7 Water

7.1 Introduction

This chapter considers the potential impacts of the development on the quality of surface water. Potential impacts on the quality of groundwater are discussed in chapter 8.

The data used in this chapter comes from publicly available information, from the results of sediment samples taken in the marine environment and from the benthic sampling and analysis undertaken as part of the ecological assessment in the marine environment (Chapter 6). The chapter also draws on information in the following documents and sources:

- Western River Basin District – River Basin Management Plan 2009–2015 (http://www.wfdireland.ie/docs/)
- Western river Basin District -Mayo West Water Management Unit Action Plan (http://www.wfdireland.ie/docs/)
- Western River Basin District Transitional and Coastal Waters Action Programme (http://www.wfdireland.ie/docs/)
- Result of vibrocore sampling and sediment analysis (Coastline Surveys Ltd)
- EPA water quality database.

7.2 Receiving environment

The AMETS site is partly located within the Western River Basin District (Western RBD) as defined in the European Communities (Water Policy) Regulations, 2003. This is the enabling legislation of the European Communities Water Framework Directive (Directive 2000/60/EC of the European Parliament and of the Council, establishing a framework for Community action in the field of water policy). The Western River Basin District includes Mayo, Galway, Sligo, Leitrim, Clare and Roscommon.

The Water Framework Directive rationalises and updates existing water legislation by setting common EU-wide objectives for water quality. It provides for a new, strengthened system for the protection and improvement of water quality and dependent ecosystems. In brief, the legislation provides for:

- The protection of the status of all waters (surface water and groundwater)
- The establishment of 'river basin districts' (RBDs)
- The coordination of actions by all relevant public authorities for water quality management in an RBD, including cross-border RBDs
- The characterisation of each RBD
- The establishment of environmental objectives
- The development of programmes of measures and river basin management plans (RBMP).

Galway County Council is the coordinating local authority for the Western RBD set out in the legislation and Mayo County Council is a designated authority for it.

The *Western River Basin District – River Basin Management Plan 2009–2015* (published 2009) has been adopted for the river basin district (see www.wfdireland.ie/docs). It establishes four core environmental objectives to be achieved generally by 2015, as follows:

- Prevent deterioration: maintain the status of waters classified as High or Good
- Restore all waters to at least Good status
- Reduce chemical pollution
- Achieve water-related protected areas objectives.

In addition, the Surface Waters Environmental Objectives Regulations (S.I. No. 272/2009) and the Groundwater Environmental Objectives Regulations (S.I. No. 9/2010) set out the measures needed to achieve the environmental objectives established in river basin management plans for surface water and groundwater. The regulations place a legal obligation on public authorities to aim to achieve those objectives in the context of their statutory functions.

7.2.1 AMETS study area setting

The AMETS project is located in north-west Mayo in the Mayo West Water Management Unit (WMU). This WMU is a geographical sub-unit of the river basin district that includes a number of water bodies (rivers and lakes) relevant to the particular sub-catchment.

The land-side components of the project are not located within any statutory water body, as defined by the Environmental Protection Agency (EPA). There are no identified rivers of significance at the substation location or the land-side cable route to Belderra Strand. The substation site does, however, drain through the local land drainage network, joining other drainage from the area before flowing across Belderra Strand and entering the sea. The nearest lake to the substation location is Cross Lough, located to the south of the proposed facility (approximately 840m away).

Test Area B (50m water depth) is located within the coastal water body of the Western Atlantic Seaboard (IE_WE_250_0000 in Hydrometric Areas 32, 33 and 34). This coastal water body, as defined by the EPA, is 4,686km^2 in size. The test area comprises a very small fraction of this total area.

Test Area A (100m water depth) is located outside the river basin district boundary, and is not directly under the management of the river basin authorities.

The location of the test area components with respect to the water bodies in the Western RBD is shown in Figure 7-1.

7.2.2 Surface water hydrology

The annual average rainfall in the general area of the test site is approximately 1,056mm, which is slightly below the average of 1,200 mm for Ireland.

