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Generation Environment Management

Report

Document supporting the application for a Marine Licence for routine activities at Torness Power Station.

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Report Summary

Report title: Torness Marine Licence Application for Routine Activities.

Report Reference: ERO/REP/0241/TOR

Summary

The purpose of this document is to support the application for a Marine Licence for Routine Maintenance activities at Torness Power Station. It outlines the locations, and the maintenance, Inspection and testing activities that are carried out there.

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1 Introduction

Torness is a nuclear power station on the East coast of Scotland, 33 miles east of Edinburgh. It is capable of supplying electricity to over 2 million UK homes. Construction started in 1980 and the station started generating electricity in 1988. It is estimated that the station will stop generating in 2030. The station has approximately 550 full time EDF Energy employees plus over 180 full time contract partners.

The plant features two 665MW units advanced gas cooled reactors (AGRs), each housed in a 5m- to 7m-thick pre-stressed concrete pressure vessel cast around a 13mm-thick carbon steel liner within the reactor building. The two reactors are served by one refuelling machine located within a common charge hall. The refuelling machine is designed to handle both fuel and control assemblies.

The Cooling Water System (CWS) is essential to maintain nuclear safety on the site, an overview of the CWS can be seen in Appendix A. The CW system takes in sea water in large quantities 48m3/sec, which is used as the heat sink for the condensers. The majority of the maintenance of the CWS can only be carried out during outage. However, it may be necessary to conduct maintenance at any time, and at short notice, as a safety/emergency requirement, or due to storm damage.

2 Project Details

For the purposes of the application, the activities have been split by geographical location on the station. There are four locations at Torness, that are subject to tidal influence (Figure 1), where routine maintenance may require a marine licence, these are:

Cooling Water Intake Structure.

Cooling Water Surge Chamber.

The Marine Outfall

The Sea Wall.

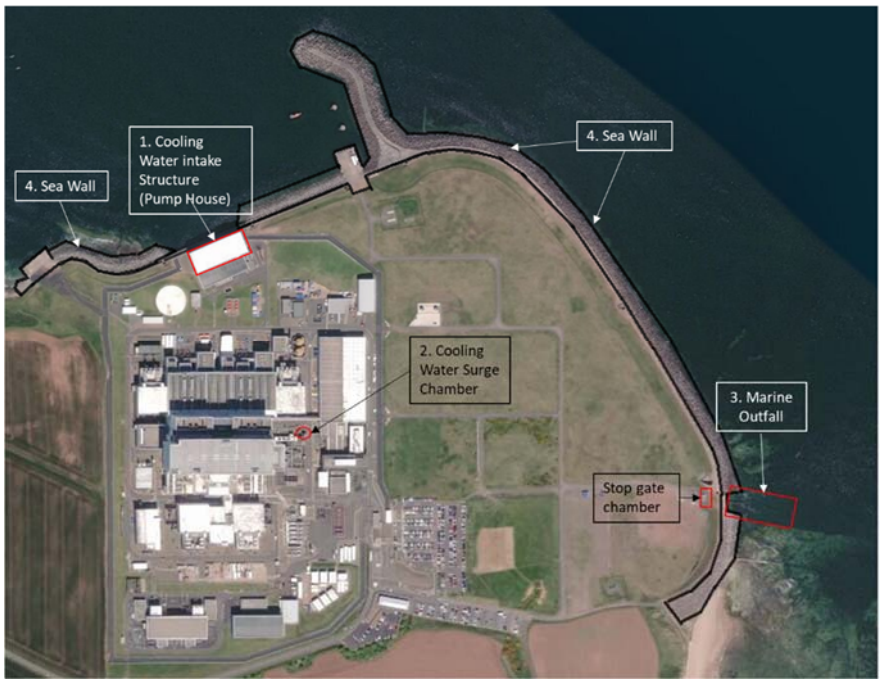


Figure 1: Satellite image of Torness Nuclear Power station, with Marine licensable areas.

