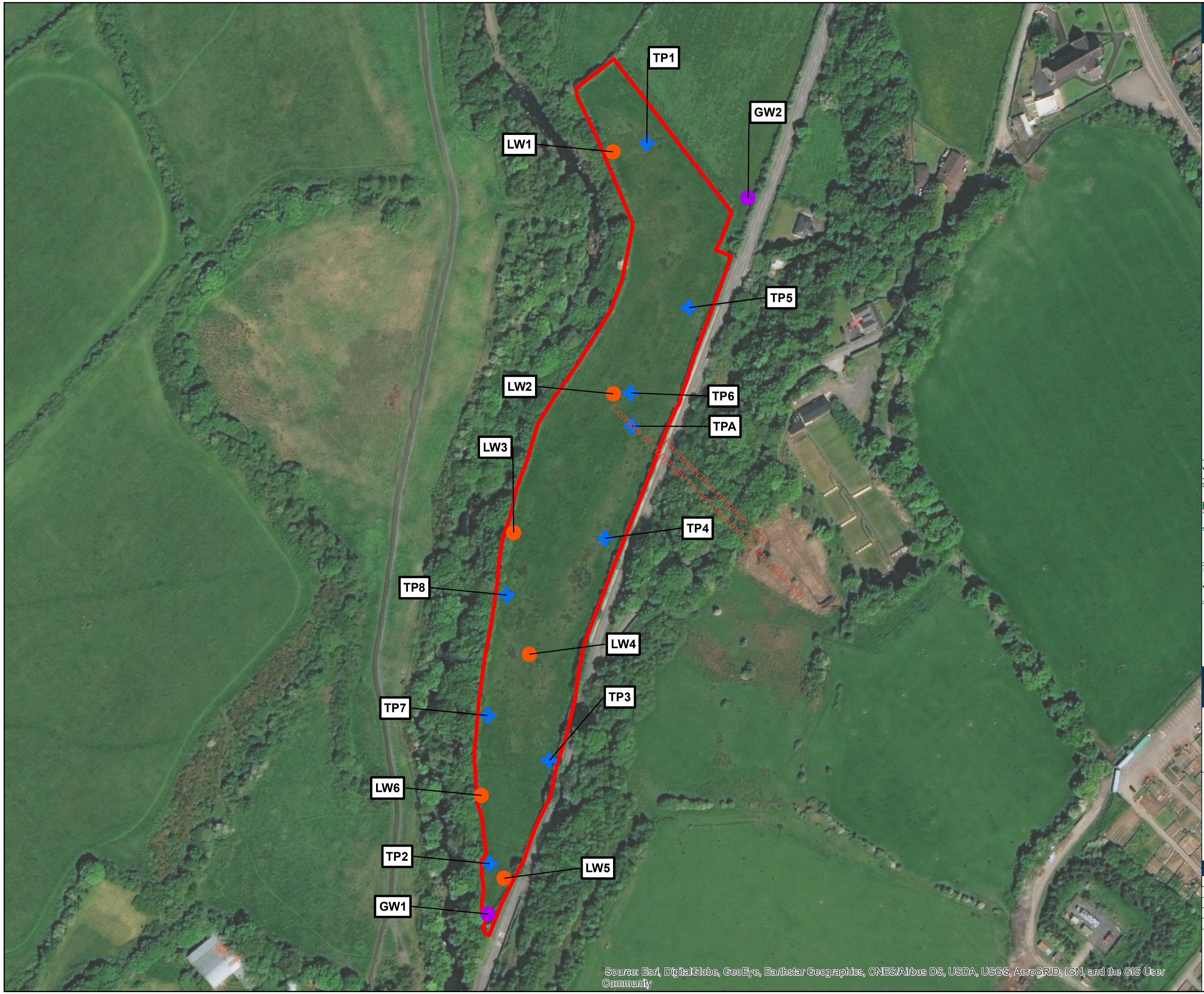


Legend

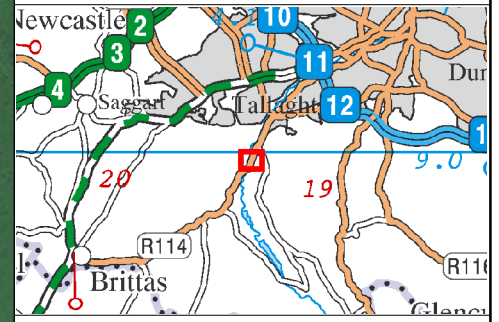
- Site Boundary

Site Investigation Locations

- Groundwater Borehole Locations
- Gas/Leachate Monitoring Well Locations
- Trial Pit Locations

N

0 20 40 80 Meters



Client

Comhairle Contae Átha Cliath Theas
South Dublin County Council

Project

Bohernabreena Landfill Environmental Risk Assessment

Title

Site Investigation Locations

Figure: 3.2

RPS

West Pier Business Campus,
Dun Laoghaire,
Co. Dublin,
Ireland.

T: +353 (0) 1 4882900
E: ireland@rpsgroup.com
W: rpsgroup.com/ireland

Issue Details

Drawn By: HF	**Project No.** MDR1489		
Checked By: BMcP	**File Ref:**		
Approved By: BMcP	MDR1489Arc0009D01		
Scale: 1:2,000 @ A3	**Drawing No.**	**Rev:**	
Date: 19/12/2018	Arc0009	D01	

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SW2
Spring 1
River Dodder
SW3
Site Boundary
Spring 2
Pipe
Road Run Off
SW1

Legend

- RPS_Sample Leachate Location
- River Dodder
- Site Bondary
- Sea_Background
- County Boundary_NoDetails

Google Map

Map shows the locations for leachate sampling

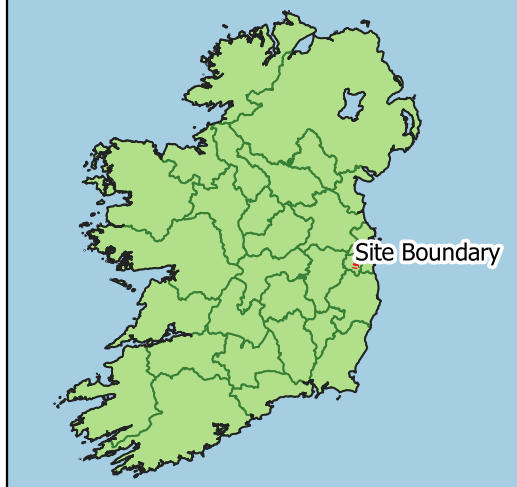


Figure 3.3
Environmental Monitoring Location

Project: Bohernabreena Landfill

Client: South Dublin County Council

West Pier Business Campus,
Dun Laoghaire,
Co. Dublin, Ireland
Tel: +353 (0)1 4882900
Fax: +353 (0)1 2835676
Email: ireland@rpsgroup.com
Web Page: rpsgroup.com/ireland

Issue Details

Drawn by: Scott graydon	Project No: MDR1489
Checked by: xxx	File Ref.: MDR1489QGIS0001D01
Approved by: xxx	
Scale: 1:4,000@A3	Drawing No.: QGIS0001
Date: 24/06/2019	

4 RECEIVING ENVIRONMENT

This section details the desktop and field survey results, in order to describe the relevant receiving environment of the proposed development. The relevant receiving environment relates to anything that may be directly or indirectly related to the QIs/SCIs of relevant European sites.

4.1 EUROPEAN SITES

The European sites identified within the ZoI of the development are shown in **Figure 4.1** and listed in **Table 4.1**. Note that while **Figure 4.1** shows the 15km ZoI, in line with good practice all European sites that may be impacted are assessed and this includes downstream sites outside the 15km area such as the North Dublin Bay SAC.

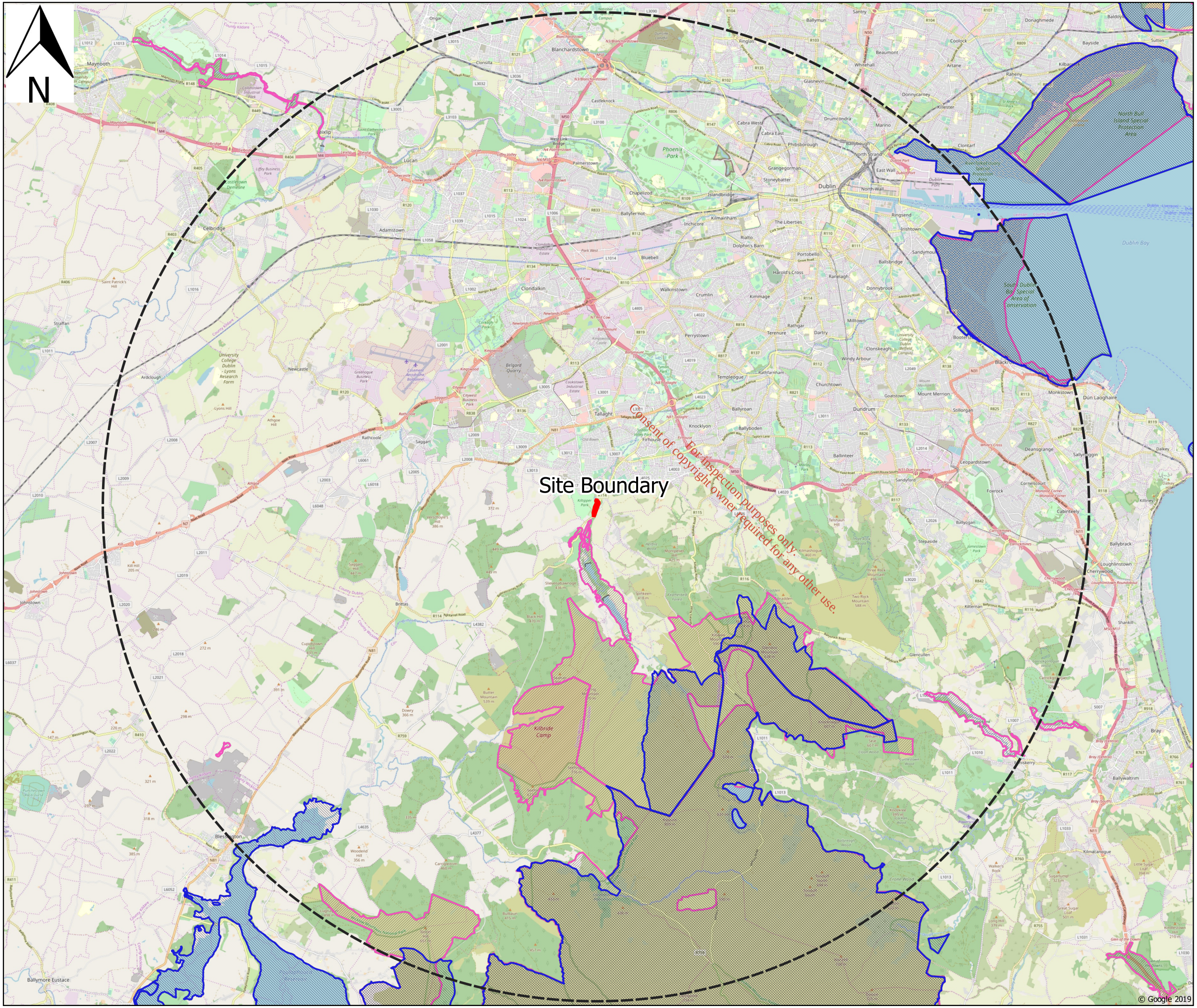
Table 4.1: European Sites

Site Code	Site Name	Qualifying Interest Habitats and Species (*=Priority Habitat)[5]	Distance from Study Area (km)[6]
Special Area of Conservations (SACs)			
001209	Glenasmole Valley SAC	**Conservation Objectives Generic Version 6.0 (21/02/18)** **Annex I Habitats** ▪ Semi-natural dry grasslands and scrubland facies on calcarerous substrates (Festuco-Brometalia) (* important orchid sites)* [6210] ▪ *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410] ▪ Petrifying springs with tufa formation (Cratoneurion) [7220]*	*c.* 0.11km
002122	Wicklow Mountains SAC	**Conservation Objectives Specific Version 1.0 (31/07/17)** **Annex I Habitats** ▪ Oligotrophic water containing very few minerals of sandy plains (Littorelletea uniflorae) [3110] ▪ Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-nanojunceatea [3130] ▪ Natural dystrophic lakes and ponds [3160] ▪ Northern Atlantic wet heaths with *Erica tetralix* [4010] ▪ European dry heaths [4030] ▪ Alpine and Boreal heaths [4060] ▪ Calaminarina grasslands of the Violetalia calaminariae [6130] ▪ Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) * [6230] ▪ Blanket Bogs (* if Active) [7130] ▪ Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) [8110] ▪ Calcareous rocky slopes with chasmophytic vegetation	*c.* 2.52km

[5] NPWS website, accessed 11th November 2019.
[6] Distance measured 'as the crow flies'.

