

Ref: R4504/01

Best Practicable Environmental Option

Introduction

Since the original capital dredge in 2011 surveys completed at Loch Ryan Port have indicated that there has been a reduction in depth in the approaches to the port. Scotland's National Marine Plan states that "Dredging is an essential activity to maintain existing shipping channels, establish safe approaches to new ports or open up routes to old ports." Maintenance dredging at the port is now required for which there is a need for a marine licence for disposal at sea under the Marine (Scotland) Act 2010. To support the marine licence there is a need for a Best Practicable Environmental Option (BPEO) assessment. The following sections provide this BPEO assessment.

Dredge Material Characterisation

Sediment sampling has been conducted in support of this Marine Licence application. Samples were obtained from ten locations throughout the proposed dredge area as shown in Figure 1. Table 1 details the percentage of each material type for the different samples obtained.

Table 1 Sample material characteristics

Sample ID	Date and time collected	Gravel (>2 mm) (%)	Sand (63-2000 µm) (%)	Silt (<63 µm) (%)
1	21/02/2018 12:10	0.0	55.8	44.2
2	21/02/2018 11:55	9.3	41.2	49.5
3	21/02/2018 11:45	96.8	2.4	0.8
5	21/02/2018 11:10	2.8	95.3	1.9
7	21/02/2018 10:30	54.8	43.5	1.7
9	21/02/2018 09:35	0.0	69.4	30.6
10	21/02/2018 09:25	2.8	95.7	1.5

Sediment at the berth pocket (Samples 1 and 2) is made up of roughly equal parts silt and sand. These areas at the rear of the berth or on the eastern side of the quay are subject to accretion and are likely to require dredging to maintain depths for the ferries.

Samples 3, 5 and 7 contain little silt and are predominately composed of sand, gravel or a mix thereof. These areas remain deeper from scour caused by the vessel manoeuvres and propellers meaning that this material will not require dredging.

Sample 9 in the approach channel to the port is comprised of mixed silt and sand. From previous surveys, this corresponds with a reduction in depth in this area meaning that it is likely to require dredging in order to maintain the depth.