3 Location 1: Cooling water intake activities

The circulating water pump house is comprised of four main circulating water pumps and eight reactor service cooling pumps driven by induction motors. Between the pumphouse and the sea is an area containing four drumscreens that filter the inlet sea water. The Torness cooling water intake (see Figure 2) draws water from Skateraw Harbour using 4 main cooling water pumps and 8 reactor sea water pumps to provide cooling for the power station.

The intakes are split into 4 discrete systems, two per unit, each with its own coarse screen, forebay and drum screen. The following activities take place in this location.

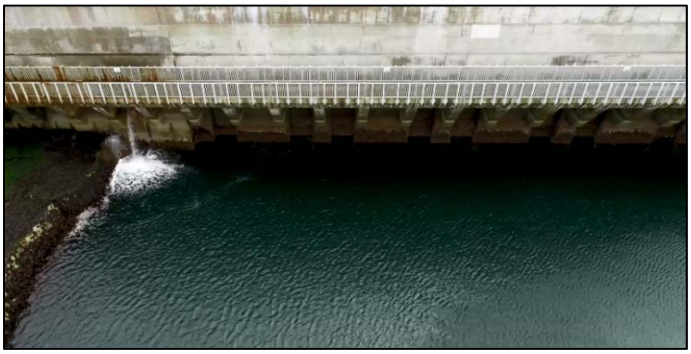


Figure 2: Torness Cooling Water Intake.

Note: Once the drumscreen and forebay areas are isolated from the sea by the stop logs, the area is no longer under tidal influence. Sections 3.4 to 3.11 covers activities that occur once the areas are isolated from the sea. As such, these activities are not licensable, but have been included for information. However, in these areas when the Stop Gates are not in, work in this area would be licensable, and as such have been included in this application.

3.1 Coarse screen removal, cleaning and reinstallation

One coarse screen is located in each intake channel to prevent large waterborne objects reaching the drumscreens (see Figure 3). The coarse screens consist of a series of vertical flat steel bars welded to a simple frame to give gaps of 100mm between the bars. Each screen is installed in two vertical guides, which extend the full height of the intake channel and are bolted to the walls of the channel.

These coarse screens need to be removed periodically for cleaning. This activity is performed using a forebay crane to pull the screens out of their channels with lifting adapter which latches onto the top of the coarse screens. Once the coarse screens are extracted, cleaning is performed on land with waste being collected and consigned offsite via a licensed waste carrier to a permitted disposal site (currently anaerobic digestion facility). The screens are then reinstalled into their channels using the same lifting adapter.

Figure 3: A generic coarse screen being lifted out of the intake channel on site.

3.2 Stop log gate installation and removal

Each drumscreen intake pass has two sets of guides into which stop-gates may be lowered. This enables the intake channel to be de-watered for maintenance purposes. Each stop-log gate is fitted with two equalising valves which open automatically when the gate is being raised, and balance the water pressure on each side of the gate.

Prior to installing the stopgates divers are used to clean the stop gate guide rails and sealing faces. At the same time general marine debris (seaweed, silt etc.) is removed from within the intake structure using a submersible pump to move debris underwater back out to sea, just in front of the intakes. Doing this reduces the amount of marine debris that is exposed when the water is removed and significantly reduces the risk of the generation of hydrogen sulphide gas in a confined space. Permission has traditionally been sought from Marine Scotland prior to the work, and approximate volumes are provided. In future outages this routine maintenance will be carried out under this marine licence application.

Figure 4: Generic Stop Gates being lifted

The Stop Gates are installed and removed using a forebay crane and lifting adapter located within the forebay building.

3.3 Drumscreen forebay dewatering and cleaning

In order to safely access the drum screen chamber and inspect the drumscreen and associated intake structures, the area must be dewatered and cleaned of entrained silt and marine growth. Installation of the Stop Gates isolates the forebay and drumscreen from tidal influence and therefore these areas may be dewatered and cleaned. A large dewatering pump is lowered into the forebay using the forebay crane. When required, townswater hoses are used to slurrify sediment and marine growth within the forebay and drumscreen areas, and this is pumped out of the chamber directly back into the sea in front of a neighbouring forebay.