Site Code	Site Name	Qualifying Interest Habitats and Species (*=Priority Habitat)[5]	Distance from Study Area (km)[6]
		[8210] ▪ Siliceous rocky slopes with chasmophytic vegetation [8220] ▪ Old Sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] **Annex II Species** ▪ Otter (*Lutra lutra*) [1355]	
000210	South Dublin Bay SAC	**Conservation Objectives Specific Version 1.0 (22/08/13)** **Annex I Habitats** ▪ Mudflats and sandflats not covered by seawater at low tide [1140]	*c.* 12.48km
000725	Knocksink Wood SAC	**Conservation Objectives Generic Version 5.0 (21/02/18)** **Annex I Habitats** ▪ Petrifying springs with tufa formation (Cratoneurion) [7220]* ▪ Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]*	*c.* 11.78km
001398	Rye Water Valley/Carton SAC	**Conservation Objectives Generic Version 5.0 (15/08/16)** **Annex I Habitats** ▪ Petrifying springs with tufa formation (Cratoneurion) [7220]* **Annex II Species** ▪ Narrow-mouthed Whorl Snail (*Vertigo angustior*) [1014] ▪ Desmoulin's Whorl Snail (*Vertigo moulinsiana*) [1016]	*c.* 13.71km
000397	Red Bog Kildare SAC	**Conservation Objectives Specific Version 1.0 (17/07/19)** **Annex I Habitats** ▪ Transition mires and quaking bogs [7140]	*c.* 13.72km
000713	Ballyman Glen SAC	**Conservation Objectives Specific Version 1.0 (17/07/19)** **Annex I Habitats** ▪ Petrifying springs with tufa formation (Cratoneurion) [7220]* ▪ Alkaline fens [7230]	*c.* 14.63km
000206	North Dublin Bay SAC	**Conservation Objectives Specific Version 1.0 (06/11/13)** **Annex I Habitats** ▪ Mudflats and sandflats not covered by seawater at low tide [1140] ▪ Annual vegetation of drift lines [1210] ▪ *Salicornia* and other annuals colonising mud and sand [1310] ▪ Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] ▪ Mediterranean salt meadows (Juncetalia maritimi) [1410] ▪ Embryonic shifting dunes [2110] ▪ Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] ▪ Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]* ▪ Humid dune slacks [2190]	*c.* 15.5km

Site Code	Site Name	Qualifying Interest Habitats and Species (*=Priority Habitat)[5]	Distance from Study Area (km)[6]
		Annex II Species ▪ Petalwort (*Petalophyllum ralfsii*) [1395]	
Special Protection Areas (SPAs)			
004040	Wicklow Mountains SPA	**Conservation Objectives Generic Version 5.0 (15/08/16)** ▪ Merlin (*Falco columbarius*) [A098] ▪ Peregrine (*Falco peregrinus*) [A103]	*c.* 5.02km
004063	Poulaphouca Reservoir SPA	**Conservation Objectives Generic (21/02/18)** ▪ Greylag Goose (*Anser anser*) [A043] ▪ Lesser Black-backed Gull (*Larus fuscus)* [A183]	*c.* 11.97km
004024	South Dublin Bay and River Tolka SPA	**Conservation Objectives Specific Version 1.0 (09/03/15)** ▪ Light Bellied Brent Goose (*Branta bernicla hrota*) [A046] ▪ Oytsercatcher (*Haematopis ostralegus*)[A130] ▪ Ringed plover (*Charadruis hiaticula*) [A137] ▪ Grey Plover (Pluvials squatarola) [A141] ▪ Knot (Calidris canutus) [A143] ▪ Sanderling (*Calidris alba*) [A144] ▪ Dunlin (*Calidris alpina alpina*) [A149] ▪ Bar-tailed Godwit (*Limosa lapponica*) [A157] ▪ Redshank (*Tringa totanus*) [A162] ▪ Black-headed Gull (*Chroicocephalus ridibundus*) [A179] ▪ Roseate Tern (*Sterna dougallii*) [A192] ▪ Common Tern (*Sterna hirundo*) [A193] ▪ Arctic Tern (*Sterna paradisaea*) {A194] ▪ Wetlands [A999]	*c.* 12.35km



Legend

- Site Bondary
- ZoI 15km
- SPA 2019
- SAC 2019

Map identifies all special protected areas (SPA) and special areas of conservation (SAC) within a 15 km zone of influence (ZoI) from the site location.

Title: **Figure 4.1**
SPA & SAC Locations

Bohernabreena Landfill
Environmental Risk Assessment

Client: South Dublin County Council

RPS
West Pier Business Campus,
Dun Laoghaire,
Co. Dublin, Ireland

Issue Details

Drawn by: SG	Date: 24/10/2019
Checked by: PC	Project No: MDR1489
Approved by: PC	File Ref.: MDR1489QGIS0001D01
Scale: 1:190,000 @A3	

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4.2 HABITATS

4.2.1 Terrestrial

There are no terrestrial habitats within the footprint of the proposed development which have affinities to QI habitats or offer any significant supporting value to QIs or SCIs of any European sites.

The nearest 'terrestrial' QI habitats to the site are likely to be those in Glenasmole Valley SAC which is immediately south of the site and separated by circa 110 metres (boundary to boundary). This site contains Orchid-rich Calcareous Grassland and Molinia meadows. While this habitat is hydrologically connected to the site via the Dodder, it is upstream of the site an therefore not considered connected to the site.

The nearest downstream terrestrial QI habitat to the proposed development are all coastal habitats - intertidal mudflats, sand-dunes and saltmarsh habitats. These are all located in excess of 12-15km downstream of the landfill.

4.2.2 Aquatic

There are no water courses on the site with the exception of a diverted spring which has been utilised a cattle water feeding at the north of the site. The site is within the Eastern River Basin District and the River Dodder which originates in the Wicklow Mountains runs along the western perimeter of the site, flowing north-easterly towards the Liffey Estuary Lower, approximately 12.5km north east of the site.

The River Dodder is not a European site; however, it does discharge into Dublin Bay downstream of the site to which it is therefore hydrologically connected.

4.2.3 Flora and Invasive Alien Plants

No invasive alien plant species, scheduled to the European Communities (Bird and Natural Habitat Regulations) 2011-2015, were recorded during the field surveys.

5 STAGE 1: APPROPRIATE ASSESSMENT SCREENING

5.1 IS THE PROJECT NECESSARY TO THE MANAGEMENT OF EUROPEAN SITES?

The existing landfill and the proposed remediation solution are not directly connected with or necessary to the management of any European site. As such, the first test of AA screening can be definitively concluded.

5.2 LIKELY SIGNIFICANT EFFECTS (LSE)

To establish the potential for LSE, a number of issues must be explored. In the first instance, connectivity between the source and the receptor must be established.

Source can be considered both the existing landfill and the elements of the proposed remediation works that have the potential to affect the identified ecological receptors. In this instance, the source of impacts has been identified under two themes summarized below:

- Water quality; and
- Spread of invasive species.

Pathway can be considered the means or route by which a source can affect the ecological receptor. In this instance, the pathways considered are summarised below:

- Surface water; and
- Groundwater (through leachate).

Ecological **Receptors** can be considered both the European sites and the SCIs (for SPAs) or QI (of SACs/cSACs) for which conservation objectives have been set. Each element can exist independently however a potential effect is created only when there is a linkage between the source, pathway and receptor. A four-step process is applied in the screening to establish potential for LSE.

5.2.1 Step 1: Identification of European Sites with Connectivity

Table 5.1 lists the European Sites within 15km of the proposed works. In total eight SAC and three SPA were identified within the defined ZoI.

Table 5.1: European Sites within 15km of the preliminary SI Works Study Area**

Site Code	Site Name	Qualifying Interest Habitats and Species (*=Priority Habitat)[7]	Distance from Study Area (km)[8]	Connectivity
Special Area of Conservations (SACs)				
001209	Glenasmole Valley SAC	**Conservation Objectives Generic Version 6.0 (21/02/18)** **Annex I Habitats** ▪ Semi-natural dry grasslands and scrubland facies on calcarerous substrates (Festuco Brometalia) (* important orchid sites)* [6210] ▪ *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410] ▪ Petrifying springs with tufa formation (Cratoneurion) [7220]*	*c.* 0.11km	Yes. Given the relative proximity of the site and hydrological connection between the landfill and the European Site via the Dodder, the potential for impact cannot be excluded. It is noted that the European site is upstream of the proposed works.
002122	Wicklow Mountains SAC	**Conservation Objectives Specific Version 1.0 (31/07/17)** **Annex I Habitats** ▪ Oligotrophic water containing very few minerals of sandy plains (Littorelletea uniflorae) [3110] ▪ Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-nanojunceatea [3130] ▪ Natural dystrophic lakes and ponds [3160] ▪ Northern Atlantic wet heaths with *Erica tetralix* [4010] ▪ European dry heaths [4030] ▪ Alpine and Boreal heaths [4060] ▪ Calaminarina grasslands of the Violetalia calaminariae [6130] ▪ Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) * [6230] ▪ Blanket Bogs (* if Active) [7130]	*c.* 2.52km	No. There is no connectivity between the landfill and the European Site due to the distance between the two sites and lack of hydrological connection between them.

[7] NPWS website, accessed 13th November 2019.
[8] Distance measured "as the crow flies".

Site Code	Site Name	Qualifying Interest Habitats and Species (*=Priority Habitat)[7]	Distance from Study Area (km)[8]	Connectivity
		▪ Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) [8110] ▪ Calcareous rocky slopes with chasmophytic vegetation [8210] ▪ Siliceous rocky slopes with chasmophytic vegetation [8220] ▪ Old Sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] **Annex II Species** ▪ Otter (*Lutra lutra*) [1355]		
000210	South Dublin Bay SAC	**Conservation Objectives Specific Version 1.0 (22/08/13)** **Annex I Habitats** ▪ Mudflats and sandflats not covered by seawater at low tide [1140]	*c.* 12.48km	Yes There is a potential indirect hydrogeological connectivity with this European Site. This is via the Dodder River which bounds the subject site and flows into the River Liffey before entering Dublin Bay.
000725	Knocksink Wood SAC	**Conservation Objectives Generic Version 5.0 (21/02/18)** **Annex I Habitats** ▪ Petrifying springs with tufa formation (Cratoneurion) [7220]* ▪ Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]*	*c.* 11.78km	No. There is no connectivity between the landfill and the European Site due to the distance between the two sites and lack of hydrological connection between them.
001398	Rye Water Valley/Carton SAC	**Conservation Objectives Generic Version 5.0 (15/08/16)** **Annex I Habitats** ▪ Petrifying springs with tufa formation (Cratoneurion) [7220]* **Annex II Species** ▪ Narrow-mouthed Whorl Snail (*Vertigo angustior*) [1014] ▪ Desmoulin's Whorl Snail (*Vertigo moulinsiana*) [1016]	*c.* 13.71km	No. There is no connectivity between the landfill and the European Site due to the distance between the two sites and lack of hydrological connection between them.
000397	Red Bog Kildare SAC	**Conservation Objectives Specific Version 1.0 (17/07/19)** **Annex I Habitats** ▪ Transition mires and quaking bogs [7140]	*c.* 13.72km	No. There is no connectivity between the landfill and the European Site due to the distance between the two sites and lack of hydrological connection

Site Code	Site Name	Qualifying Interest Habitats and Species (*=Priority Habitat)[7]	Distance from Study Area (km)[8]	Connectivity
				between them.
000713	Ballyman Glen SAC	**Conservation Objectives Specific Version 1.0 (17/07/19)** **Annex I Habitats** ▪ Petrifying springs with tufa formation (Cratoneurion) [7220]* ▪ Alkaline fens [7230]	*c.* 14.63km	No. There is no connectivity between the landfill and the European Site due to the distance between the two sites and lack of hydrological connection between them.
000206	North Dublin Bay SAC	**Conservation Objectives Specific Version 1.0 (06/11/13)** **Annex I Habitats** ▪ Mudflats and sandflats not covered by seawater at low tide [1140] ▪ Annual vegetation of drift lines [1210] ▪ *Salicornia* and other annuals colonising mud and sand [1310] ▪ Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] ▪ Mediterranean salt meadows (Juncetalia maritimi) [1410] ▪ Embryonic shifting dunes [2110] ▪ Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] ▪ Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]* ▪ Humid dune slacks [2190] **Annex II Species** ▪ Petalwort (*Petalophyllum ralfsii*) [1395]	*c.* 15.5km	Yes. There is a potential indirect hydrogeological connectivity with this European Site. This is via the Dodder River which bounds the subject site and flows into the River Liffey before entering Dublin Bay.
Special Protection Areas (SPAs)				
004040	Wicklow Mountains SPA	**Conservation Objectives Generic Version 5.0 (15/08/16)** ▪ Merlin (*Falco columbarius*) [A098] ▪ Peregrine (*Falco peregrinus*) [A103]	*c.* 5.02km	No. There is no connectivity between the landfill and the European Site due to the distance between the two sites and lack of disturbance to qualifying interest species within the European Site.
004063	Poulaphouca	**Conservation Objectives Generic (21/02/18)**	*c.* 11.97km	No.