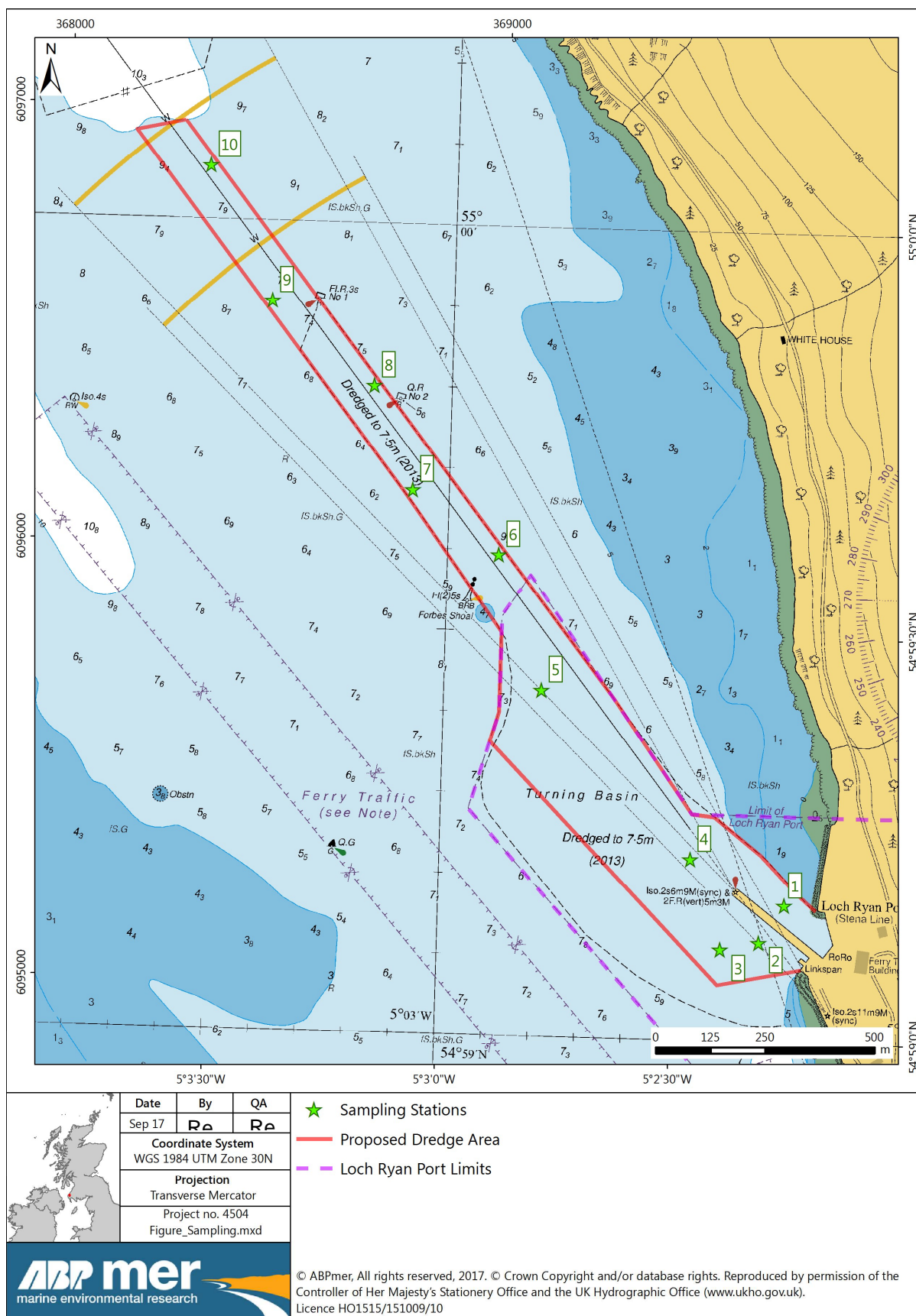


Figure 1 **Sediment Sample Locations**

Samples exceeding Action Levels

From analysis of sediment collected during grab sampling, there were four samples identified with levels of chromium exceeding action level 1 and all eight tested samples exceeded action level 1 for nickel. Figure 2 and Figure 3 show the levels of chromium and nickel identified in the sediment samples against action levels 1 and 2.