3.4 Drumscreen maintenance, inspection and testing

The Drumscreen is supported on a main shaft which rotates in split roller bearings within the Drumscreen chamber. As the Drumscreen rotates, debris that settles on the screens is lifted out of the water (elevating trays mounted on the crossbars of the screen lift any debris that is too heavy to adhere to the mesh). As it approaches the top of its travel, the Drumscreen passes over two debris hoppers and beneath a battery of washwater spray jets. Under the combined action of gravity and high-pressure washing, the debris is dislodged from the screen and falls onto the debris hoppers. The washwater carries the debris into trenches at either side of the Drumscreen, which feed into a common debris channel. This water discharges via the trash basket that retains coarse material, which is subsequently disposed of offsite via a licenced waste carrier to a disposal site holding the correct permits. Wash water is returned to the harbour via the consented discharge point, which is permitted by the Scottish Environment Protection Agency.
Each Drumscreen is housed in a chamber formed by interior walls, which extend from the bottom of the intake channel up to deck level (See Figure 5). Routine maintenance, inspection & testing of the drumscreen is carried out periodically to ensure that the structure remains safe and operational.

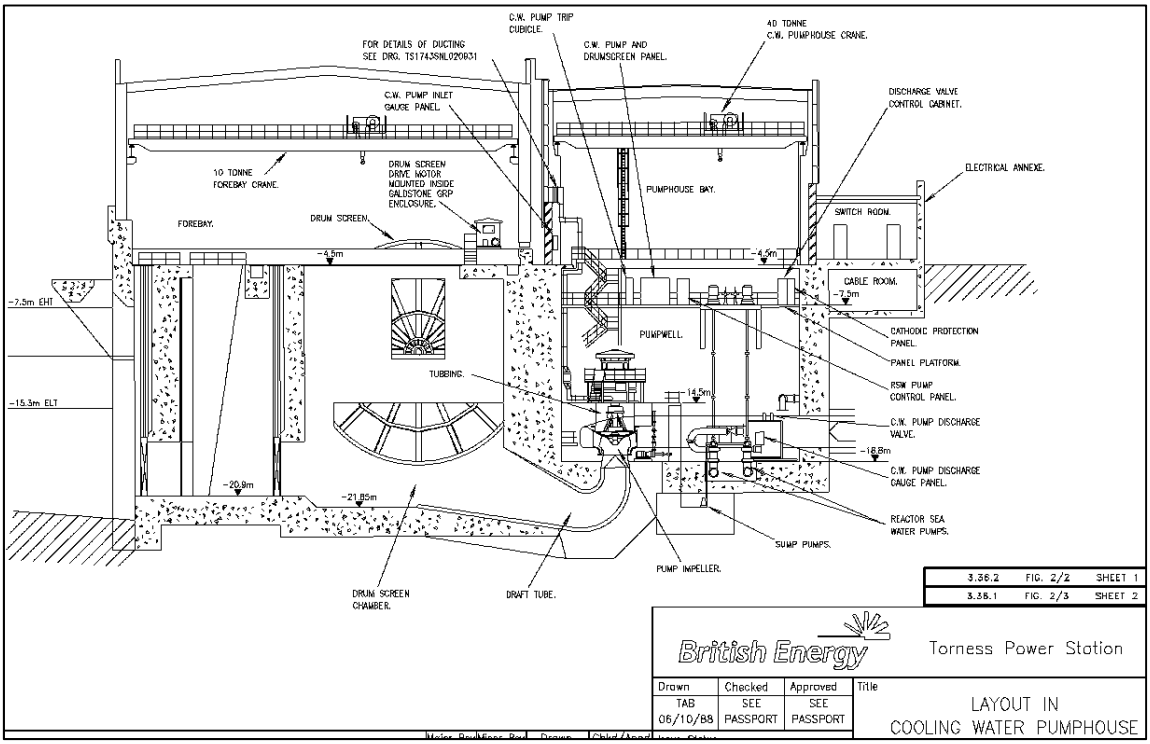


Figure 5: Sectional Arrangement of CW Intake and drumscreen.