Site Code	Site Name	Qualifying Interest Habitats and Species (*=Priority Habitat)[7]	Distance from Study Area (km)[8]	Connectivity
	Reservoir SPA	▪ Greylag Goose (*Anser anser*) [A043] ▪ Lesser Black-backed Gull (*Larus fuscus)* [A183]		There is no connectivity between the landfill and the European Site due to the distance between the two sites and lack of disturbance to qualifying interest species within the European Site.
004024	South Dublin Bay and River Tolka SPA	**Conservation Objectives Specific Version 1.0 (09/03/15)** ▪ Light Bellied Brent Goose (*Branta bernicla hrota*) [A046] ▪ Oytsercatcher (*Haematopis ostralegus*)[A130] ▪ Ringed plover (*Charadruis hiaticula*) [A137] ▪ Grey Plover (Pluvials squatarola) [A141] ▪ Knot (Calidris canutus) [A143] ▪ Sanderling (*Calidris alba*) [A144] ▪ Dunlin (*Calidris alpina alpina*) [A149] ▪ Bar-tailed Godwit (*Limosa lapponica*) [A157] ▪ Redshank (*Tringa totanus*) [A162] ▪ Black-headed Gull (*Chroicocephalus ridibundus*) [A179] ▪ Roseate Tern (*Sterna dougallii*) [A192] ▪ Common Tern (*Sterna hirundo*) [A193] ▪ Arctic Tern (*Sterna paradisaea*) {A194] ▪ Wetlands [A999]	*c.* 12.35km	Yes. There is a potential indirect hydrogeological connectivity with this European Site. This is via the Dodder River which bounds the subject site and flows into the River Liffey before entering Dublin Bay.

** It is recognised that a number of other European Sites extend beyond the 15km Zone of Influence in Dublin Bay. However, given the distance from the study area, the temporary nature of the works and the dilution factor of coastal waters, it is considered that these would not be subject to any significant effect.
Full details of the Conservation Objectives (COs) are available on the NPWS website at www.npws.ie/sites/default/files/protecte-sites.

5.2.2 Step 2: Potential Impact Pathways

The landfill does not lie within the boundaries of any European site (refer **Figure 4.1**) and therefore no direct impacts are likely to occur. Based on the site description and proposed remediation works, the following key impact themes are brought forward for consideration in the screening of the project and the European sites:

Water quality and habitat deterioration

The existing landfill, in its current form, is known to have an adverse impact on the Dodder (refer **Section 3.3.8**), in particular levels of ammonium impacting on the water quality. During the proposed capping, sediment and/or other contaminants (oils, fuels, etc.) may enter the Dodder through surface water run-off for the short term duration of the works. However, it is noted that the residual impact would be positive through a breaking of the pathway for the existing impact from the landfill to the Dodder (as per the ERA recommendations).

The ZoI of effects from contaminated surface water is difficult to accurately estimate as it will depend on numerous factors including the type and concentration of pollutants, assimilative capacity of receiving waters, and time of year (related to water levels). As a precautionary measure, a reasonable worst-case ZoI for water pollution from the proposed development site is considered to be the downstream surface water catchment but also the upstream Glensamole Valley SAC given the proximity to the landfill. In this report the surface water catchment is defined at the scale of Catchment Management Unit (CMU) as adopted in the River Basin Management Plan (RBMP) for Ireland 2018-2021 (DoHPLG, 2018). Open coastlines, where Coastal Waterbodies begin, are considered to fall outside the potential ZoI of significant effects.

Changes to groundwater yield or quality

At present, the landfill is potentially having an adverse impact on groundwater with a pathway to surface water (refer **Section 3.3.8**). Small seepages/springs were noted that had emerged along the bank at the western perimeter as discreet seepages which discharge directly to the River Dodder. These seepages are the point of emergence from the groundwater baseflow and were sampled and indicated exceedances of arsenic. It is considered that there is direct connectivity of leachate to the underlying gravel aquifer and the mixing of leachate with laterally flow groundwater in the saturated aquifer dilutes the leachate concentrations. The potential ZoI of effects from groundwater arising to the Dodder is considered to be the downstream surface water catchment as above.

The proposed capping may interfere with groundwater quality, yields and/or flow paths, potentially affecting the water quality or habitats dependent on groundwater supply. These impacts are likely to be positive given that the cap will break the pathway from rainwater ingress to the waste body and the formation of leachate. As above, the potential ZoI of effects from groundwater arising to the Dodder is considered to be the downstream surface water catchment.

Spread of invasive species

Given the nature of the proposed remediation solution through capping and the need to import capping material, there is potential for invasive alien plants, scheduled to the European Communities (Bird and Natural Habitat Regulations) 2011-2015 to be spread within the footprint or

ZoI of the landfill. However, these would not ordinarily result in a likely significant effect to European sites. Capping activities could lead to the dispersal of scheduled invasive species either via machinery, materials, clothing or wild animals. The ZoI of effects for spread of terrestrial invasive species is difficult to accurately estimate, as plant fragments may be spread on tyre treads to distant unrelated sites. In relation to water-borne spread of vegetation, the ZoI generally is restricted to the surface water Catchment Management Unit.

5.2.3 Step 3: Connectivity

Potential connectivity of the works to the European sites and any mobile QI / SCI species has been considered in **Section 5.2.1.** Impact pathways considered included via surface water and groundwater. Four European sites have been identified with direct surface water connectivity and the conservation objectives for these sites is presented in **Table 5.2** (SAC) and **Table 5.3** (SPA)**.**

The closest relevant European site to the proposed development is the Glenasmole Valley SAC (site code 001209), which is located c. 110 m to the south of the proposed development, separated by a woodland and wet grassland. The Glenasmole Valley SAC is within the same Catchment Management Unit as the proposed development but is located upstream of the proposed works within the Dodder catchment.

The South Dublin Bay SAC (site code 000210), North Dublin Bay SAC (site code 000206) and South Dublin Bay and River Tolka SPA (site code 004024) have a potential indirect hydrogeological connectivity to the site. This is via the Dodder River which bounds the subject site and flows into the River Liffey before entering Dublin Bay.

There are no other European sites within the ZoI of the proposed development site.

Table 5.2: Conservation Objectives of relevant SACs

Site and Conservation Objectives Version	Qualifying Interest(s) (*Priority Habitat) and Special Conservation Interest(s)	Conservation Objective(s)
Glenasmole Valley SAC Conservation Objectives Generic Version 6.0 (21/02/18)	**Annex I Habitats** ▪ Semi-natural dry grasslands and scrubland facies on calcarerous substrates (Festuco Brometalia) (* important orchid sites)* [6210] ▪ *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410] ▪ Petrifying springs with tufa formation (Cratoneurion) [7220]*	To maintain or restore the favourable conservation condition of the Annex I habitat(s) for which the SAC has been selected.
South Dublin Bay SAC Conservation Objectives Specific Version 1.0 (22/08/13)	**Annex I Habitats** ▪ Mudflats and sandflats not covered by seawater at low tide [1140]	To maintain the favourable conservation condition of the Annex I habitat in South Dublin Bay SAC (1140) for which are defined by a list of attributes and targets.
North Dublin Bay SAC Conservation Objectives Specific Version 1.0 (06/11/13)	**Annex I Habitats** ▪ Mudflats and sandflats not covered by seawater at low tide [1140] ▪ Annual vegetation of drift lines [1210] ▪ *Salicornia* and other annuals colonising mud and sand [1310] ▪ Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] ▪ Mediterranean salt meadows (Juncetalia maritimi) [1410] ▪ Embryonic shifting dunes [2110] ▪ Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] ▪ Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]* ▪ Humid dune slacks [2190] **Annex II Species** ▪ Petalwort (*Petalophyllum ralfsii*) [1395]	To maintain the favourable conservation condition of Annex I habitats in North Dublin Bay SAC (1140, 1330, 1410) for which are defined by a list of attributes and targets. To restore the favourable conservation condition of Annex I habitats in North Dublin Bay SAC (1210, 1310, 2110, 2120, 2130, 2190) which are defined by a list of attributes and targets. To maintain the favourable conservation condition of Petalwort in North Dublin Bay SAC which is defined by a list of attributes and targets.

Table 5.3: Conservation Objectives of relevant SPA

Site and Conservation Objectives Version	Qualifying Interest(s) and Special Conservation Interest(s)	Conservation Objective(s)
South Dublin Bay and River Tolka SPA Conservation Objectives Specific Version 1.0 (09/03/15)	▪ Light Bellied Brent Goose (*Branta bernicla hrota*) [A046] ▪ Oytsercatcher (*Haematopis ostralegus*)[A130] ▪ Ringed plover (*Charadruis hiaticula*) [A137] ▪ Grey Plover (Pluvials squatarola) [A141] ▪ Knot (Calidris canutus) [A143] ▪ Sanderling (*Calidris alba*) [A144] ▪ Dunlin (*Calidris alpina alpina*) [A149] ▪ Bar-tailed Godwit (*Limosa lapponica*) [A157] ▪ Redshank (*Tringa totanus*) [A162] ▪ Black-headed Gull (*Chroicocephalus ridibundus*) [A179] ▪ Roseate Tern (*Sterna dougallii*) [A192] ▪ Common Tern (*Sterna hirundo*) [A193] ▪ Arctic Tern (*Sterna paradisaea*) {A194] ▪ Wetlands [A999]	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.

5.2.4 Step 4: Assessment of Likely Significance

The sites and species listed have been demonstrated as having all three elements of the SPR model in place and therefore potential for LSE are explored in more detail below. In considering LSE, the nature, scale, duration and magnitude of potential impacts is considered. In light of the April 2018[9] judgement of the Court of Justice of the European Union, mitigation measures, including pollution control measures proposed during construction and operation, may not be considered when deciding whether to 'Screen in' a project plan to the requirement for AA.

Elevated levels of ammonium have been observed within the Dodder adjacent to the site during the site investigation stage and this is considered to be from the leachate associated with the existing landfill using a groundwater pathway to impact the surface water quality. As such, the landfill in its current form is potentially having a direct adverse impact on the Dodder and there is a potential indirect link to the European sites in Dublin Bay and the upstream Glenasmole Valley.

Similarly, the Dodder lies circa 10-20 metres from the nearest proposed capping works and there is a potential indirect link between the proposed capping works and associated sediment risk and the European sites in Dublin Bay and the upstream Glenasmole Valley.