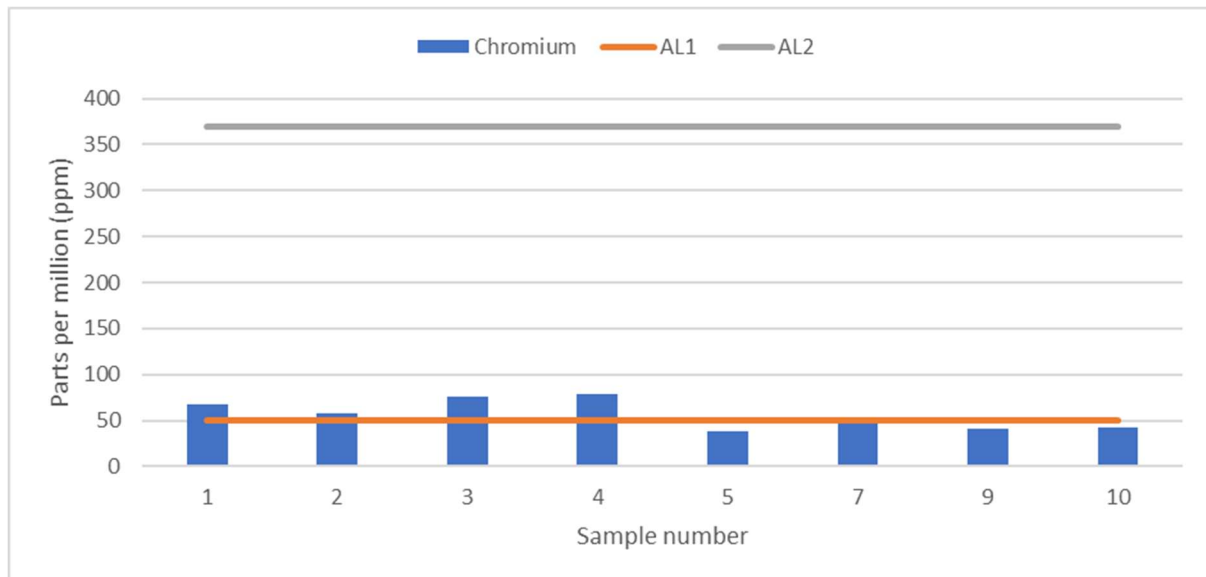


Figure 2 Chromium levels in samples 2018

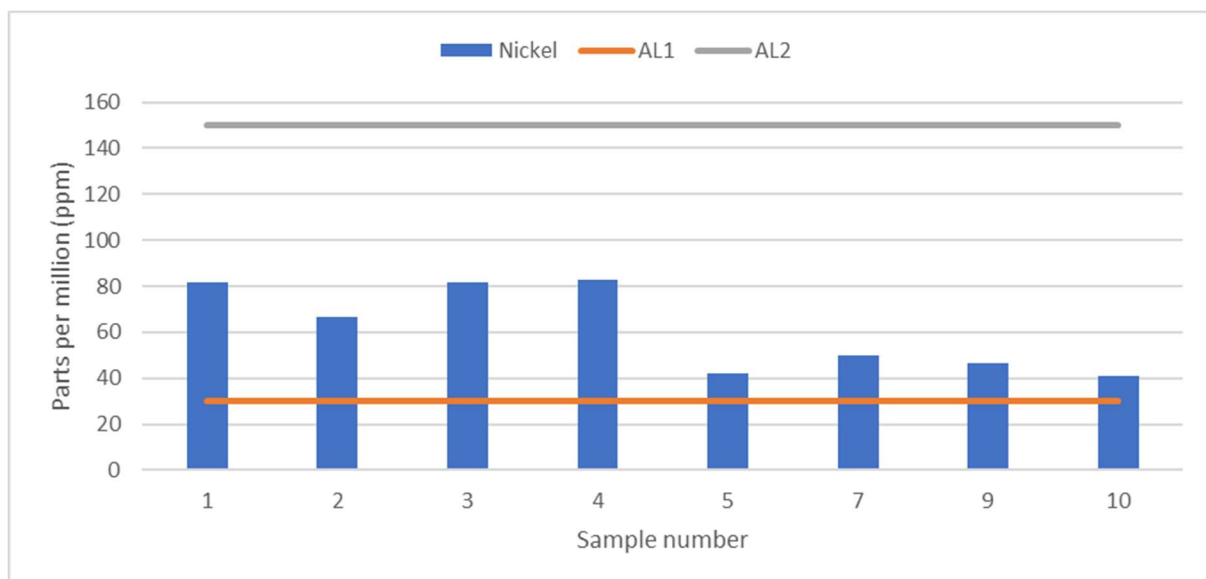


Figure 3 Nickel levels in samples 2018

It can be seen from Figure 2 that although there were four samples above action level 1 for chromium, the samples were only marginally above the action level and significantly lower than action level 2. The highest level of chromium in a sample was 79.1 ppm which is 9% between action level 1 and action level 2.

Figure 3 shows that the highest levels of nickel present in the sediment samples are from samples 1 to 4. These samples were taken near the berthing pocket with the highest level being 82.9 ppm meaning it is 44% of the way between action level 1 and action level 2.

To analyse the cause of the identified levels of chromium and nickel in the sediment samples, the results of the previous sampling completed in 2008. This sampling included boreholes and Harmon grab samples with results for chromium and nickel presented in Figure 4 and Figure 5.

