dry grit blasting is unavoidable then ensure areas of work are sealed off and dust extraction systems used.
- Where possible pre-mixed plasters and masonry compounds should be used to minimise dust arising from on-site mixing.
- Before commencement, the main contractor should identify the construction operations which are likely to generate dust and draw up action plans to minimise emissions, utilising the methods highlighted above. Furthermore, the main contractor should prepare environmental risk assessments for all dust-generating processes, which are envisaged.
- The main contractor should allocate suitably qualified personnel to be responsible for ensuring the generation of dust is minimised and effectively controlled.
- The name and contact details of a person to contact regarding air quality and dust issues should be displayed on the site boundary, this notice board should also include head/regional office contact details.

The contractor will be obliged to implement the mitigation measures outlined in the EIAR in respect of dust/dirt control, as detailed in the Dust Management Plan Set out in Appendix 7.3 of Chapter 7 Air and Climate of the EIAR.

6.4.6 Noise Control

The main contractor will deal with the immediate dangers to hearing etc. associated with high noise levels and the impact of same on construction operatives, using risk assessment and mitigation/precautionary measures and equipment, all pursuant to the current health and safety legislation.

The main contractor will carry out a noise assessment in relation to the proposed works at the construction stage. This noise assessment will be carried out by a competent person (or a specialist firm) with specialist training in this area.

The noise assessment should include the following steps:-

- Identify and list all construction work activities where there is likely to be a significant noise hazard.
- Determine the hazards/nuisance.
- Identify all third parties likely to be exposed to the nuisance.
- Measuring the risk: The level of noise in dBs
- Considering and Implementing Control Measures.
- Control exposure to noise.
- Record the findings of the noise assessment.
- Review and revise.

The contractor will be obliged to implement the noise mitigation measures set out in Chapter 8 of the EIAR.

6.4.7 Protection of Soils and Groundwater

To preserve the topsoil on the site, topsoil will be removed to stockpiles and protected during the construction period for reuse on completion of the works. Topsoil will be stored in mounds and suitably protected to prevent waterlogging during wet weather. The stripping of topsoil will be undertaken on a phased basis so that no area is stripped until works are imminent in that area. All topsoil stripping associated with the proposed development will be monitored by a suitably qualified archaeologist. During topsoil stripping a written and photographic record describing the form of the townland boundaries to be impacted upon should be included in the monitoring report.

Levels of the proposed roads will be established to minimise the quantity of fill material to be imported to the site. Surplus subsoil will be used for landscaping where possible.

The provision of wheel wash facilities at the construction entrance to the development will minimise the amount of soil deposited on the surrounding road network. The adjoining road network will be cleaned regularly, if required, to prevent the build-up of soils from the development site on the existing blacktop roads.

Measures will be implemented throughout the construction stage to prevent contamination of the soil and adjacent watercourses from oil and petrol leakages and significant siltation. Suitable bunded areas will be installed for oil and petrol storage tanks. Designated fuel filling points will be put in place with appropriate oil and petrol interceptors to protect from accidental spills. Spill kits will be provided by the Contractor to cater for any other spills.

Cut off trenches along the northern boundary of the development boundary will be constructed before stripping topsoil. These cut off trenches will have a settlement pond/silt trap at the end of each trench with an overflow. Straw bales will be placed within the cut off trenches at strategic locations and at the outfall of the settlement ponds to the overflow. These measures will be implemented and maintained during the construction phase to prevent silt runoff into the existing ditches/watercourses during the drainage works.

Dampening down measures with water sprays will be implemented during periods of dry weather to reduce dust levels arising from the development works.

The excavations for the basement, drainage pipes, water supply, utilities and foundations have been designed to be as shallow as possible to reduce excavation depths. However, an impact on the water on site is anticipated. Careful attention will be required to maintain the excavations clear of groundwater.

A discharge Licence will be required for any groundwater pumped from the excavations to any public watercourse or sewer.

All water pumped from the excavations will require to be treated for silt and deleterious matter (i.e. by the use of silt traps, straw bales or similar) and no direct discharge to an existing stream/ditch or sewer will be allowed. During any discharge of water from the excavations, the quality of the water will be regularly monitored visually for hydrocarbon sheen and suspended solids. Periodic laboratory testing of discharge water samples will be carried out in accordance with the requirements of the discharge licence obtained from the Local Authority.

After implementation of the above measures the proposed development will not give rise to any significant long term adverse impact. Negative impacts during the construction phase will be short term only in duration.