A site walkover of the study area found no evidence of high impact IAPS. However, during the proposed capping works, machinery and equipment used has the potential to lead to the

[9] Case C 323/17, REQUEST for a preliminary ruling under Article 267 TFEU from the High Court (Ireland), made by decision of 10 May 2017, received at the Court on 30 May 2017, in the proceedings People Over Wind, Peter Sweetman v Coillte.

introduction of IAPS if the machinery/equipment was previously used in another area containing IAPS. It could also lead to the spread of IAPS both within and outside of the proposed works area if IAPS within the area are not identified. This could potentially lead to the unwitting introduction of IAPS to European Sites if the machinery/equipment used for the proposed works lead to the spread of IAPS outside of the proposed works area following completion of works.

5.3 CUMULATIVE IMPACTS

A review of potential plans and projects in the area with potential for cumulative impact has been undertaken and is documented within this section.

5.3.1 South Dublin County Development Plan (CDP) 2016-2022

The County Development Plan has a number of infrastructure development policies along the Dodder Valley that have potential for both positive and adverse impact to the river as follows:

- Core Strategy Policy 5: It is the policy of the Council to restrict the spread of dwellings in the Rural 'RU', Dublin Mountain 'HA-DM', Liffey Valley 'HA-LV' and Dodder Valley 'HA-DV' zones based on the criteria set out in the Rural Settlement Strategy contained in Chapter 2 Housing.
- Housing Policy 20: It is the policy of the Council to restrict the spread of dwellings in the rural 'RU', Dublin Mountain 'HA-DM', Liffey Valley 'HA-LV' and Dodder Valley 'HA-DV' zones and to focus such housing into existing settlements.
- Housing Policy 24: It is the policy of the Council that within areas designated with Zoning Objective 'HA -LV' (to protect and enhance the outstanding character and amenity of the Liffey Valley) and 'HA–DV' (to protect and enhance the outstanding character and amenity of the Dodder Valley) residential development will only be permitted in exceptional circumstances.
- Economic and Tourism Policy 6, Objective 1: To support and facilitate the development of an integrated network of Greenways and Trails, including blueways/water trails, along suitable corridors, including the River Liffey, Dublin Mountains Way, Grand Canal, River Dodder and Slade Valley.

While the restriction in residential development will protect the Dodder with no potential for cumulative impact, the development of a greenway has potential for in-combination impacts to European sites as a result of the proposed works. These potential adverse cumulative impacts relate to water quality if both the proposed SI works and greenway infrastructure project resulted in impacts to same. The detailed design of the greenway has been completed but the construction works are yet to commence on the new infrastructural elements (car parking facilities at Kiltipper Road, new surfacing, etc.). As such, there is potential for overlap between the works on the greenway (expected in 2020) and the proposed capping at the Bohernabreena site.

Furthermore, the Heritage, Conservation and Landscapes (HCL) section of the plan sets out several relevant objectives for the protection of biodiversity along the Dodder Valley and more generally as follows:

HCL6 Objective 2: To protect, preserve and maintain industrial heritage features including weirs, millraces, and mills along the River Dodder and River Liffey.

HCL10 Objective 1: To restrict development within areas designated with Zoning Objective 'HA – LV' (To protect and enhance the outstanding character and amenity of the Liffey Valley) and 'HA – DV' (To protect and enhance the outstanding character and amenity of the Dodder Valley) and ensure that new development is related to the area's amenity potential and is designed and sited to minimise environmental and visual impacts.

HCL10 Objective 2: To ensure that development within the Liffey Valley and Dodder Valley will not prejudice the future creation and development of uninterrupted and coherent parklands including local and regional networks of walking and cycling routes.

HCL10 Objective 3: To ensure that development proposals within the Liffey Valley and Dodder Valley, including local and regional networks of walking and cycling routes, maximise the opportunities for enhancement of existing ecological features and protects and incorporates high value natural heritage features including watercourses, wetlands, grasslands, woodlands, mature trees, hedgerows and ditches, as part of the County's Green Infrastructure network.

HCL10 Objective 6: To recognise the key role the Dodder River plays in the County's Green Infrastructure network by facilitating and supporting the continued development of the Dodder Valley (Zoning Objective 'HA – DV') as a linear park, greenway and an area of special amenity, recreational, heritage, geology, biodiversity and conservation value to include for the completion of the Dodder Green Route along the full length of the Dodder River.

HCL10 Objective 7: Within areas designated 'High Amenity – Liffey Valley' and 'High Amenity – Dodder Valley' non-residential development will only be permitted where it:

- Relates to the area's amenity potential or to its use for agriculture or recreational purposes, including recreational buildings; or
- Comprises the redevelopment of or extensions to existing commercial or civic uses or development of new commercial or civic uses within an existing established area of commercial or civic activity; and
- Preserves the amenity value of the river valley including its landscape value, views or vistas of the river valley and its biodiversity value.

HCL10 Objective 10: To promote and support the development of a tourist amenity and educational/interpretive centre, such as a working mill, within the Dodder Valley.

More generally the objectives relating to the protection of the Natura 2000 network include the following:

HCL12 Objective 1: To prevent development that would adversely affect the integrity of any Natura 2000 site located within and immediately adjacent to the County and promote favourable conservation status of habitats and protected species including those listed under the Birds Directives, the Wildlife Acts and the Habitats Directive.

HCL12 Objective 2: To ensure that project that give rise to significant direct, indirect or secondary impacts on Natura 2000 sites, either individually or in combination with other plans or projects, will not be permitted unless the following is robustly demonstrated in accordance with Article 6(4) of the

Habitats Directive and S177AA of the Planning and Development Act (2000-2010) or any superseding legislation:

- There are no less damaging alternative solutions available; and
- There are imperative reasons of overriding public interest (as defined in the Habitats Directive) requiring the project to proceed; and
- Adequate compensatory measures have been identified that can be put in place.

HCL15 Objective 1: To ensure that development does not have a significant adverse impact on rare and threatened species, including those protected under the Wildlife Acts 1976 and 2000, the Birds Directive 1979 and the Habitats Directive 1992.

HCL15 Objective 2: To ensure that, where evidence of species that are protected under the Wildlife Acts 1976 and 2000, the Birds Directive 1979 and the Habitats Directive 1992 exists, appropriate avoidance and mitigation measures are incorporated into development proposals as part of any ecological impact assessment.

IE2 Objective 8: To protect salmonid water courses, such as the Liffey and Dodder Rivers catchments (including Bohernabreena Reservoir), which are recognised to be exceptional in supporting salmonid fish species.

G2 Objective 13: To seek to prevent the loss of woodlands, hedgerows, aquatic habitats and wetlands wherever possible including requiring a programme to monitor and restrict the spread of invasive species such as those located along the River Dodder.

With such high levels of protection built into the local planning policy, it is not anticipated that development under the plan will result in any in-combination impacts on European sites.

5.3.2 Ballycullen - Oldcourt Local Area Plan (2014)

The approximate 90 Ha of undeveloped lands along the Ballycullen-Oldcourt fringe is zoned for residential development and the western section of this area is within the catchment of the River Dodder. This section of the plan is governed by Specific Local Objective 87 of the CDP (2010-2016, now replaced by the 2016-2022 plan above) which, amongst other criteria, seeks to protect and preserve the biodiversity value and landscape character of the Dodder Valley.

Given the restrictions on development within the Dodder Valley, it is not anticipated that the development under the LAP would result in any in-combination impacts on European sites.

5.3.3 Glenmasole-Bohernabreena Design Guidelines (March 2005)

This document presents the siting and design advice prepared by South Dublin County Council to give guidance on locating, siting and designing a cluster housing scheme in the Glenasmole/Bohernabreena area. The guidelines followed the housing need criteria as set out in the Glenasmole/Bohernabreena Housing and Planning Study 2002. The guidelines restrict any development within 100 metres of existing streams and limited development appears to have been undertaken in the area since publication of the guidelines.

Given the restrictions imposed in these guidelines, it is not anticipated that the development in the area under the guidelines would result in any in-combination impacts on European sites.

5.3.4 River Basin Management Plan for Ireland 2018-2021

The River Basin Management Plan (RBMP) for Ireland 2018 – 2021 (DoHPLG, 2018) sets out the condition of Irish waters and a summary of status for all monitored waters in the 2013 – 2015 period, including a description of the changes since 2007 – 2009. The objectives of the RBMP are to undertake the following:

- Prevent deterioration;
- Restore good status;
- Reduce chemical pollution; and
- Achieve water related protected areas objectives.

Nationally, both monitored river water bodies and lakes at high or good ecological status, appear to have declined by 3% since 2007 – 2009; nevertheless, this figure does not reflect a significant number of improvements and dis-improvements across these waters since 2009. Provisional figures from the EPA suggest that approximately 900 river water bodies and lakes have either improved or dis-improved. In addition, the previously observed long term trend of decline in the number of high-status river sites has continued. Chapter 5 of the RBMP presents results of the catchment characterisation process, which identifies the significant pressures on each water body that is *At Risk* of not meeting the environmental objectives of the WFD. Importantly, the assessment includes a review of trends over time to see if conditions were likely to remain stable, improve or deteriorate by 2021. This work was presented in the RBMP for 81% of water bodies nationally, which had been characterised at the time. 1,517 water bodies were classed *At Risk* out of a total of 4,775, or 32%. An assessment of significant environmental pressures found that agriculture was the most significant pressure in 729 river and lake water bodies that are *At Risk*. Urban waste water, hydromorphology and forestry were also significant pressures amongst others.

5.3.5 Water Quality

The Water Framework Directive (WFD) 2000/60/EC provides a framework for the protection and improvement of rivers, lakes, marine and ground waters in addition to water-dependent habitats. The aim of the WFD is to prevent any deterioration in the existing status of water quality, including the protection of good and high-water quality status where it exists. The second cycle River Basin Management Plan, covering the period 2018 – 2021, was published in April 2018. The Plan sets out a proposed framework for the protection and improvement of Ireland's water environment in line with Water Framework Directive objectives. It was determined that the multiple River Basin District approach used in the 2009-2015 Management Plan was not as effective as expected so the 2018-2021 Management Plan has defined a single River Basin District (DoHPLG, 2018). This national strategy outlined all the actions required to improve the water quality, with county councils and Irish Water playing an important role in the implementation of the plan. There are binding obligations on all Irish local authorities including South Dublin County Council to achieve good status of surface waters, under the terms of the EU Water Framework Directive 2000/60/EC, and in related policies in the SDCC County Development Plans, e.g. Surface and Groundwater Objectives such as IE2 Objectives 1- 11 which reinforces the Council Policy as follows:

'It is the policy of the Council to manage surface water and to protect and enhance ground and surface water quality to meet the requirements of the EU Water Framework Directive'.

5.3.6 Flooding

The Dodder CFRAMS study was a pilot study that covered all of the Dodder catchment. It was subject to Strategic Environmental Assessment (RPS, 2014)[10]. The study arose out of a number of flooding incidents, most notably during the 1986 'Hurricane Charlie' fluvial event, in 2002 in conjunction with a tidal event, and in 2011 during widespread flooding resulting from heavy rainfall. During these events, extensive damage was caused in the lower reaches of the catchment where the river flows through south Dublin to the confluence with the Liffey Estuary, a nutrient sensitive area under the Urban Waste Water Treatment Directive (91/271/EEC). The Dodder CFRAMS made a number of recommendations and the SEA statement identified that these proposed flood risk management options could give rise to a number of positive environmental effects, but also negative environmental effects that could not be avoided. It further noted that the effects were likely to be limited in their scope and duration and a project specific Appropriate Assessment at a scheme level was also recommended.

The mapping of flood risk along the Dodder indicates that the section of the river that bounds the site to the west is not subject to flooding. The section to the south of the site and south of the road crossing shows a risk of 1% AEP and 0.1% AEP of a flood event on the section of the river between the reservoir and the road crossing. Similarly, to the north of the site, the section of the river directly east of the Kiltipper Woods Care Centre is subject to a 10% AEP flood event.

Any flood alleviation works undertaken on the river will be the subject of Appropriate Assessment and no cumulative impacts are predicted.