At Torness the drumscreens are housed in a building to protect from inclement weather (See Figure 6).

Figure 6: Drumscreen as observed from ground level, please note that at Torness these are housed.

The intake channels discharge into the open ends of the Drumscreen through inlet ports in the chamber walls. Water passes through the screening mesh at the lower periphery of the screen and enters the draft tube leading to the CW pump.

Figure 7: Generic Drumscreen chamber showing location of main bearing

3.5 Inspection of mechanical panels, edge seals and drive ring gear

Once the forebay is cleaned scaffolding is erected around the drumscreen to allow safe access for inspection, maintenance and testing. A visual inspection is made of the mechanical mesh panels, drumscreen edge seals and drive ring gear from ground level.

Maintenance may be required to repair any defects found this could include:

- Damaged mechanical panels would be removed mechanically and disposed of via a permitted waste stream. A new panel would be attached in its place and fixed mechanically.
- Drumscreen side seals may be replaced if damaged, this requires the old seal to be removed mechanically and a new seal fitted in its place. The side seals are attached with mechanical fasteners.

3.6 Overhaul and replacement of drumscreen main bearing

This work would be performed with the drumscreen drained of water to expose the drumscreen bearing and the drumscreen area would be isolated from the influence of the tide by installation of the Stop Gates (see above). There would be no discharges to the environment from this work and all waste would be removed via approved permitted waste disposal routes.

3.7 Inspection and replacement of cathodic protection

Cathodic protection is located around the drumscreen chamber and require periodic replacement. Anodes are mechanically fixed to the concrete walls of the drumscreen chamber. Waste anodes are removed and disposed of via a permitted route. Some of this work may require the use of diving operations.

3.8 Structural surveys of the intake structure

Once the drumscreen and forebay areas isolated from tidal influence and are pumped dry and cleaned a structural survey is performed. This requires man-access into the drumscreen and forebay areas, access is either via fixed ladders, scaffolding or crane and basket. Any access materials (e.g. scaffolding) are removed following completion of the work.

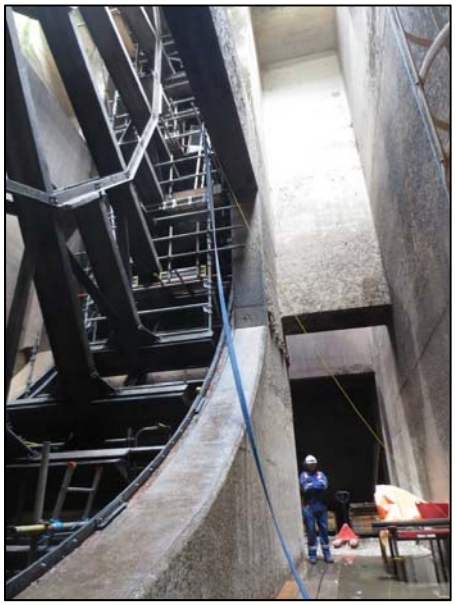


Figure 8: Structural inspection of a drumscreen chamber and forebay

3.9 Inspection and paint patch repair of drumscreen

The drumscreen is inspected and areas of paint degradation are repaired by mechanically preparing the surface in the damaged area and recoating.

3.10 Drumscreen drive rack inspection and replacement

The rack that is used to drive the drumscreen is inspected periodically and when necessary replaced. The rack is mechanically fixed to the external surface of the drumscreen and any waste rack removed is disposed of via a permitted waste stream.

3.11 Drumscreen drivetrain

The drumscreen is rotated by a surface mounted motor/gearbox/driveshaft and drive wheel that engages with the drive rack around the periphery of the drumscreen. Periodic on load and outage maintenance is performed on the drive shaft bearings and drive wheel. Defect maintenance can include shaft replacement.