7.2.3 Existing water quality status

Water quality status is assigned by assessing biological, hydromorphological and physico-chemical quality elements. The EPA is responsible for assigning the status to water bodies in Ireland. However, no status has been assigned to the Western Atlantic Seaboard coastal water body because of insufficient data. The EPA assigned the status of Poor to Cross Lough, due to high chlorophyll levels recorded in 2009.

In coastal and transitional waters, the presence of soft bottom benthic macrofauna and their quality and diversity are among the more important and frequently used elements used to

determine habitat quality. Biological quality elements that must be included in the ecological status assessment of a water body include 'the level of diversity and abundance of invertebrate taxa' and the proportion of 'disturbance-sensitive taxa'. Data obtained from monitoring is compared with reference (undisturbed) conditions to derive an Ecological Quality Ratio (EQR).

Several methodologies have been proposed by member states for the status assessment of the benthic component. In the UK and Ireland, the EQR developed is the Infaunal Quality Index (IQI).

The macrofaunal communities of the study area were sampled, delineated and characterised as communities, which were classified in terms of standard biotopes. The ecological status of the sampling stations was assessed using the IQI (see **Appendix 3**). Twenty-five sites were sampled at the test area locations and along the proposed cable route (see Figure 7-2).

The ecological status of the stations sampled was generally High or Good. There was a tendency for lower diversity in shallower water to lead to a lower classification of habitat quality (Moderate) (see Table 7-1). It is likely that the lower diversity found in the shallower areas is due to greater physical disturbance from wave action rather than any anthropogenic influences.

Table 7-1: Benthic sampling stations and status

Station Number	IQI	Status
NP08-1	0.7	GOOD
NP08-2	0.66	GOOD
NP08-3	0.52	MODERATE
NP08-4	0.59	MODERATE
NP08-5	0.65	GOOD
NP08-6	0.86	HIGH
NP08-7	0.85	HIGH
NP08-8	0.87	HIGH
NP08-9	0.86	HIGH
NP08-10	0.84	HIGH
NP08-11	0.84	HIGH
NP08-12	0.85	HIGH
NP08-13	0.88	HIGH
NP08-14	0.92	HIGH
NP08-16	n/a	n/a
NP08-17	0.88	HIGH
NP08-18	0.88	HIGH
NP08-19	0.84	HIGH
NP08-20	0.87	HIGH
NP08-21	0.84	HIGH
NP08-22	0.92	HIGH
NP08-23	0.85	HIGH
NP08-24	0.9	HIGH

Station Number	IQI	Status
NP08-25	0.86	HIGH
NP08-15	0.91	HIGH

7.2.4 Seabed contaminants

There are no licensed marine waste disposal sites at sea within the project area.

As part of the seabed survey and investigation, twenty-six sediment core samples were submitted for chemical testing, and the results were compared with Irish and international guidelines for sediment quality. Analytes were typically found to be within acceptable sediment quality limits or below analytical limits of detection, which indicates a low to negligible risk to the marine environment if the sediment is disturbed. (For more information, see www.seai/oceanenergy.ie.)

7.3 Impact of the development

The main potential for impact on surface water quality arises during the construction phase of the project.

7.3.1 Construction phase

Potential impacts on terrestrial surface water

Potential impacts on water arise during site preparation, landscaping and construction activities associated with the substation and access road. These would mainly affect the small first-order streams that border the substation site. There is also the potential for impact on the marine coastal water, as the drainage network flows directly across Belderra Strand to the sea. The main potential impacts that could arise are:

- Sedimentation: impacts include smothering of the small drainage systems, with consequent loss of freshwater insect and fish life.
- Cement, grout and concrete: these are toxic to fish and other aquatic species.
- Oil and fuels arising from leakages or spillages: these would have direct impact on fish, fish food and fish habitats, and other aquatic species.
- Improper waste disposal: this could cause direct contamination of waters in the drainage system.
- Sanitary waste disposal from temporary facilities on site: if not properly managed, this could lead to direct contamination of waters in the drainage system and across Belderra Strand.