5.3.7 Planning Register

There are a number of planning consents identified on the South Dublin County Council planning system in which the proposed investigative works are proposed and these are listed in **Table 5.4**. Only applications granted in the last five years have been included in the search.

Outside of the greenway (which is noted earlier) the only development is for residential upgrade and would be minor construction works. All would have been subject to the requirements of the planning process and given the low level of construction involved, it is not anticipated that the development in the area under the guidelines would result in any in-combination impacts on European sites.

Table 5.4: Planning Register in the Area

Reference	Description	Lodged	Status
SD178/0003	Dodder Greenway Route Scheme - 14km in length of a shared 3-4m wide bound surface on the off road sections from Orwell to the Bohernabreena reservoirs at Glenasmole	22/06/2017	Application Under Part VIII
SD18A/0256	Fort Bridge, Bohernabreena, Co. Dublin - Modifications to existing dwelling and shop.	17/07/2018	Granted
SD16B/0319	The White House, Bohernabreena - demolition of structures and construction of a new single storey extension	28/09/2016	Granted

[10] RPS (2014) Dodder Catchment Flood Risk Management Plan – SEA Statement.

Similarly, a review of the EIA portal illustrates that the only major development in the area is the Dublin Mountain Visitors Centre in the townlands of Mountpelier, Killakee and Jamestown located circa 3km east of the site. This application was lodged with ABP in July 2017 for a visitor centre which will comprise an exhibition and educational facility, a café and shop, a rambler's lounge and toilets. There will be enhanced access to the site with increased car parking and public transport, road improvements and the construction of a new footpath to the site. No decision on this development has been made to date.

No other pathways have been identified by which the project could have a likely significant in-combination effect on any European site(s). There is therefore no potential for cumulative or in-combination impacts.

5.3.8 Friarstown Landfill

As noted in **Section 3.2.8**, Friarstown landfill is located adjacent to the southern boundary of the Bohernabreena landfill site. The Friarstown landfill leachate overflow pipes run across the Bohernbreena landfill site and discharge into the river Dodder along the boundary of the Bohernbreena landfill site. As such, there is potential for cumulative adverse impact from the Friarstown landfill and the Bohernabreena landfill on the Dodder and the hydrologically linked European sites.

5.4 SCREENING FOR APPROPRIATE ASSESSMENT CONCLUSION

On completion of the AA Screening process, it was concluded that the potential for likely significant effects on three SACs and one SPA from the landfill (in both it's existing form and the proposed remediation) was present, therefore, the AA process should proceed to the preparation of a Natura Impact Statement (NIS). Following NPWS technical advice that AA Screening should 'Screen in' a project or plan, and not 'Screen in' specific European sites, this AA Screening considered the potential effect pathways to all European sites within the identified ZoI.

The European sites to be brought forward to Stage 2 AA were:

- Glensamole Valley SAC;
- South Dublin Bay SAC;
- North Dublin Bay SAC; and
- South Dublin Bay and River Tolka Estuary SPA.

Through an assessment of the source-pathway-receptor model, which considered the ZoI of effects from the landfill and the potential in-combination effects with other plans or projects, the following findings were reported:

- The absence of any existing controls to manage the generation and transport of leachate from the landfill in it's current form is potentially facilitating the dispersion of leachate pollutants (such as ammonium) entering the river and being transported to the affected habitats (QI habitats and habitat supporting QI and SCI species). This has the potential for LSEs to European sites in Glensamole Valley and Dublin Bay.

- The absence of comprehensive mitigation measures to control surface water pollution during the proposed capping works, it is anticipated that sediment and/or other contaminants (oils, fuels, concrete etc.) entering the river and being transported to the habitats (QI habitats and habitat supporting QI and SCI species). This has the potential for LSEs to European sites in Glensamole Valley and Dublin Bay.
- The absence of comprehensive mitigation measures to control IAPS during the capping operation, there is potential for IAPS to have potential for LSEs to European sites in Glensamole Valley and Dublin Bay.

While the above potential impacts principally relate to the three downstream European sites in Dublin Bay, the upstream site in Glensamole Valley is also included under the precautionary principle given the proximity to the landfill.

6 STAGE 2: NATURA IMPACT STATEMENT

The requirement to carry out a NIS followed on from the conclusion arrived at during the Screening process (refer **Section 5.4**). In order to determine if the identified source-pathway-receptor linkages could give rise to Likely Significant Effects (LSEs), the following steps are taken:

- Identification of the information required, including the proposed development, linkages to European sites, and description of relevant European sites;
- Examination of the site-specific conservation objectives and attributes of QIs/SCIs of relevant European sites; and
- Prediction of any LSEs of the proposed development, including in-combination effects.

Each of the above steps is addressed within the section of the report.

6.1 REQUIRED INFORMATION

6.1.1 Proposed Development

The landfill and the proposed works have been described in detail in **Section 3** of this report.

6.1.2 Linkages to European Sites

The connectivity between the landfill and all European sites has been assessed. The three SAC's (Glensamole Valley, South Dublin Bay and North Dublin Bay) and the SPA (South Dublin Bay and River Tolka Estuary) have been identified as relevant European sites for this NIS. The source-pathway-receptor model for the proposed development is detailed in **Table 6.1**. Only relevant QIs/SCIs identified are brought forward to the next part of the NIS assessment.

The QIs and SCIs of the four European sites are described, with regard to source-pathway-receptor link(s) within the ZoI of LSE of the landfill in **Tables 6.2** and **6.3**. QIs and SCIs with identified source-pathway-receptor link(s) are carried forward for further assessment; while QIs and SCIs with no identified source-pathway-receptor link(s) are not assessed further in this NIS.

Table 6.1: Source Pathway Receptor Model

Phase	Source of Potential Effect	Description of Effect Pathway	Potential ZoI of Effect	Potential Relevance of Effect to AA
Existing Landfill	Leachate levels within the waste body that ae known to have direct contact with the groundwater.	Seepages and springs at the boundary of the landfill and river carrying contaminated groundwater/leachate mix into the Dodder and to the European Sites within the CMU.	The ZoI of effects from contaminated groundwater/leachate mix impacting surface water is difficult to accurately estimate as it will depend on numerous factors including the type and concentration of pollutants, assimilative capacity of receiving waters, and time of year (related to water levels). As a precautionary measure, a reasonable worst-case ZoI for water pollution from the landfill site is considered to be both the downstream surface water catchment and the upstream Glensamole SAC, given the proximity of this site to the landfill. In this NIS the surface water catchment is defined at the scale of Catchment Management Unit (CMU) as adopted in the River Basin Management Plan (RBMP) for Ireland 2018-2021 (DoHPLG, 2018).	**Relevant**. There is potential for pollution from the leachate groundwater mix to effect QI(s)/SCI(s) of relevant European sites from the landfill in it's existing condition.
Capping Works	Surface water run-off carrying suspended silt or contaminants into local watercourses, i.e. the Dodder.	Silt, hydrocarbons, and/or other contaminants (oils, fuels, etc.) may enter nearby watercourses through surface water run-off during capping works.	The ZoI of effects from contaminated surface water is difficult to accurately estimate as it will depend on numerous factors including the type and concentration of pollutants, assimilative capacity of receiving waters, and time of year (related to water levels). As a precautionary measure, a reasonable worst-case ZoI for water pollution from the proposed development site is considered to be both the downstream surface water catchment and the upstream Glensamole SAC, given the proximity of this site to the landfill. In this NIS the surface water catchment is defined at the scale of Catchment Management Unit (CMU) as adopted in the River Basin Management Plan (RBMP) for Ireland 2018-2021 (DoHPLG, 2018).	**Relevant**. There is potential for pollution from surface water run-off to effect QI(s)/SCI(s) of relevant European sites during the proposed capping works. These would be short term effects and would reduce on completion of capping and vegetation of the cap.
	Disturbance of invasive species during the proposed capping works.	Capping activities such as material importation could lead to the dispersal of scheduled invasive species	The ZoI of effects for spread of terrestrial invasive species is difficult to accurately estimate, as plant fragments may be spread on tyre treads to distant unrelated sites. In relation to water-borne spread of vegetation, the ZoI generally is restricted	**Relevant**. While no third scheduled invasive plants are known to occur within the ZoI, there is potential for their spread

		either via machinery, materials, clothing or wild animals.	to the surface water Catchment Management Unit.	and establishment downstream as a result of the capping works.
	Changes of groundwater quality, yield and/or flow paths associated with maintenance during operation.	Capping activities (e.g. earthworks) could interfere with groundwater flow paths, potentially affecting the quality or distribution of habitats dependent on groundwater supply.	The potential ZoI of effects from earthworks to ground water quality, flow or/or yield is difficult to accurately estimate as it will depend on factors including the depth and intrusion of excavations, and time of year (related to water levels). As a precautionary measure, a reasonable worst-case spatial ZoI is considered to be 500 m from the point of excavation; which is a precautionary doubling of the 250 m stated as the potential ZoI from intrusive excavations to sensitive upland peatland sites (SEPA, 2014).	**Relevant.** There is potential for pollution from groundwater to effect QI(s)/SCI(s) of relevant European sites during the proposed capping works.
Capped Landfill	Leachate levels within the waste body that ae known to have direct contact with the groundwater.	Seepages and springs at the boundary of the landfill and river carrying contaminated groundwater/leachate mix into the Dodder and to the European Sites within the CMU.	The ZoI of effects from contaminated groundwater/leachate mix impacting surface water is difficult to accurately estimate as it will depend on numerous factors including the type and concentration of pollutants, assimilative capacity of receiving waters, and time of year (related to water levels). As a precautionary measure, a reasonable worst-case ZoI for water pollution from the landfill site is considered to be both the downstream surface water catchment and the upstream Glensamole SAC, given the proximity of this site to the landfill. In this NIS the surface water catchment is defined at the scale of Catchment Management Unit (CMU) as adopted in the River Basin Management Plan (RBMP) for Ireland 2018-2021 (DoHPLG, 2018).	**Relevant**. The capping system will reduce the infiltration of rainwater through the waste and reduce the volume of leachate entering the underlying aquifer and the River Dodder. However, there remains a potential for pollution (albeit reduced potential) from the leachate groundwater mix to effect QI(s)/SCI(s) of relevant European sites from the capped landfill.

Table 6.2: Links with the Identified SAC

QI (priority habitat indicated with asterisk)	Relevance to the ZoI of Likely Significant Effects of the Proposed Development	Source-Pathway-Receptor Link(s)
Glensamole Valley SAC		
Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (*important orchid sites) [6210]	Orchid-rich grassland occurs in the drier parts of the SAC and in places grades into Molinia meadow. Given the significant flow of the Dodder the upstream nature of this habitat, this habitat would not be subject to hydrological impact from the landfill site.	No links identified
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]	The areas of Molinia meadows are associated with the grasslands on the valley sides, and in particular in seepage and flushed areas. Given the significant flow of the Dodder the upstream nature of this habitat, this habitat would not be subject to hydrological impact from the landfill site.	No links identified
Petrifying springs with tufa formation (*Cratoneurion*) [7220]	Tufa depositing springs are long-known from the site, along the valley sides, and some have substantial tufa mounds and banks. Tufa formation is also known from small streams within the woodland at the site. Given the significant flow of the Dodder the upstream nature of this habitat, this habitat would not be subject to hydrological impact from the landfill site.	No links identified
South Dublin Bay SAC		
Mudflats and sandflats not covered by seawater at low tide [1140]	Mudflats and sandflats not covered by seawater at low tide has been mapped and were identified as being in the southern part of Dublin Bay, sheltered behind Great south wall (NPWS 2013a). Furthermore, this is a highly dynamic habitat subject to considerable tidal disturbance. As such, it would not be possible to distinguish a sedimentation impact from the proposed development from those associated with tidal cycles.	No links identified
North Dublin Bay SAC		
Mudflats and sandflats not covered by seawater at low tide [1140]	Mudflats and sandflats not covered by seawater at low tide has been mapped and were identified as located to the front and rear of Bull Island (NPWS 2013b). This is a highly dynamic habitat subject to considerable tidal disturbance. As such, it would not be possible to distinguish a sedimentation impact from the proposed development from those associated with tidal cycles.	No links identified.
Annual vegetation of drift lines [1210]	Annual vegetation of drift lines has been mapped and was identified as being discontinuously located to the seaward side of Bull Island (NPWS 2013b).	Links Identified. There is potential for strandline vegetation to be affected by contamination generated by the existing landfill and