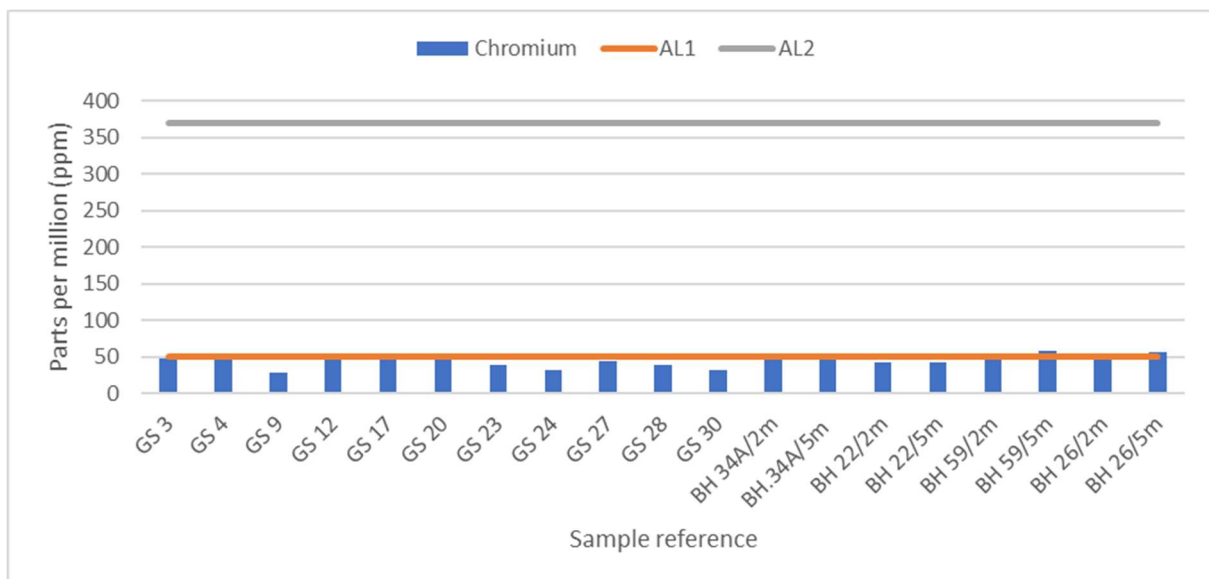


Figure 4 Chromium levels in samples 2008

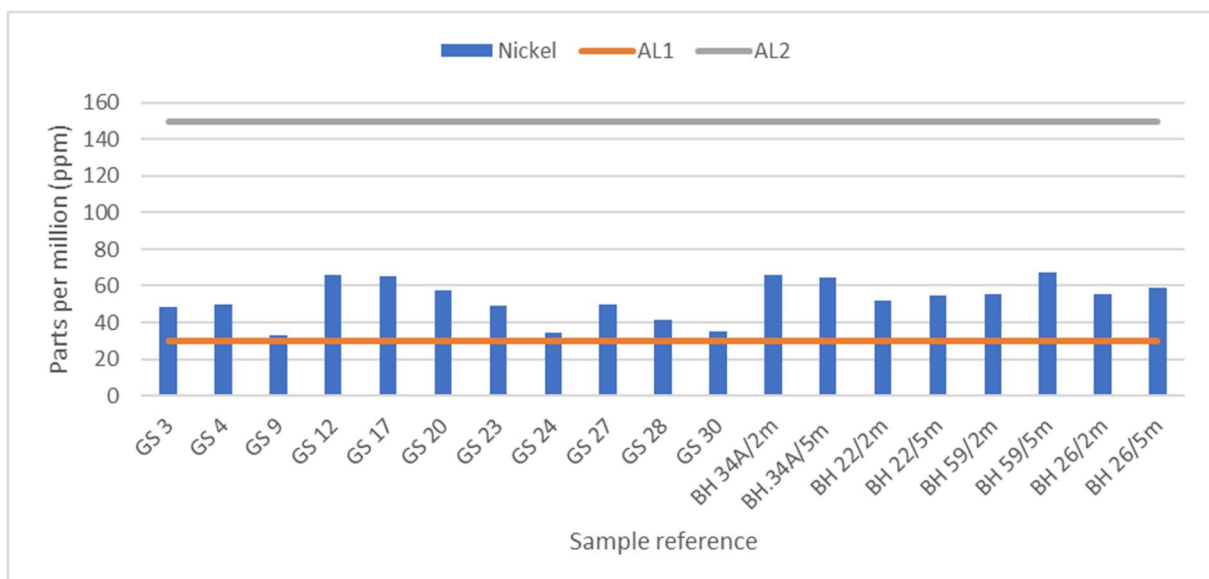


Figure 5 Nickel levels in samples 2008

Figure 4 and Figure 5 show that there are historic levels of chromium and nickel above action level 1 in the dredge area. The levels of both chromium and nickel are higher in the 2018 sediment samples for sampling station 1 to 4 located near to the berthing structure. This area has been subject to accretion and so it is likely that the higher levels of chromium and nickel are due to the disturbance of sediment due to either vessel movements or previous plough dredging which has subsequently been deposited in the area around the berthing location. The type of vessel's that use Loch Ryan Port (Ro-Ro ferries) is not associated with increased levels of chromium or nickel in sediment adjacent to their operation. It is likely that these metals are naturally occurring with increased levels due to the development of the port.

Prevention

There are three main alternatives for the prevention of generating waste material, including:

- Do Nothing (i.e. do not undertake maintenance dredging);
- Reduce the Dredging Requirement; and
- Reduce the Disposal Requirement.

The main approach to avoiding the generation of waste would be to not undertake the proposed maintenance dredging. Lack of maintenance dredging would mean that the accretion in the navigation channel would continue and would affect the ability for vessels to navigate to or from the port. Maintenance dredging is therefore concluded to be essential for the ongoing operations of the port. The 'do nothing' scenario is therefore not appropriate.

Dredging will be carried out in response to planned and timely hydrographic surveys, determined by recorded accretion rates. The requirement to dredge is a direct cost to the operation of port facilities and is not undertaken without sufficient business need. As described in the previous paragraph, the need to keep navigation channels, approaches and berths at a safe navigable depth is the overriding priority. This is linked the size of vessels and careful consideration of available water depths. Stena Line Ports use proactive monitoring in the form of hydrographic survey, with scientific evaluation of deposition rates to predict future short-term, and long-term dredging trends. The objective, is to reduce the dredge burden whilst maintaining safe navigational access. In this way, the dredge requirement is reduced where possible through optimisation of campaigns.

In summary all measures to prevent and/or reduce the volume of waste generated by the maintenance activities have been fully considered.