Potential impacts on marine waters

The main potential for impact on the marine environment arises from the cable-laying and WEC deployment operations. The effects of these operations will be temporary and of short duration. Possible impacts include:

- Sedimentation: mobilising sediment on the seabed will increase the concentration of suspended matter in the water column. Ploughing and jetting both result in disturbed sediment and suspension in the water column. Similarly, rock armouring may result in some short-term increase in the concentration of suspended matter in the water column. Any such disturbance will be of short duration, and the suspended matter will

quickly settle onto the seabed. Also, given the high-energy nature of the site, it is likely that matter suspended in the water column will disperse rapidly, and the impact will not be significant. This was also confirmed by the coastal process study in (Chapter 16).

- Disturbance of contaminated sediments on the seabed: this is unlikely to arise, as there are no disposal sites recorded in the AMETS test site location. Sediment sampling also indicated that analytes were typically within acceptable sediment quality limits or below analytical limits of detection, which indicates a low to negligible risk to the marine environment.
    - Accidental spillage of oil and fuels on vessels: any such spillages would have a direct impact on fish, fish food and fish habitats, and other aquatic species.
    - Leakage of hydraulic fluids from WECs during deployment: any such leakages would involve small volumes and the fluids would be rapidly dispersed in the open ocean environment.

7.3.2 Operational phase

Potential impacts on terrestrial surface water

During the operational phase, the surface water runoff from the substation buildings will be drained to the adjacent drain through an oil interceptor. The HV transformer will be bunded to prevent any oil leak to groundwater. The substation will occasionally be manned, and sanitary facilities will be provided which will give rise to small volumes of sanitary waste.

Potential impacts on marine waters

During this phase, WECs will be brought to and anchored in the test areas, and routine maintenance operations will be carried out. These activities will involve vessel movement in the area. The impacts that potentially arise include:

- Contamination of marine waters resulting from oil spillage from work vessels or WECs
- Contamination from anti-foulants used on the WECs
- Short-term disturbance of the sea bed from WEC anchoring activities when WECs are taken off station and reinstated, resulting in increased concentration of suspended solids. Any such suspended solids will rapidly disperse, and impact will be minimal.

7.3.3 Decommissioning phase

Potential impacts on terrestrial surface water

Decommissioning, involving demolition of the substation and site restoration, will result in temporary disturbance to the site. There is some potential for an increased concentration of suspended solids in the nearby drainage system from runoff and sedimentation. This will be a temporary impact of short duration and of low significance. Accidental oil spillage could also occur leading to contamination of the drainage system leading to Belderra Strand but with proper mitigation the risk of this will be very low.

Potential impacts on marine waters

It is unlikely that the submarine electricity cables will be recovered from the sea bed. However, if this is required as part of decommissioning, the lifting of the cables will result in increased concentrations of suspended matter in the water column along the cable routes as they are recovered. The impact would be temporary, of short duration and of low significance.

7.4 Mitigation

7.4.1 Construction phase

Terrestrial water quality

Impacts on terrestrial water quality will be minimised by the following measures:

- The development should involve the minimum footprint possible.
- The development should be carried out as efficiently as possible within the minimum timeframe possible.
- Losses of alkali waters from concrete works to surface water will be mitigated by normal construction good practice. Raw or uncured waste concrete will be removed from the site.
- Wash-down water from exposed aggregate surfaces, cast-in-place concrete and concrete trucks will be trapped on site to allow sediment to settle out and reach neutral pH before the clarified water is released to a drain system.
- Care should be taken that no oils or hydraulic fluids are allowed to leak from machinery during construction.
- All hydrocarbons will be managed appropriately to prevent their potential release to surface water or groundwater. All hydrocarbon containers, including transformers, will be stored in bunds. Double-skinned tanks shall not be considered sufficient containment and all above-ground tanks will be externally bunded.
- To mitigate any losses of oil from electrical apparatus such as transformers, all electrical apparatus containing oil shall be located within permanent concrete bunds constructed and tested to provide containment. Each bund shall be sized to hold 110% of the oil volume within the electrical apparatus it encloses, blind sumped and alarmed to allow the regular removal of clean rain water by means of pump. Rainwater pumped from each bund shall be discharged to the surface water drainage system via an oil interceptor.
- All transfer of hydrocarbons will be undertaken in a bunded area. All transfer of hydrocarbons between containers and to plant and vehicles shall be undertaken in a bunded area.
- Any accidental spillage of oils or hydraulic fluids should be cleaned up and contaminated material removed and disposed off in accordance with agreed procedures and recognised best practice. In the event of a spill, the liquid contained in the bund shall be removed by liquid waste tanker, as will be the contents of the surface water drainage system oil interceptor.
- The construction site will have an oil spill response plan, and there will be appropriately trained staff and containment equipment on the site to allow immediate control of any spills.
- Excavated materials from construction works will be deposited in pre-arranged locations where there is no danger of run-off into local watercourses. Stored excavated material will be placed on plastic sheeting and will be covered when not in use to mitigate the potential for elevated levels of particulates in run-off. All run-off water from soil storage locations shall be captured and discharged to appropriate receiving water after being clarified by an appropriate particulate removal apparatus.