		during the proposed capping operation.
Salicornia and other annuals colonising mud and sand [1310]	*Salicornia* and other annuals colonising mud and sand has been mapped and was identified as being located to the landward side of Bull Island (NPWS 2013b). This is a highly dynamic habitat subject to considerable tidal disturbance. As such, it would not be possible to distinguish a sedimentation impact from the proposed development from those associated with tidal cycles.	No links identified.
Atlantic salt meadows (*Glauco-Puccinellietila maritimae*) [1330]	Atlantic salt meadows (Glauco-Puccinellietila maritimae) has been mapped and was identified as being located to the landward side of Bull Island (NPWS 2013b).	Links Identified. There is potential for Atlantic salt meadows to be affected by contamination generated by the existing landfill and during the proposed capping operation.
Mediterranean salt meadows (*Juncetalia maritima*) [1410]	Mediterranean salt meadows (Juncetalia maritima) has been mapped and was identified as being located to the landward side of Bull Island (NPWS 2013b).	Links Identified. There is potential for Mediterranean salt meadows to be affected by contamination generated by the existing landfill and during the proposed capping operation.
Embryonic shifting dunes [2110]	Embryonic shifting dunes has been mapped and was identified as being located to the seaward side of Bull Island (NPWS 2013b).	Links Identified. There is potential for embryonic dunes to be affected by contamination generated by the existing landfill and during the proposed capping operation.
Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120]	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) has been mapped and was identified as being located to the seaward side of Bull Island (NPWS 2013b).	Links Identified. There is potential for shifting dunes to be affected by contamination generated by the existing landfill and during the proposed capping operation.
Fixed coastal dunes with herbaceous vegetation (grey dunes)* [2130]	Fixed coastal dunes with herbaceous vegetation (grey dunes)* has been mapped and was identified as being located to the central parts of Bull Island (NPWS 2013b). Owing to the terrestrial nature of the habitat, it is unlikely that it would be impacted by the site.	No links identified
Humid dune slacks [2190]	Humid dune slacks has been mapped and was identified as being located to the central parts of Bull Island (NPWS 2013b). Owing to the terrestrial nature of the habitat, it is unlikely that it would be impacted	No links identified

	by the site.	
Petalwort (*Petalophyllum ralfsii*) [1395]	The petalwort, by virtue of its preference for disturbed ground within dune hollows and slacks (NPWS 2013b) is unlikely that it would be impacted by the site	No links identified

Table 6.3: Links with the Identified South Dublin Bay and River Tolka Estuary SPA

SCI	Relevance to the ZoI of Likely Significant Effects of the Proposed Development	Key Source-Pathway-Receptor Link(s)
Light Bellied Brent Goose (*Branta bernicla hrota*) [A046]	Roosting locations for the SCI species have been mapped in 2012 (NPWS 2014). No roosting habitat not likely usage of proximal habitats within the ZoI of the proposed development have been identified.	No links identified
Knot (*Calidris canutus*) [A143]	Roosting locations for the SCI species have been mapped in 2011 (NPWS 2014). No roosting habitat not likely usage of proximal habitats within the ZoI of the proposed development have been identified.	No links identified
Sanderling (*Calidris alba*) [A144]	Roosting locations for the SCI species have been mapped in 2011 (NPWS 2014). No roosting habitat not likely usage of proximal habitats within the ZoI of the proposed development have been identified.	No links identified
Bar-tailed Godwit (*Limosa lapponica*) [A157]	Roosting locations for the SCI species have been mapped in 2011 (NPWS 2014). No roosting habitat not likely usage of proximal habitats within the ZoI of the proposed development have been identified.	No links identified
Redshank (*Tringa totanus*) [A162]	Roosting locations for the SCI species have been mapped in 2011 (NPWS 2014). No roosting habitat not likely usage of proximal habitats within the ZoI of the proposed development have been identified.	No links identified
Roseate Tern (*Sterna Dougallii*) [A192]	Roosting locations for the SCI species have been mapped in 2011 (NPWS 2014). No roosting habitat not likely usage of proximal habitats within the ZoI of the proposed development have been identified.	No links identified
Roseate Tern (*Sterna Dougallii*) [A192]	Roosting locations for the SCI species have been mapped in 2011 (NPWS 2014). No roosting habitat not likely usage of proximal habitats within the ZoI of the proposed development have been identified.	No links identified
CommonTern (*Sterna hirundoi*) [A193]	Roosting locations for the SCI species have been mapped in 2011 (NPWS 2014). No roosting habitat not likely usage of proximal habitats within the ZoI of the proposed development have been identified.	No links identified
Arctic Tern (*Sterna paradisaea*) [A194]	Roosting locations for the SCI species have been mapped in 2011 (NPWS 2014). No roosting habitat not likely usage of proximal habitats within the ZoI of the proposed development have been identified.	No links identified
Oystercatcher (*Haematopus ostralegus*) [A130]	Roosting locations for the SCI species have been mapped in 2011 (NPWS 2014). No roosting habitat not likely usage of proximal habitats within the ZoI of the proposed development have been identified.	No links identified

Ringed Plover (*Charadrius hiaticulaa*) [A137]	Roosting locations for the SCI species have been mapped in 2011 (NPWS 2014). No roosting habitat not likely usage of proximal habitats within the ZoI of the proposed development have been identified.	No links identified
Golden Plover (*Pluvialis apricaria*) [A140]	Roosting locations for the SCI species have been mapped in 2011 (NPWS 2014). No roosting habitat not likely usage of proximal habitats within the ZoI of the proposed development have been identified.	No links identified
Grey Plover (*Pluvialis squatarola*) [A141]	Roosting locations for the SCI species have been mapped in 2011 (NPWS 2014). No roosting habitat not likely usage of proximal habitats within the ZoI of the proposed development have been identified.	No links identified
Dunlin (*Calidris alpina*) [A149]	Roosting locations for the SCI species have been mapped in 2011 (NPWS 2014). No roosting habitat not likely usage of proximal habitats within the ZoI of the proposed development have been identified.	No links identified
Black-headed Gull (*Chroicocephalus ribidinus*) [A179]	Roosting locations for the SCI species have been mapped in 2011 (NPWS 2014). No roosting habitat not likely usage of proximal habitats within the ZoI of the proposed development have been identified.	No links identified
Wetlands & Waterbirds {A999]	No specific wetland habitat is mapped. The NPWS have mapped the SPA territory and do identify subsites within the 2012 roosting surveys. There is potential for contaminants generated by the existing landfill or during the proposed capping or IAPS to be carried into local surface waters, and enter the SPA, thereby potentially reducing habitat quality.	Link Identified

Based on the findings in **Tables 6.2** and **6.3**, Glensamole Valley SAC and South Dublin Bay SAC are not considered further in the NIS process as it can be shown that there is no link between the proposed development and the QI for these SAC. Furthermore, a number of QI habitats and the single species from North Dublin Bay SAC are likewise removed from further consideration as no link exists between the proposed development and the QI for the SAC.

In respect of South Dublin Bay and River Tolka Estuary SPA, there is no linkage between the proposed development and the SCI species of both of these coastal SPA's by virtue of their habitat requirements, and their absence from the ZoI of the proposed development.

The NPWS Natura 2000 data form, dated September 2017, provides status assessments for QIs of the North Dublin Bay SAC (NPWS 2017b). For each relevant QI of the identified SAC, the site-level and national conservation status, and the site-level and national threats are detailed in **Table 6.4**.

The NPWS Natura 2000 data form, dated September 2017, provides status assessments for QIs of the South Dublin Bay and River Tolka Estuary SPA (NPWS, 2017d). For each relevant SCI of the identified SPA, the site-level conservation status, short and long-term population trends, and the site-level and international treats are detailed in **Table 6.5**.

Table 6.4: Conservation Status and Threats to Relevant QI's of North Dublin Bay SAC

Relevant QI	Site-Level Conservation Status (NPWS, 2017b)	National Conservation Status (and Trend) (NPWS, 2013b)	Primary Site-level Threats from the Proposed Development (Professional Judgement Applied to NPWS, 2017b)	Other National Threats from NPWS (2013a,b)
Annual vegetation of drift lines [1210]	B	Unfavourable Inadequate - Declining	Species Composition change (Succession) K02.01 Invasive non-native species (I01)	Reduction or loss of specific habitat features (J03.01) Changes in Abiotic conditions (M01)
Atlantic salt meadows (Glauco-Puccinellietil a maritimae) [1330]	B	Unfavourable Inadequate - Stable	Species Composition change (Succession) K02.01	Changes in Abiotic conditions (M01)
Mediterrane an salt meadows (Juncetalia maritima) [1410]	B	Unfavourable Inadequate - Stable	Species Composition change (Succession) K02.01	Changes in Abiotic conditions (M01)
Embryonic shifting dunes [2110]	A	Unfavourable Inadequate – Stable (negligible loss of national area)	Species Composition change (Succession) K02.01 Invasive non-native species (I01)	Reduction or loss of specific habitat features (J03.01) Changes in Abiotic conditions (M01)
Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120]	B	Unfavourable Inadequate - Stable	Species Composition change (Succession) K02.01 Invasive non-native species (I01)	Reduction or loss of specific habitat features (J03.01) Changes in Abiotic conditions (M01)

Table 6.5: Conservation Status and Threats to Relevant SCIs of South Dublin Bay and River Tolka Estuary SPA

Relevant SCI	Site-Level Conservation Status (NPWS, 2013a)	Long term site population trend (NPWS, 2013b) BoCCI 2014-2019 (Colhoun and Cummins 2013)	Primary Site-level Threats from the Proposed Development (Professional Judgement Applied to NPWS, 2017b)	Other threats identified by Birdlife International[11]
Wetlands & Waterbirds {A999]	N/A	N/A	Loss/Degradation of habitat and Spread of IAPS	Agricultural intensification, wetland drainage, flood control, afforestation, land reclamation, industrial development, encroachment of Spartina spp. on mudflats, improvement of marginal grasslands, disturbance on intertidal mudflats from construction work.

6.1.3 Brief Description of European Sites within the ZoI that are further assessed

There are two European sites within the ZoI of the landfill, namely North Dublin Bay SAC and South Dublin Bay and River Tolka Estuary SPA. A pollution effect pathway was identified between the landfill and these European sites. No effect pathways have been identified between the proposed development and distant European sites, based on the ZoI's identified and the known or potential distribution of mobile QI/SCI features identified.

6.1.3.1 North Dublin Bay SAC

The SAC is centred on the inner part of Dublin Bay, extending northwards from the Bull wall and includes Bull Island. The island is a sandy spit that formed after engineering works in Dublin port and has over time seen increased. The site holds good examples of nine coastal habitats both sand-dune and saltmarsh that are listed on Annex I of the E.U. Habitats Directive; one of which is a priority habitat. The terrestrial part of the SAC supports a number of rare and scarce plants including some which are legally protected (e.g. *Petallophyllum ralfsii*), as well as some of the invertebrates are of national importance. Given the range of habitats, the SAC which overlaps with SPA and supports internationally important numbers of some wintering bird species.

6.1.3.2 South Dublin Bay and River Tolka Estuary SPA

This is an extensive estuarine complex that covers much of Dublin Bay, both the southern sections of the bay along with Booterstown marsh and the discharge of the Tolka River to the immediate south of Bull Islands (North Bull Islands SPA). The SPA includes extensive areas of intertidal flats. For this reason, the site is of considerable ornithological importance given its extent, diversity of habitat and availability of feeding resource. It supports an internationally important population of Light-bellied Brent Goose and nationally important populations of a further nine wintering species. Furthermore,

[11] BirdLife International Data Zone. Available online at http://datazone.birdlife.org/species/search. Accessed April 2019.

the site supports a nationally important colony of breeding Common Tern and is an internationally important passage/staging site for three tern species.