6.4.8 Protection of Surface Waters

- The contractor will appoint a suitably qualified person to oversee the implementation of measures for the prevention of pollution to the receiving surface water environment.
- Cut off trenches along the northern boundary of the development boundary will be constructed prior to stripping topsoil. These cut off trenches will have a settlement pond/silt trap at the end of each trench with an overflow. Straw bales will be placed within the cut off trenches at strategic locations and at the outfall of the settlement ponds to the overflow. These measures will be implemented and maintained during the construction phase to prevent surface water runoff from discharging directly into the local watercourse.
- Settlement ponds/silt traps as outlined above will be provided to prevent silt runoff into the River Broadmeadow during the drainage works.
- Regular testing of surface water discharges will be undertaken at the outfall from the subject lands. The location will be agreed upon between the project ecologist and the site foreman at the commencement of works. Trigger levels for halting works and re-examining protection measures will be: pH >9.0 or pH <6.0; and/or suspended solids >25 mg/l. These trigger levels are based on those outlined within 'Guidelines on Protection of Fisheries During Works in and Adjacent to Waters (IFI, 2016)'.
- Where silt control measures are noted to be failing or not working adequately, works will cease in the relevant area. The project ecologist will review and agree on alternative pollution control measures, such as deepening or redirecting trenches as appropriate, before works may recommence.
- All fuels and chemicals will be banded, and where applicable, stored within double skinned tanks/containers with the capacity to hold 110% of the volume of chemicals and fuels

contents. Bunds will be located on flat ground a minimum distance of 50 m from any watercourse or other water-conducting features, including the cut off trenches.

- All existing services will be located using service records, GPR surveys and slit trenches to ensure that their positions are accurately identified before excavation works commence.
- Temporary traffic management will be implemented as appropriate during the construction of the outfalls on Glen Ellan Road.

6.4.9 Refuelling

- Construction plant and equipment will only be parked overnight within the site compound. Construction plant and equipment will be checked daily for any visual signs of oil or fuel leakage, as well as wear and tear.
- Fuel will not be stored on-site for the duration of the construction phase. Fuel will only be brought to the site via mobile fuel bowser. For any liquid other than water, this will include storage in suitable tanks and containers which will be housed in the designated area surrounded by a bund wall of sufficient height and construction to contain 110 percent (110%) of the total contents of all containers and associated pipework. The floor and walls of the bunded areas will be impervious of all containers and associated pipework. The floor and walls of the bunded area will be impervious to both water and oil. The pipes will vent downwards into the bund.
- Where Contractors are required to refuel vehicles, this will only be carried out at the designated refuelling location within the site storage compound, which must employ pollution control mechanisms to prevent the escape of fluids to the river. No refuelling is permitted on-site, i.e. within the river or adjacent due to risk of spillage.
- The local authority will be informed immediately of any spillage or pollution incident that may occur on-site during the construction phase.
- All small plant such as generators and pumps bunded and stood in drip trays capable of holding 110% of their tank contents,
- All small plant will be positioned on the bridge itself (within the designated works area – refer to Preliminary Traffic Management Plan), on the secured scaffolding/work platforms, or within the dewatered, 'dry' sections of the dammed river during the works.
- Waste oils, empty oil containers and other hazardous wastes will be disposed of in accordance with the requirements of the Waste Management Act, 1996.

6.4.10 Site Tidiness and Housekeeping

- Construction works will be carried out according to a defined schedule agreed with the client and the relevant contractors, with regard to the hours of work outlined above. Any delays or extensions required will be notified at the earliest opportunity to the client and Contractors.

- Contractors will ensure that road edges and footpaths are swept regularly.
- Any and all waste materials arising during the works will either be immediately taken to a location from which discharge to the Broadmeadow River cannot take place, or temporarily stored/covered to prevent washout thereto.
- All Contractors will be responsible for the clearance of their plant, equipment and any temporary buildings upon completion of construction. The site will be left in a safe condition.

6.4.11 Monitoring, Inspection and Record Keeping

- The Project Ecologist will supervise the sampling of suspended solids downstream prior to commencement of works, and weekly during remediation works. Samples will be analysed on-site. Should results show a 10% increase in suspended solids downstream of the site this will be brought to the attention of the contractor by the Project Ecologist and any suitable contingency measures will be instigated.
- Routine inspections of construction activities will be carried out daily by the contractor staff to ensure all controls to prevent environmental impact, relevant to the construction activities taking place at the time, are in place. Environmental inspections will ensure that the works are undertaken in compliance with the Project CEMP and that the requirements of the Conditions of Planning, the NIS and associated documentation are being adhered to during construction.
- The Contractor will develop their site inspection programme, which will include an inspection procedure and relevant forms to record any issues.
- Only suitably trained staff will undertake environmental site inspections.
- The Project Ecologist will keep records of works undertaken.