- In addition to soil excavation, the site works may require exposure of large areas of soil; run-off water from such areas will be collected by temporary drainage and passed through settlement tanks or lagoons before discharging to surface water via an interceptor.
- A drainage system, incorporating sediment ponds and silt traps, will be provided at the substation sites to control silt during construction works and manage any accidental spillages. The hydrology of the area will be retained as far as practicable by maintaining existing drainage pathways
- Movement of vehicles should be restricted to existing roads. Vehicles, machinery and construction materials should only be parked or housed in the designated area.
- Where soil is to be placed for landscaping purposes or for screening embankments, the final formation face will be covered by an appropriate substrate to facilitate plant growth and minimise erosion. This should be carried out as soon as is feasible, to minimise sediment loss from erosion.
- Waste water effluents arising primarily from welfare facilities(toilets and washbasins) will be required to be treated by a proprietary treatment system and percolation area or alternatively collected in storage tanks that will be emptied by a licensed waste liquid tanker and disposed of at an appropriately licensed treatment facility.

Marine water quality

To minimise potential impact in the marine environment:

- All vessels used in cable-laying should have an oil pollution emergency response plan and carry emergency response equipment to allow immediate control of any spills. Staff should be appropriately trained in oil pollution response procedures.
- All hydrocarbons on board vessels should be managed appropriately to prevent their potential release to surface or ground water.

7.4.2 Operational phase

Terrestrial water quality

It is not anticipated that significant impacts will arise during the operational phase and no mitigation measures are required other than monitoring and inspection.

Marine water quality

Mitigation of potential impacts during the operational phase are similar to those during the construction phase. All vessels will be required to have an oil pollution emergency response plan and carry emergency response equipment and appropriately trained staff.

- WECs should be designed so that on-board oil leaks are contained within the hull; only oils with low environmental impact should be used.
- The use of antifoulant on WECs should be minimised to prevent the excessive accumulation of antifoulants in the sediments of the area.

7.4.3 Decommissioning phase

Terrestrial water quality

Decommissioning works will involve activities similar to those during the construction period and the mitigation measures set out in section 7.4.1.1 will apply.

Marine water quality

Mitigation as set out in Section 7.4.1.2 will be required during the decommissioning phase in marine waters

7.5 Conclusion

The deployment and operation of the test site submarine electricity transmission cables in the sea bed offshore and in the beach of Belderra Strand is not anticipated to present any significant risks to water quality during construction, operation or decommissioning. In the marine environment, the main threat to water quality is oil pollution arising from accidental leakage from the vessels used in construction and deployment and from WECs in operation. Vessels engaged in construction and operational activities will be required to have appropriately trained staff to implement an oil pollution emergency response plan and to have appropriate emergency response equipment. This will minimise the impact of any oil spill that might occur. WECs should be designed so that on-board oil leaks are contained within the hull, and only oils with low environmental impact should be used.

The construction of the landside project components – cable jointing bay, land cable and substation – present limited risks to receiving waters during construction and lesser risk during operation. Good general construction practices, coupled with good substation design, will mitigate the risks to water quality in the area.