6.2 CONSERVATION OBJECTIVES

6.2.1 North Dublin Bay SAC

Site specific Conservation Objectives for North Dublin Bay SAC are available (NPWS, 2013b). **Table 6.6** identifies the Conservation Objective attributes which could be adversely affected by the proposed development, for 'relevant' QIs scoped into the assessment.

Table 6.6: Conservation Objective Attributes for North Dublin Bay SAC

Relevant QI	Site Specific Conservation Objective (NPWS)	Site Specific Attributes Potentially affected by the Landfill
Annual vegetation of drift lines [1210]	To restore the favourable conservation condition	Habitat area Vegetation composition – negative indicator species
Atlantic salt meadows (Glauco-Puccinellietila maritimae) [1330]	To maintain the favourable conservation condition	Habitat area Vegetation composition – negative indicator species
Mediterranean salt meadows (Juncetalia maritima) [1410]	To maintain the favourable conservation condition	Habitat area Vegetation composition – negative indicator species
Embryonic shifting dunes [2110]	To restore the favourable conservation condition	Habitat area Vegetation composition – negative indicator species
Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120]	To restore the favourable conservation condition	Habitat area Vegetation composition – negative indicator species

6.2.2 South Dublin Bay and River Tolka Estuary SPA

Site specific Conservation Objectives for South Dublin Bay and River Tolka Estuary SPA are available (NPWS, 2015b). **Table 6.7** identifies the Conservation Objective attribute which could be adversely affected by the proposed development, for 'relevant' SCIs scoped into the assessment.

Table 6.7: Conservation Objective Attributes for Relevant SPA

Relevant SCI	Site Specific Conservation Objective (NPWS, 2015b)	Site-Specific Attributes Potentially affected by the Proposed Development
Wetlands & Waterbirds {A999]	To maintain the favourable conservation condition of the wetland habitat in South Dublin Bay and River Tolka Estuary SPA as a resource for regularly occurring migratory waterbirds that utilise it.	Habitat Area

6.3 PREDICTED EFFECTS

The prediction of potential effects from the proposed development (alone) to the integrity of European sites is presented in this Section. Cumulative effects from the proposed development in-combination with other plans or projects are presented in **Section 6.3.5**.

6.3.1 North Dublin Bay SAC

The prediction of effects from the proposed development to the integrity (based on QIs) of the North Dublin Bay SAC is set out in **Table 6.8**.

Table 6.8: Prediction of Effects on Site Integrity (QIs) in North Dublin Bay SAC

Relevant QI	Effect Pathway	Relevant Site-Level Threat	Predicted Adverse Effect(s) Triggers to relevant QI
Annual vegetation of drift lines [1210]	Surface water pollution. Dispersal of scheduled invasive Species	Species composition change (succession) (K02.01) and invasive non-native species (I01)	**Habitat area:** None predicted as landfill avoids activity within the habitat. **Vegetation composition:** Predicted impacts resulting from surface water pollution.
Atlantic saltmeadows (Glauco Puccinelliatia) [1330]	Surface water pollution. Dispersal of scheduled invasive Species	Species composition change (succession) (K02.01) and invasive non-native species (I01)	**Habitat area:** None predicted as landfill avoids activity within the habitat. **Vegetation composition:** Predicted impacts resulting from surface water pollution.
Mediterranean salt meadows (Juncetalia maritimi) [1410]	Surface water pollution. Dispersal of scheduled invasive Species	Species composition change (succession) (K02.01) and invasive non-native species (I01)	**Habitat area:** None predicted as landfill avoids activity within the habitat. **Vegetation composition:** Predicted impacts resulting from surface water pollution.
Embryonic shifting dunes [2110]	Surface water pollution. Dispersal of scheduled invasive Species	Species composition change (succession) (K02.01) and invasive non-native species (I01)	**Habitat area:** None predicted as landfill avoids activity within the habitat. **Vegetation composition:** Predicted impacts resulting from surface water pollution.
Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120]	Surface water pollution. Dispersal of scheduled invasive Species	Species composition change (succession) (K02.01) and invasive non-native species (I01)	**Habitat area:** None predicted as landfill avoids activity within the habitat. **Vegetation composition:** Predicted impacts resulting from surface water pollution.

6.3.2 South Dublin Bay and River Tolka Estuary SPA

The prediction of effects from the proposed development to the integrity (based on SCIs) of the South Dublin Bay and River Tolka Estuary SPA is set out in **Table 6.9**.

Table 6.9: Prediction of Effects on Site Integrity (QIs) in South Dublin Bay and River Tolka Estuary SPA

Relevant SCI	Effect Pathway	Relevant Site-Level Threat	Predicted Adverse Effect(s) Triggers to relevant SCI
Wetlands & Waterbirds {A999]	Surface water pollution. Dispersal of scheduled invasive Species	Discharges and Loss/change to habitat invasive non-native species	**Extent:** No direct impact predicted as landfill avoids activity within the habitat. However, predicted impacts resulting from surface water pollution and potential invasive species spread.

6.3.3 In Combination Effects

Legislation, guidance and case law requires that in-combination effects with other plans or projects are considered. On this basis, a range of other plans and projects were considered in terms of their potential to have in-combination effects with the landfill and these have been previously listed (**Section 5.3**). The assessment of in-combination effects has regard for developments potentially affecting the downstream European sites, with which a potential pathway has been identified. The Natura Standard Data Form (NPWS Website) for the two sites identify the most important impacts (high and medium) and activities with high effect on the various European sites as:

North Dublin Bay SAC[12]

- E03 - Discharges
- E01 - Urbanised areas, human habitation
- E02 - Industrial or commercial areas
- G01.02 - walking, horseriding and non-motorised vehicles
- K03.06 - antagonism with domestic animals
- H01.09 - diffuse pollution to surface waters due to other sources not listed
- J01.01 - burning down
- A04 - grazing
- G01.01 - nautical sports
- H01.03 - other point source pollution to surface water
- F02.03 - Leisure fishing
- G02.01 - golf course
- I01 - invasive non-native species

South Dublin Bay and River Tolka Estuary SPA[13]

[12] https://www.npws.ie/sites/default/files/protected-sites/natura2000/NF000206.pdf

- E02 - Industrial or commercial areas
- E01 - Urbanised areas, human habitation
- J02.01.02 - reclamation of land from sea, estuary or marsh
- E03 - Discharges
- G01.02 - walking, horseriding and non-motorised vehicles
- D01.02 - roads, motorways
- F02.03 - Leisure fishing
- K02.03 - eutrophication (natural)
- G01.01 - nautical sports
- F02.03.01 - bait digging / collection

While the Dodder is generally well protected under local land use policy, there are two existing or committed developments highlighted in **Section 5.3** which have potential for cumulative impact with the Bohernbreena landfill as follows:

- The detailed design of the Dodder Greenway has been completed but the construction works are yet to commence on the new infrastructural elements (car parking facilities at Kiltipper Road, new surfacing, etc.). There is potential for overlap between the works on the greenway (expected in 2020) and the proposed capping at the Bohernabreena site with potential for cumulative sedimentation and IAPS impact to the Dodder and associated European sites.
- The Friarstown Landfill leachate tank overflow pipe is discharging directly to the Dodder River potentially having a cumulative adverse impact from controlled and uncontrolled discharges of leachate constituents (e.g. ammonium) to the Dodder.

These projects have the potential for a likely significant in-combination effect on the European sites. Residual effects of the Bohernabreena landfill, following mitigation measures, are discussed in **Section 7.7**.

[13] https://www.npws.ie/sites/default/files/protected-sites/natura2000/NF004024.pdf

7 MITIGATION MEASURES

For the purposes of this assessment the term 'mitigation measures' refers to 'those measures which aim to minimise, or even cancel, the negative impacts on a site that are likely to arise as a result of the implementation of a plan or project. These measures are an integral part of the specifications of a plan or project' (Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC, January 2007).

Based on the Appropriate Assessment carried out in **Section 6**, the mitigation will focus on the following potential pathways:

- Surface water pollution; and
- Biosecurity measures for IAPS

The mitigation is set out in three themes as follows:

- **The Need for a Remediation Solution** – As shown in Section 6, the landfill in it's current form is potentially having an adverse impact on surface water (i.e. the Dodder) and potentially the downstream European sites through the migration of leachate from the site. As such, the existing landfill must be mitigated to reduce any potential adverse impact as determined by the Environmental Risk Assessment (ERA). The ERA recommends the installation of an engineered cap on the waste body with a low permeability barrier as described in **Section 7.1**.
- **Mitigation of the Proposed Capping Works** – As shown in Section 6, the proposed capping works have the potential for adverse impact on European sites and hence a series of management/mitigation measures must be implemented during the works. Any capping contractor appointed by SDCC shall be required to comply with, and implement, the requirements and mitigation measures as set out in **Section 7.2**, **Section 7.3, Section 7.4** and **Section 7.5**.
- **Aftercare Monitoring** – A proposed set of aftercare monitoring is included to track the success of the proposed capping works relative to baseline (**Section 7.6**).

Residual effects of the proposed development, following mitigation measures outlined in this section, are discussed in **Section 7.7**.

7.1 CAPPING OF THE LANDFILL

The findings of the Environmental Risk Assessment recommends the installation of an engineered cap on the waste body with a low permeability barrier. The cap will be designed and constructed in line with the EPA Landfills Manuals – Landfill Site Design. The capping system should consist of at a minimum the following:

- Top soil (150 – 300mm) and subsoil of at least 1m total thickness;
- Drainage layer of 0.5m thickness having a minimum hydraulic conductivity of $1x10^{-4}$m/s

- Compacted mineral layer of a minimum 0.6m thickness having a hydraulic conductivity of less than or equal to $1x10^{-9}$m/s or a geosynthetic material (e.g. GCL) or similar that provides equivalent protection; and
- A gas collection layer of natural material (minimum 0.3m) or a geosynthetic layer. This layer may be unnecessary given the gas generating potential of the waste body.

An engineered low permeability capping solution allied with controlled water and ecological monitoring would represent the preferred strategy for managing the risks associated with the site, assuming a net betterment approach be acceptable to the regulator.

The cap will create a barrier between the source (the waste body and associated leachate) and pathway (rainfall ingress to the waste body) to reduce the potential for the generation and transport of leachate from the site to the adjoining River Dodder.

7.2 BEST PRACTICE DESIGN AND CONSTRUCTION METHODOLOGY

The proposed capping works will be carried out by contractors, suitably appointed, who will meet the requirements of the standard best practice measures outlined below. The appointed contractor will be obliged to submit a detailed method statement or similar outlining how the proposed best practice measures will be implemented and how these methods will avoid all potential impacts to proximal European sites. The measures required for inclusion in the Contractor's Method Statements are provided in greater detail below.

The appointed contractor will be required to develop and implement Method Statements (MS)/ Environmental Operating Plan (EOP) to be informed by those guidance documents and best practice measures provided below. These documents will detail control measures with respect to minimising impacts upon ecology in the area. These will be submitted to the Employers Representative for review and agreement prior to the commencement of proposed works. The method statement will be strictly adhered to by the contractors involved in the works and will be overseen by the project representative/foreman.

The following documents will form the backbone of the method statement supplemented by specific additional measures proposed below:

- NRA (2010). Guidelines for the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads. National Roads Authority, Dublin;
- NRA (2008). Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes. National Roads Authority, Dublin;
- Murnane, E., Heap, A. and Swain, A. (2006). Control of water pollution from linear construction projects. Technical guidance (C648). CIRIA;
- Murnane, E., et al., (2006). Control of water pollution from linear construction projects. Site guide (C649). CIRIA;
- Masters-Williams, H., et al., (2001). Control of water pollution from construction sites. Guidance for consultants and contractors (C532);
- IFI (2016). Guidelines on Protection of Fisheries during construction works in and adjacent to waters. Inland Fisheries Ireland, Dublin; and

- Enterprise Ireland (Anon.) Best Practice Guide (BPGCS005) Oil Storage Guidelines.