3.12 Drumscreen Level Instrumentation

There are a series of hydrostatic level probes suspended in the sea for measuring screen differential levels and pump suction levels, these are removed and refitted for routine calibration.

3.13 Forebay Miscellaneous

Material condition work will take place on grating, handrails, support steelwork etc.

4 Location 2: Cooling water discharge structure (surge chamber and shaft) activities*

**Marine Scotland have confirmed that licences are only required mean high water springs (MHWS) limit. This means that the cooling water surge chamber and the stop gate chamber do not require a Marine Licence as they are above MHWS.*

The Torness cooling water discharge takes place via surge chambers and a shaft (Figure 2) that runs under the ground to the marine outfall, located outside of the site security fence. The surge chamber and shaft can then be isolated from tidal influence by installing the outfall stop gates. Once isolated routine maintenance and inspection work can take place, which tends to be undertaken during 3 yearly statutory maintenance outages, although in the event of an unplanned outage this work could occur at any time during the proposed licence period. The following activities are undertaken.

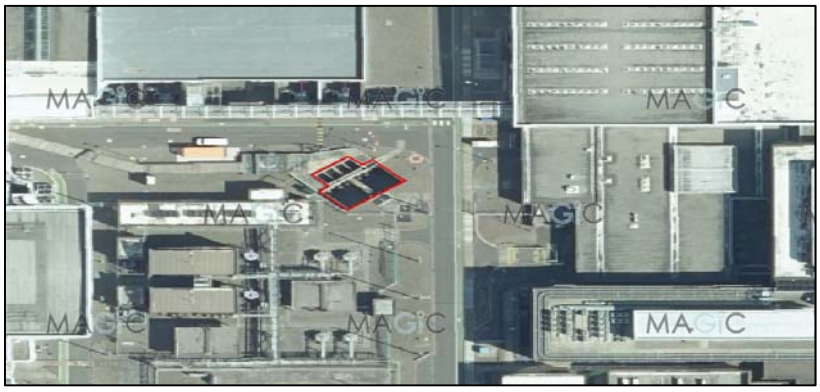


Figure 9: Torness Surge chamber location

When these areas have been isolated by the stop logs these activities are not licensable however there maybe occasions when work will need to be completed when the area is still under tidal influence.

4.1 Drain, inspect and maintain surge chamber and shaft

A pump is lowered into the surge chamber from a mobile crane. Seawater is then pumped from the isolated surge chamber into the adjacent surge chamber (which serves the other Unit). Once the seawater is removed the chamber and shaft are accessed for a structural inspection via a ladder. Routine maintenance of the structures will be completed as required.

4.2 Inspect and maintain discharge pipework

The station discharges various effluents into the surge chamber under consents and permits issued by the Scottish Environment Protection Agency. During outages, discharge pipework contained within the surge chamber, is inspected and repaired where required. Repairs are either in-situ for small repairs or involve removing the existing pipework for offsite disposal via a permitted route and installing new pipework. The pipework is mechanically fixed to the side walls of the surge chamber.

5 Location 3: Marine outfall

Figure 10 (above) & 11 (below): Torness cooling water discharge channel.

5.1 Description of proposed work: Stop gates installation*

**Marine Scotland have confirmed that licences are only required mean high water springs (MHWS) limit. This means that the cooling water surge chamber and the stop gate chamber do not require a Marine Licence as they are above MHWS.*

The stop gates are put into position via a purpose built chamber (See figure 12).

Figure 12, Purpose built chamber for lowering stop gates.

Divers are used to clean down the runs for the installation of the stop gate, any debris will be swept out into the sea. A mobile crane is used to lower the stop gate into place.

Figure 13: Installation and removal of the stop gate

Once the stop gate is installed it will remain in place until the end of the outage. This work is routinely performed every statutory outage and has no impact on the foreshore area. The gates are removed via a mobile crane.

6 Location 4, Sea Wall maintenance, inspection and testing

The sea wall at Torness extends from the North West of the site to the South East (see outlined area in figure 14) and is primarily made up of dolos blocks (5Te reinforced concrete) (see figure 15).