7. Proposed Construction Phasing and Programme

A detailed construction programme has not been developed at this stage. However, it is anticipated that the total construction period for the development will be approximately 5 years.

The project is planned to be developed in three distinct phases. Phase 1 is programmed to be fully constructed by 2023, Phase 2 by 2024 and Phase 3 by 2029. These milestones have been defined to fully comply with the Estuary West masterplan Phasing and Implementation programme.

Each phase will include:

- Site clearance and construction of associated infrastructure including drainage, water supply, utilities and roads.
- Construction and subsequent fitting out of the residential units.

Whilst the construction programme is yet to be developed, there are a series of elements to be built within/close to sensitive areas, specific mitigation measures will be incorporated in this regard.

Works adjacent to a Special Conservation Area

There are no European sites within the site. However, the Malahide Estuary SAC is located c. 1.5 km east of the proposed development and the Malahide Estuary SPA is located c. 1.1km east of the site. Works along the northern boundary have been kept to a minimum to minimise the impact on the Broadmeadow River and subsequently the European sites located downstream of the river.

North Detention Basin Outfall and Stormwater Storage Tank

As part of the surface water treatment works and due to the site topography, there is a requirement to locate a detention basin to the north of the subject site. The northern detention basin has been designed over an existing low lying area in order to minimise the amount of works in this area.

Two gravity connection outfall pipes from the detention basin and from the stormwater storage tank to discharge into the Broadmeadow River are also required. The works will be limited to a trench for the pipe and the installation of a manhole and a headwall in both cases. The surface water outfall headwalls will be constructed behind a temporary cofferdam so that works will be undertaken “in the dry”. The depth of the trench and manholes have been kept to a minimum, taking into account the topography of the site and the Invert Level of the outfall with the works required area varying in depth from c. 2.0 m to 3.0 m. As part of these works, estimated to take c.1-2 weeks to complete, mitigation provided will include limiting topsoil strip to the immediate works area (along the line of the sewer only), utilising precast elements (manholes and headwall) to limit concrete pouring and for speed of construction and immediate reinstatement of the area upon completion of the outfall sewer. Access to this area will be prohibited during the construction works save for the construction of the outfall sewer. The headwall installation to the watercourse will be subject to agreed detailed drawings and method statements with Inland Fisheries Ireland.

These works will not be undertaken during wet weather or when wet weather is forecast. A temporary silt fence will be erected down gradient of the works area and will remain in place until the ground has been reinstated and vegetation has become re-established

The general mitigation measures set out in this report will be employed along with all the measures set out in section 10 of this report. Additionally, daily monitoring of the stream will be carried out during these processes.

General Measures

To protect the SAC, the existing stream and the environment generally, and to minimise the potential impact on the trees and hedgerows specific measures will be put in place during these works.

Prior to any works taking place, silt fences will be installed alongside the stream within the site and will be maintained during the duration of the works. This silt fence provides a barrier that prevents the silts that are caught in the runoff to enter the stream, filtering it and preventing it from contaminating the stream.

Silt fence installation includes the installation of the geotextile fabric and the support post and will be done manually by experienced labour or using a fencing machine. The geotextile must be trenched and backfilled in.

The silt fence will be inspected daily to assure that there is no damage to the same and that is working correctly. If any damage is detected, it will be repaired immediately and an assessment of possible contamination of the stream will be carried out.

The excavation of the detention basin will be carried out by mechanical means. The excavated material will be stored away from the stream to avoid any spillage. The excavation will be battered to a safe slope to allow both.

Any groundwater is encountered during the excavation will be pumped out of the excavation into a silt trap. This silt trap will consist of a geotextile and 505 stone (or similar agreed) that will filter the pumped water from debris, and it will be conducted to the stream once is treated.

Any pumps/equipment used to remove the water from the excavation will be placed in a secure manner and in drip trays, to avoid any soil contamination from oils/fuel that might be spilled from the machine. Drip trays will be suitable in size for the machine using them. No undersize drip trays will be allowed, and they should be placed on a flat surface if deemed possible.

Silt traps will be inspected daily and cleaned as appropriate. A log of the inspections will be kept on-site, including the findings and any remedial action if needed.

UK and Ireland Office Locations