The proposed works will be carried out in accordance with the following best practice construction measures:

- During the course of the works, all materials shall be stored at a secure contractor compound and transported to the works zone immediately prior to construction;
- Fuels, lubricants and hydraulic fluids for equipment used on the site, as well as any solvents, oils, and paints will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to codes of practice;
- Any spillage of fuels, lubricants of hydraulic oils will be immediately contained and the contaminated soil removed from the site and disposed of properly;
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling;
- Any bulk or fuel storage tank should be properly bunded with a bund capacity of at least 110% of that fuel tank;
- Prior to construction works a Waste Management Plan (WMP) should be prepared to outline the methodology for dealing with generated spoil and in particular Invasive Alien plant material and vector soil, during excavation, handling and disposal of any such material;
- Contaminated spoil (including spoil contaminated with invasive species) shall only be disposed of at an appropriately licenced facility. The necessary licences, permits and permissions will be required for this activity; and
- The contractor shall ensure that no harmful materials shall be deposited into nearby watercourses, including drainage pipes, on or adjacent to the site.

7.3 SURFACE WATER MANAGEMENT

The capping works shall be undertaken within a framework of environmental protection practices defined and co-ordinated as outlined in **Section 7.2**. In addition, there are specific mitigation requirements relating to sediment control and the protection of water through good working practices, most notably the CIRIA guidance for the 'Control of Water Pollution from Construction Sites' (CIRIA, 2001). The following mitigation will be applied as a minimum:

- Existing surface water drainage infrastructure (e.g. gullies) will not be interfered with or blocked during the proposed works. Neither will they be used for the unattenuated discharge of silt-laden waters from the works;
- Stockpiling of construction materials shall be strictly prohibited within 10 metres of the boundary with the Dodder, any existing surface water drainage, ditch or water-laden channel;
- Excavations, where necessary shall be left open for minimal periods to avoid acting as a conduit for surface water flows;
- Waste materials shall be stored in designated areas that are isolated from surface water drains. Skips, where used, will be closed or covered to prevent materials being blown or washed away and to reduce the likelihood of contaminated water leakage;

- Temporary construction compounds shall not be located within the boundary of the landfill;
- No harmful materials shall be deposited into any watercourses, including drainage ditches/pipes on or adjacent to the site; and
- A series of silt curtains will be installed at the western boundary of the capping works adjacent to the Dodder to mitigate the potential for sedimentation impact from the capping works. These silt curtains will provide an effective barrier between the imported material and the water course for the duration of works. The silt curtains will be inspected as part of routine maintenance to ensure the efficiency in the operation is maintained.

Protection measures shall be put in place to ensure that all hydrocarbons used during the construction works are appropriately handled, stored and disposed of in accordance with recognised standards. These measures will include:

- Hazardous materials including diesel, fuel oils, solvents, paints and/or lubricants stored on site will be stored within suitably designed bunded areas with a bund volume of 110% of the capacity of the largest tank/container.
- Re-fuelling of plant will not ordinarily occur within 50 metres of any watercourse or surface water/groundwater feature. Drip trays will be used and appropriate spill kits will be kept available;
- Machinery used on site will be regularly inspected to ensure there is no leakage from them and to ensure the machinery will not cause contamination of watercourses;
- Where required, fuel will be transported in a mobile, double skinned tank and a spill tray will be used when refuelling (if taking place outside a compound area);
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or recycling;
- Only emergency breakdown maintenance will be carried out on site. Emergency procedures and spillage kits will be readily available at strategic site locations and construction staff will be familiar with emergency procedures; and
- Any spillage of fuels, lubricants of hydraulic oils will be immediately contained, with an appropriate emergency response put in place (**Section 7.4**). Any contaminated soil will be removed from the site and properly disposed of to a suitably licenced facility.

Protection measures shall be put in place to ensure that all contaminated soil and water disturbed/generated during the construction are appropriately handled, stored and disposed of in accordance with recognised standards. These measures will include:

- Any excavations shall be supervised by a suitably qualified person if contamination is encountered this should be appropriately segregated to prevent cross contamination;
- Any material to be deposed offsite are required to be Waste Acceptance Criteria (WAC) tested to classify the material as either inert, non-hazardous, or hazardous. The waste shall be disposed of at the appropriate licenced or permitted waste facility.
- The excavation and handling of any potentially contaminated material could increase the mobilisation of any contaminants present. This presents a risk from leaching, surface run-off, migration through the subsurface, and direct contact (human health);

- Should contamination be encountered during construction, further site investigations are required to delineate any potential contamination within the subsurface;
- Excavated contaminated material (including IAPS material or infected soil) should be appropriately stockpiled on plastic liners (if not taken offsite immediately). The stockpile should be covered with plastic to prevent the ingress of rainwater. The stockpile should be bunded to collect any contaminated surface water run-off. The excavated material should be WAC tested for appropriate disposal or reuse on site;
- During piling any contaminated arisings should be stockpiled as previously described and WAC tested for appropriate disposal or reuse on site; and
- Any contaminated water generated from contaminated material shall be containerised in an Intermediate Bulk Container (IBC)/tank, tested and disposed of at an appropriate facility.

7.4 EMERGENCY RESPONSE & ENVIRONMENTAL TRAINING

SDCC, or any contractor appointed by SDCC, shall prepare an Emergency Response Plan (ERP) which will include the following as a minimum:

- Details of proposed training of relevant staff, including cover staff, in the implementation of the ERP and the use of spill kits;
- A method for which all staff will ensure that all personnel working on site are trained in pollution incident control response. A regular review of weather forecasts of heavy rainfall is required, and the contractor is required to prepare a contingency plan for before and after such events;
- The details of procedures to be undertaken in the event of the release of any sediment into a watercourse, or any spillage of chemicals, fuel or other hazardous wastes or other such risks that could lead to a pollution incident, including flood risks;
- A confirmation of the number and specification of spill kits which shall be carried at the site as a minimum; and
- Information on clean-up procedures to include the following:
    - The contractor will immediately initiate appropriate clean-up operations and notify the Local Authority and Inland Fisheries Ireland of any sediment releases, hydrocarbon leakages or spillages during the construction activities;
    - The contractor will contain the bulk of the spill immediately using a spill kit (on terrestrial land) before placing the contaminated absorbent material and the contaminated soil in a stockpile at least 50 m from, and downslope of any watercourses; and
    - All contaminated material will be underlain and covered by plastic to prevent leachate generation, until such time as it can be removed off-site by an appropriately licensed waste management company.

7.5 INVASIVE SPECIES BEST PRACTICE MEASURES

Invasive Alien Plant Species (IAPS) can be introduced into a location or spread from a location by means of contaminated vehicles and equipment, in particular tracked vehicles which have been

previously used in locations that contained IAPS and for which no biosecurity measures have been put in place.

In the event that high impact IAPS were noted on any part of the site, the contractor will be required to produce an Invasive Species Management Plan and /or refine test locations, access points as necessary, prior to continuation of the proposed works. This will be submitted to SDCC for review and written agreement prior to the proposed works recommencing. It will include best practice measures pertinent to the specific IAPS identified. Best practice measures must include but not be limited to the following:

- All plant and equipment employed on the proposed works (e.g. diggers, tracked machines, footwear etc.) must be thoroughly inspected and where necessary cleaned down using a power washer unit, and washed into a dedicated and contained area prior to arrival on site and on leaving site to prevent the spread of high impact invasive plant species such as Japanese Knotweed *Fallopia japonica* and Himalayan Balsam *Impatiens glandulifera.* A sign off sheet must be maintained by the contractor to confirm cleaning;
- For any material entering the site including backfill material, the supplier must provide an assurance that it is free of non-native invasive species;
- Should any invasive plant species be encountered, the infested areas will be clearly demarcated accounting for potential underground rhizome spread, creating an exclusion zone. Dedicated exclusion zone entry and exit points will be created for operators on foot and for small mobile equipment. A delineated access track to be maintained free of invasive species should be established through the site to minimise the spread of invasive species by permitted vehicles accessing the site. Dedicated footwear and vehicular clean down facility should be installed in the exclusion zone;
- All vehicles leaving the site should be inspected for any plant material and cleaned down in a secure and contained area;
- Spoil or other material contaminated with IAPS shall only be disposed of at an appropriately licenced waste facility. The necessary licences, permits and permissions for this activity will be required to be put in place by the contractor;
- Vehicles used in the transport of contaminated material will need to be visually checked and cleaned down into a contained area before being used for any other work, either on the same site or at a different site;
- Any material gathered in a dedicated/contained clean down area will need to be appropriately treated as contaminated material;
- The contractor must ensure all site users are aware of the invasive species management plan and treatment methodologies. This can be achieved through 'toolbox talks' before works begin on the site; and
- Adequate site hygiene signage should be erected in relation to the management of non-native invasive material.

7.6 AFTERCARE MONITORING

To support the capping, the following environmental monitoring is proposed at the site:

- Surface water monitoring at the locations shown in **Figure 3.3** should be undertaken monthly during the capping works and quarterly thereafter for a period of five years.
- Groundwater monitoring at the locations shown in **Figure 3.2** should be undertaken annually for a period of five years.
- While landfill gas is considered a low risk on the site, this was based on monitoring within a limited time frame. It is recommended to take a conservative approach and carry out additional gas monitoring in accordance with industry best practice (CIRIA C665) over a longer period to fully assess seasonal trends.
- An invasive alien plant species (IAPS) survey should be undertaken prior to and following the proposed capping works.

7.7 RESIDUAL IMPACTS

Guidance provided by the Irish Government (DoEHLG, 2010) states that:

'*If the competent authority considers that residual adverse effects remain, then the plan or project may not proceed without continuing to stage 3 of the AA process: Alternative Solutions*'

Taking into account the mitigation measures identified and set out in this NIS, no residual adverse effects within the ZoI of the proposed development have been identified (**Table 7.1**).

Table 7.1: Identification of Residual Adverse Effects within the ZoI

Relevant QI/SCI	Potential Impacts Identified	Potential Cumulative Impacts Identified	Mitigation Proposed	Residual Adverse Effects Identified
Annual vegetation of drift lines [1210]	Surface water pollution. Dispersal of scheduled invasive Species	Yes	Yes	None
Atlantic saltmeadows (Glauco Puccinelliatia) [1330]	Surface water pollution. Dispersal of scheduled invasive Species	Yes	Yes	None
Mediterranean salt meadows (Juncetalia maritimi) [1410]	Surface water pollution. Dispersal of scheduled invasive Species	Yes	Yes	None
Embryonic shifting dunes [2110]	Surface water pollution. Dispersal of scheduled invasive Species	Yes	Yes	None
Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120]	Surface water pollution. Dispersal of scheduled invasive Species	Yes	Yes	None
Wetlands & Waterbirds {A999]	Surface water pollution. Dispersal of scheduled invasive Species	Yes	Yes	None

8 CONCLUSION OF THE APPROPRIATE ASSESSMENT

This NIS has been prepared following the Department of the Environment, Heritage and Local Government guidance 'Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities' (DoEHLG, 2010). As stated in that guidance document, the requirement of the AA is not to prove what the impacts and effects will be, but rather to establish beyond reasonable scientific doubt that adverse effects on site integrity will not result.

RPS has prepared this NIS to document the analysis and evaluation seeking to establish whether or not, in view of best scientific knowledge and applying the precautionary principle, and in light of the conservation objectives of relevant European sites, the landfill and/or proposed capping, either individually or in combination with other plans or projects, will adversity affect the integrity of European sites.

The landfill in its current form and the proposed remediation works have been detailed (**Section 3**), and the receiving environment has been described (**Section 4**). A number of European sites have been identified within the ZoI of the site via the following effect pathways (**Section 6**):

- Surface water pollution; and
- Spread of IAPS.

To minimise, or even cancel, the negative impacts on a European site that are likely to arise as a result of the existing landfill and/or the proposed capping, mitigation measures were recommended (**Section 7**). These mitigation measures provide recommendations for surface water management, invasive species management, emergency responses and environmental training, and site management during capping. Provided the full implementation of mitigation measures are carried out, it is envisaged that there will be no significant residual effects on the integrity of any European sites.

In conclusion, it is the opinion of RPS that in view of best scientific knowledge and applying the precautionary principle, and in light of the conservation objectives of the relevant European sites, the proposed capping, either individually or in combination with other plans or projects, will not have an adverse effect on the integrity of any European site(s), given the implementation of mitigation measures outlined.

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