Overall, any impact on water quality from the project will be short-term and of low significance, and the development does not present any significant risks to water quality.

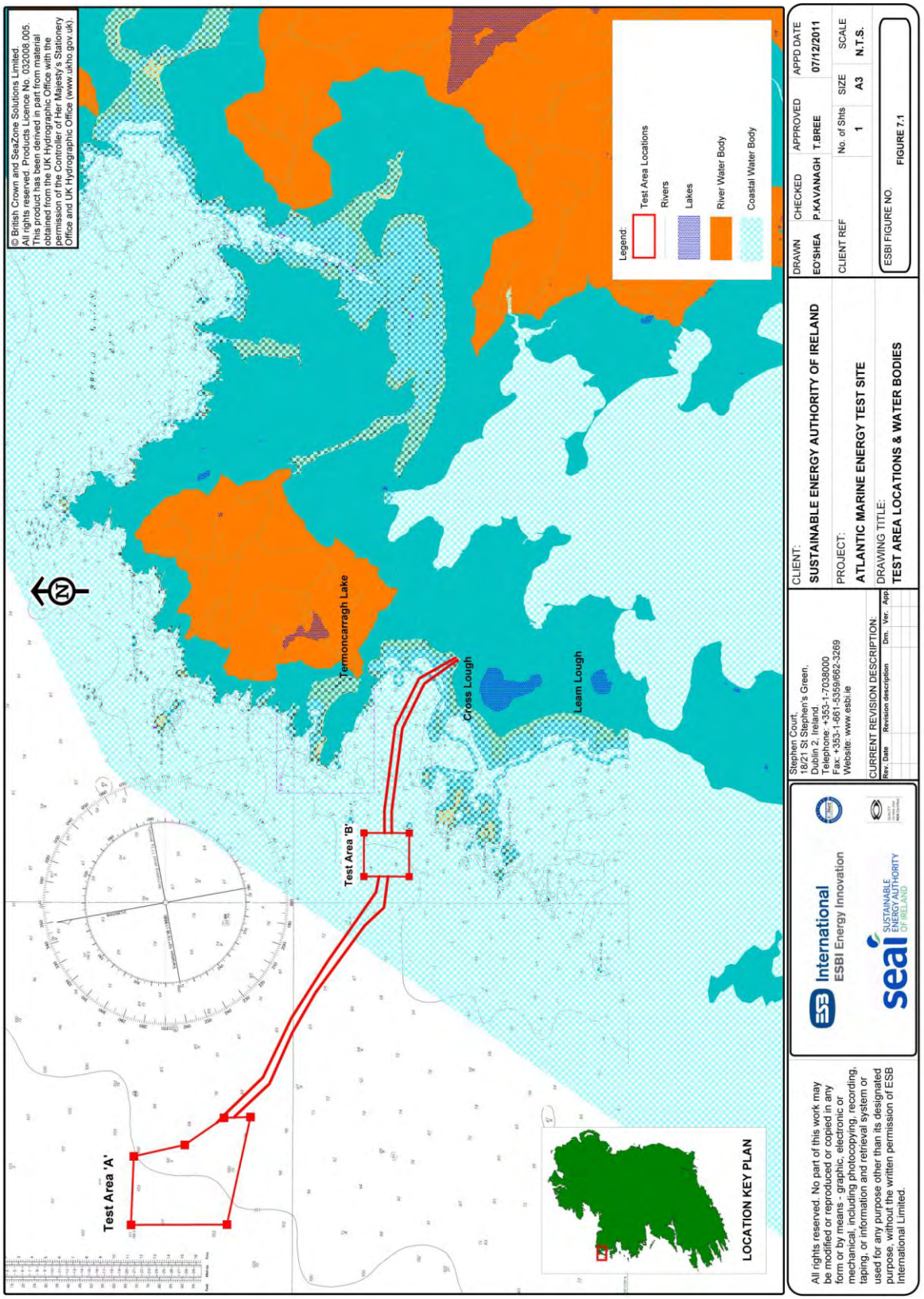

Figure 7-1: Test area locations and water bodies

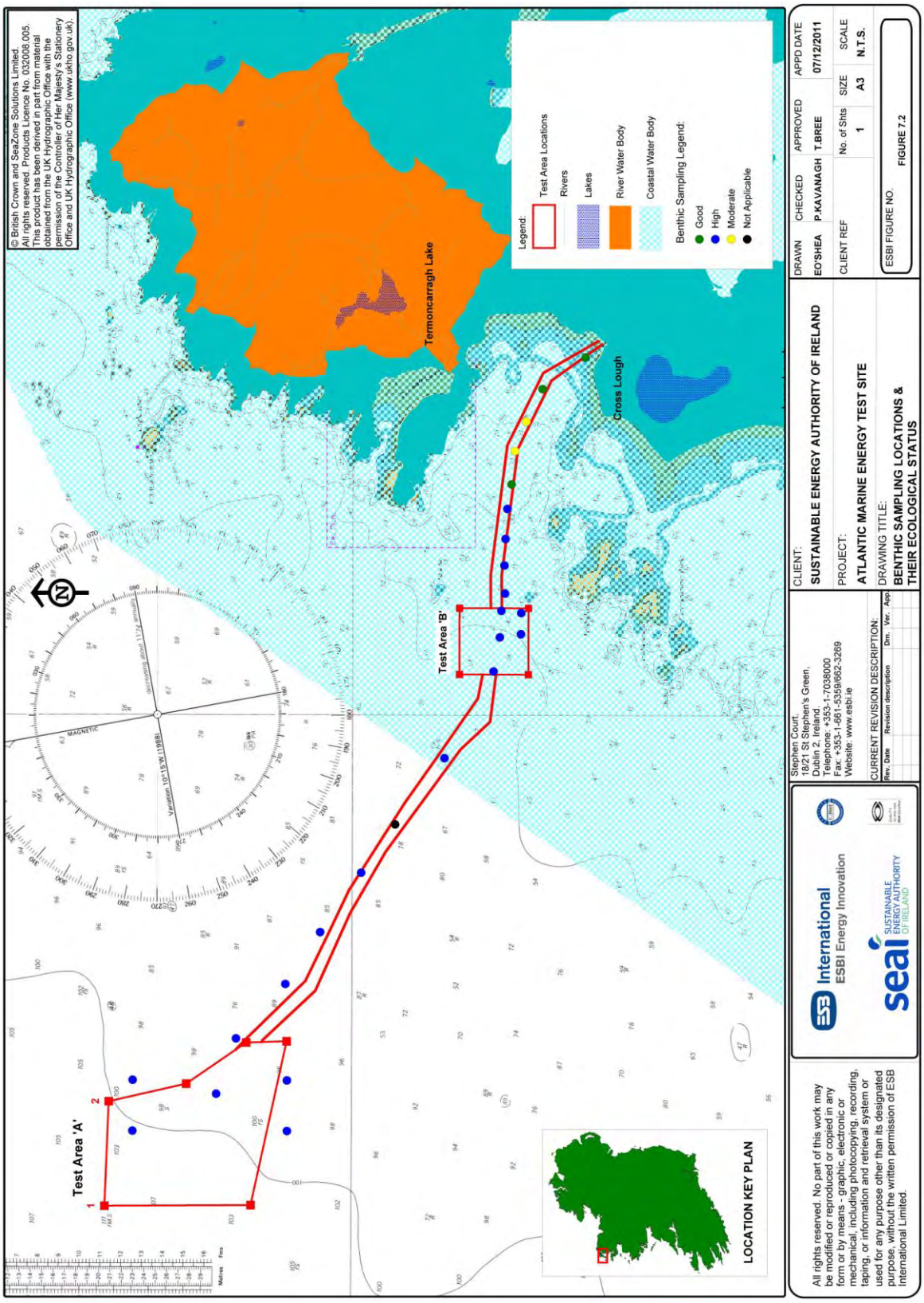

Figure 7-2: Benthic sampling locations and their ecological status