Figure 14, satellite photo showing the Torness site and the sea wall.

Drones are used to inspect the Dolos blocks for any structural damage, or movement. A survey is then carried out to identify the extent of any movement using set points around the site. It should be noted that any significant repair or replacement of the Dolos blocks would be covered in a separate, bespoke licence application.

Figure 15, Dolos blocks from the majority of the sea defence at Torness.

The sea wall has fixed railings in place to protect members of the public who chose to walk along the sea wall. The sea wall is a public right of way, which is regularly used. Visual inspections of the sea wall occur every 12 months, and after periods of bad weather. Railings and gratings will require maintenance, repainting and replacement around the site, there may also be concrete/rebar inspection and repair of the sea wall structure. These railings are only located directly above the areas under tidal influence in the following locations-

Figure 16, Outfall.

Figure 17, RORO slip way (including the RNLI lifeboat)

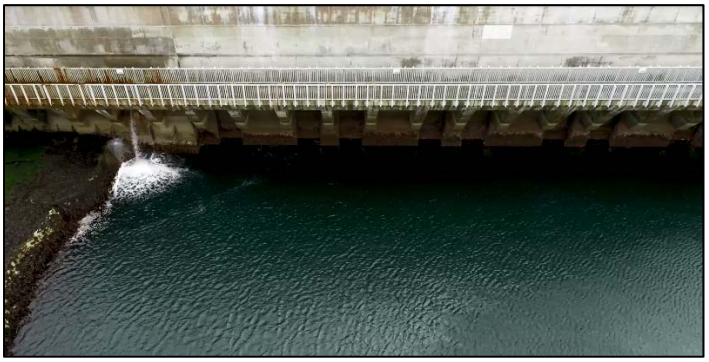
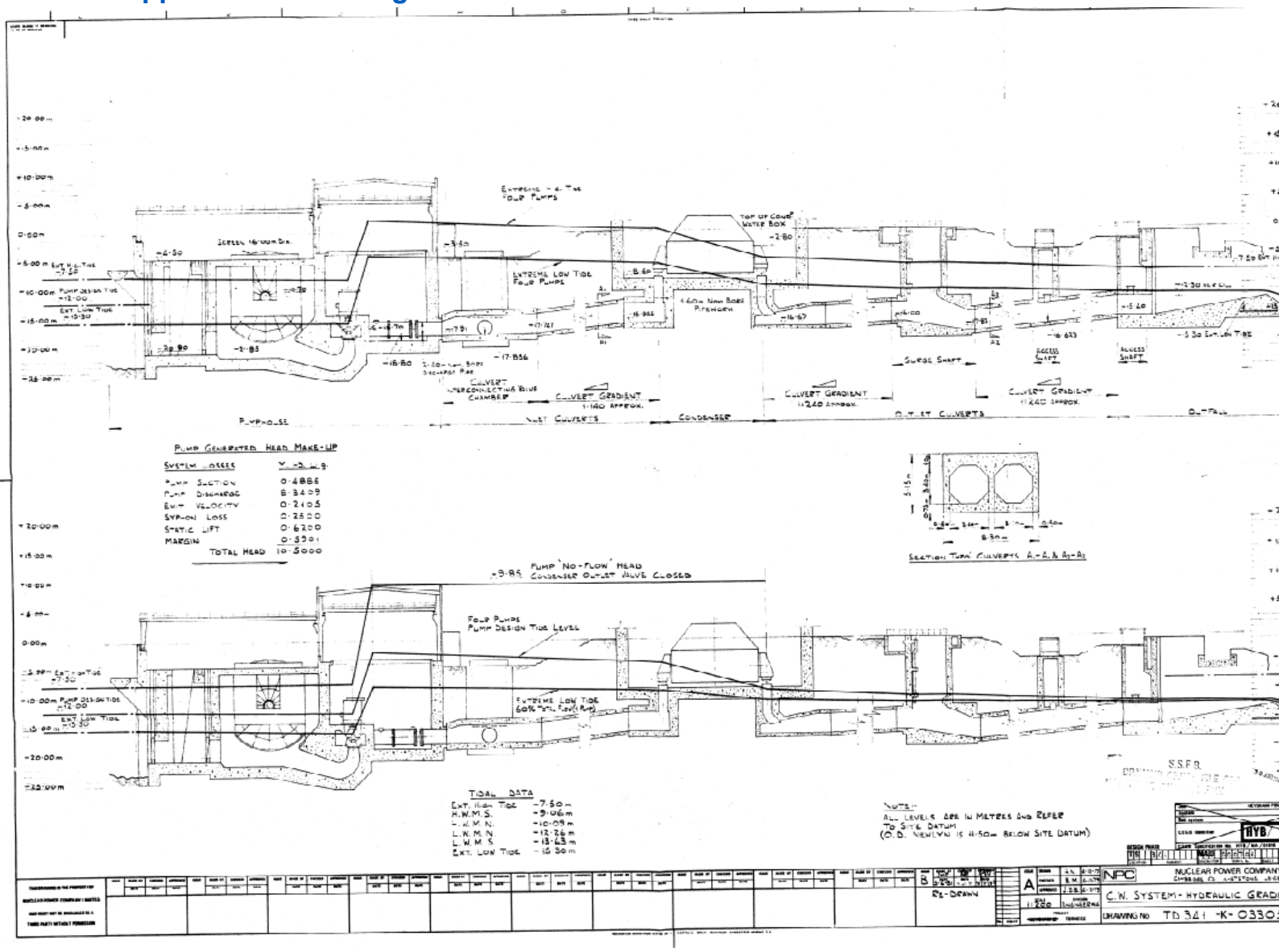
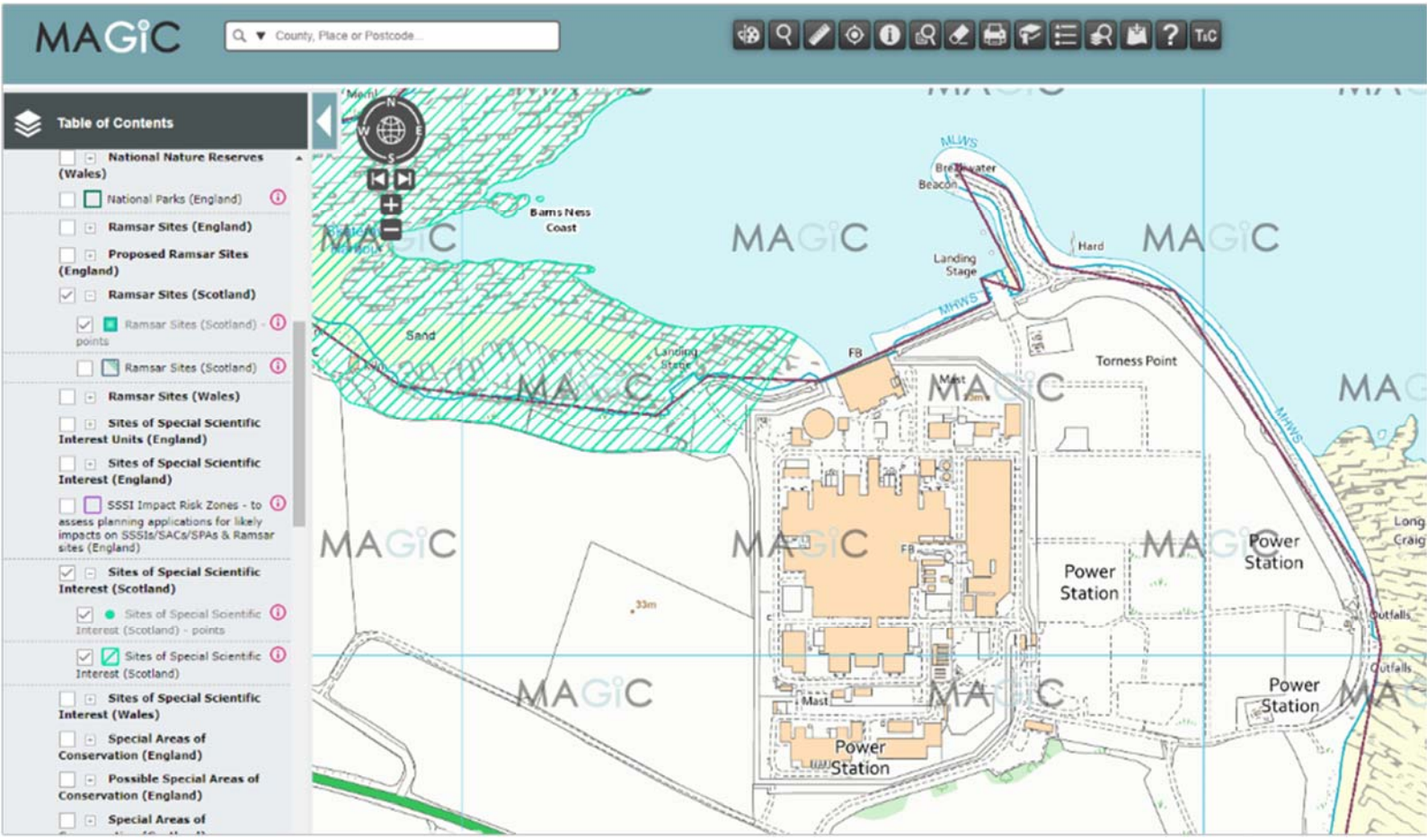


Figure 18, Cooling water Intake.

Appendix A Cooling Water Overview Schematic.



Appendix B Ordinance Survey.



Appendix C Total area of proposed works

Location	1. Cooling Water Intake Structure	2. Cooling Water Surge Chamber	3. The Marine Outfall	Stop Gate chamber (Details included in section 3. Marine Outfall).	4. The Sea Wall
The total area of proposed works in square metres. Sq Metres	2,859.20	107.2	2588.9	65.4	43889.1

Appendix D Co-ordinates.

Location	1. Cooling Water Intake Structure	2. Cooling Water Surge Chamber *	3. The Marine Outfall	Stop Gate chamber (Details included in section 3. Marine Outfall). *	4. The Sea Wall (The following co-ordinates are follow the MHWS.
Co-ordinates	55°58'14.82"N 2°24'36.37"W	55°58'6.71"N 2°24'27.78"W	55°58'4.05"N 2°23'54.47"W	55°58'4.07"N, 2°23'56.45"W	55°58'13.23"N 2°24'49.31"W
	55°58'15.62"N 2°24'33.04"W	55°58'6.99"N 2°24'27.34"W	55°58'3.95"N 2°23'50.27"W	55°58'4.04"N, 2°23'56.08"W	55°58'18.80"N 2°24'24.98"W
	55°58'15.39"N 2°24'32.96"W	55°58'6.72"N 2°24'26.94"W	55°58'2.74"N 2°23'50.26"W	55°58'3.73"N, 2°23'56.15"W	55°58'23.78"N 2°24'26.97"W
	55°58'14.62"N 2°24'36.24"W	55°58'6.46"N 2°24'27.44"W	55°58'3.23"N 2°23'54.35"W	55°58'3.79"N, 2°23'56.53"W	55°58'19.61"N 2°24'19.59"W
	55°58'14.82"N 2°24'36.37"W	55°58'6.71"N 2°24'27.78"W	55°58'4.05"N 2°23'54.47"W	55°58'4.07"N, 2°23'56.45"W	55°58'18.48"N 2°24'9.89"W
					55°58'5.66"N 2°23'54.80"W
					55°58'2.94"N 2°23'53.63"W
					55°57'58.46"N 2°23'55.08"W

**Marine Scotland have confirmed that licences are only required mean high water springs (MHWS) limit. This means that the cooling water surge chamber and the stop gate chamber do not require a Marine Licence as they are above MHWS.*