Re-use, recycling and other recovery

Few cost effective re-use and/or recycling options have been identified due to the nature of much of the material arising from maintenance dredging in Loch Ryan. The dredge area locations which have experienced the largest levels of accretion and so would require maintenance dredging is predominantly comprised of mixed sand and silts (Table 1). Sand presents the most advantageous material for beneficial use from the material types that will be extracted through the maintenance dredging. It is considered that when dredging of this material is required, this could represent a resource for general fill material that could be used within for backfill in the local area. In general, the material does not meet the standards for beach nourishment purposes or good quality aggregate.

There are not currently any planned developments in the local area which would be able to use the material from a dredge campaign. Stena Line Ports will continually look to use a proportion of this material wherever possible to reduce the need of using a more valuable natural resource in any future developments, therefore minimising any environmental impacts when considered on a wider, more holistic basis. No other practical methods for cost effective recovery of the material have been identified at this time, due to the type of material and the developments in the area.

Beach Nourishment/Recharge

Consideration of Rennie et al. (2017) shows that in the vicinity of the Port there are areas currently experiencing erosion (Cairnryan Old Pier (Site 88)). Detailed sediment mapping data for this location has not been found; however, the available evidence (including aerial photographs) suggests that the frontage comprises predominantly coarse grained material. Importantly, this material differs in character from that in the area of the dredge licence application, with several of the grab samples containing a high proportion of muddy material. This material is not considered suitable for beach recharge. It is

noted here that whilst some of the grab samples did contain coarse material (which may potentially be more suitable for recharge), this material was not identified in those areas of the Port which would be targeted by the maintenance dredging.

In addition, dredge arisings comprising gravel and larger material will fall from suspension once entering the dredge hopper and resuspension for pumping would not be possible. This means that to discharge this material ashore, a grab or conveyor would be required at a quay. The dredge material would then need to be transported to a beach location for discharge. This would require the quay to be out of use during the dredge campaigns causing significant disruption to the ferry service.

For dredge arisings comprising sand and mud, pumping ashore direct from the dredge location is not practical as the dredger would have to be connected to a pipe, either from a quay or a mooring point which would need to be maintained during discharge. This would mean that the navigation channel would not be accessible to the regular ferry service operating at the port. If the dredger were to take material to a beach for recharge, a pipe would be required to run along the foreshore and be deployed and removed each time the replenishment was required. Intervention of this kind would significantly damage the existing beach and restrict recreational use beyond the area of replenishment. The infrastructure required for the deployment would also be significant and costly to implement.

Disposal

The above assessment has considered the options available for management of the maintenance dredged arisings from Loch Ryan Port. No beneficial use options have been identified and therefore the material will require disposal. However, the context in which disposal is achieved should be further considered.

Disposal ashore

The nature of the dredged material (a mixture of sand, silt and gravel) is unsuitable for sacrificial landfill without involving an extensive transport and treatment process. Disposal to landfill would involve a complicated material handling operation involving sea to land transfer, de-watering, loading to trucks and transport to site. In addition, there would need to be a change in dredger type, for example from a vessel designed for maintenance dredging to one designed for aggregate recovery or a change to a mechanical form of dredger, unless a settling lagoon could be constructed.

Each existing dredger load would produce *circa* 1,000 m³ of 'semi- wet' material after water has been 'weired-off' from the dredger or de-watered in a settling lagoon on land. This volume equates to *circa* 50-60 lorry loads of material produced at the quayside in a time of 1 – 2 hours to several hours depending on the method of de-watering the dredge arisings. This transport requirement is impractical and costly as a significant fleet of lorries would be required to prevent significant delays in dredging operations.

Disposal at sea

The identified deposit grounds MA010 (North Channel Scotland) is located as near as practically possible to the area where dredging will take place; thus relocation in terms of distance is minimised. The main effects of the disposal are all short term and transient in nature. It is therefore unreasonable to assume that the proposed dredging and disposal operations will have a long-term impact on the environment. Continuing the current disposal practice will not change (make any worse) the current minimal impacts on the uses and users, habitats and ecology of the disposal area.

Summary

The BPEO has not identified any immediate opportunities for the re-use of the dredge material. Without any suitable uses available at the present time disposal in the marine environment at a licenced disposal ground is considered the BPEO. The optimum disposal location is determined through consideration of practical, environmental and economic parameters. The site has been selected to be as close as practical to the dredge site. This minimises transport time to each site and reduces the carbon footprint whilst minimising transportation cost. The disposal site is are characterised for the material present at the proposed dredge location.

Prepared by Redacted

Reviewed by Redacted

12 October 2018

Figures

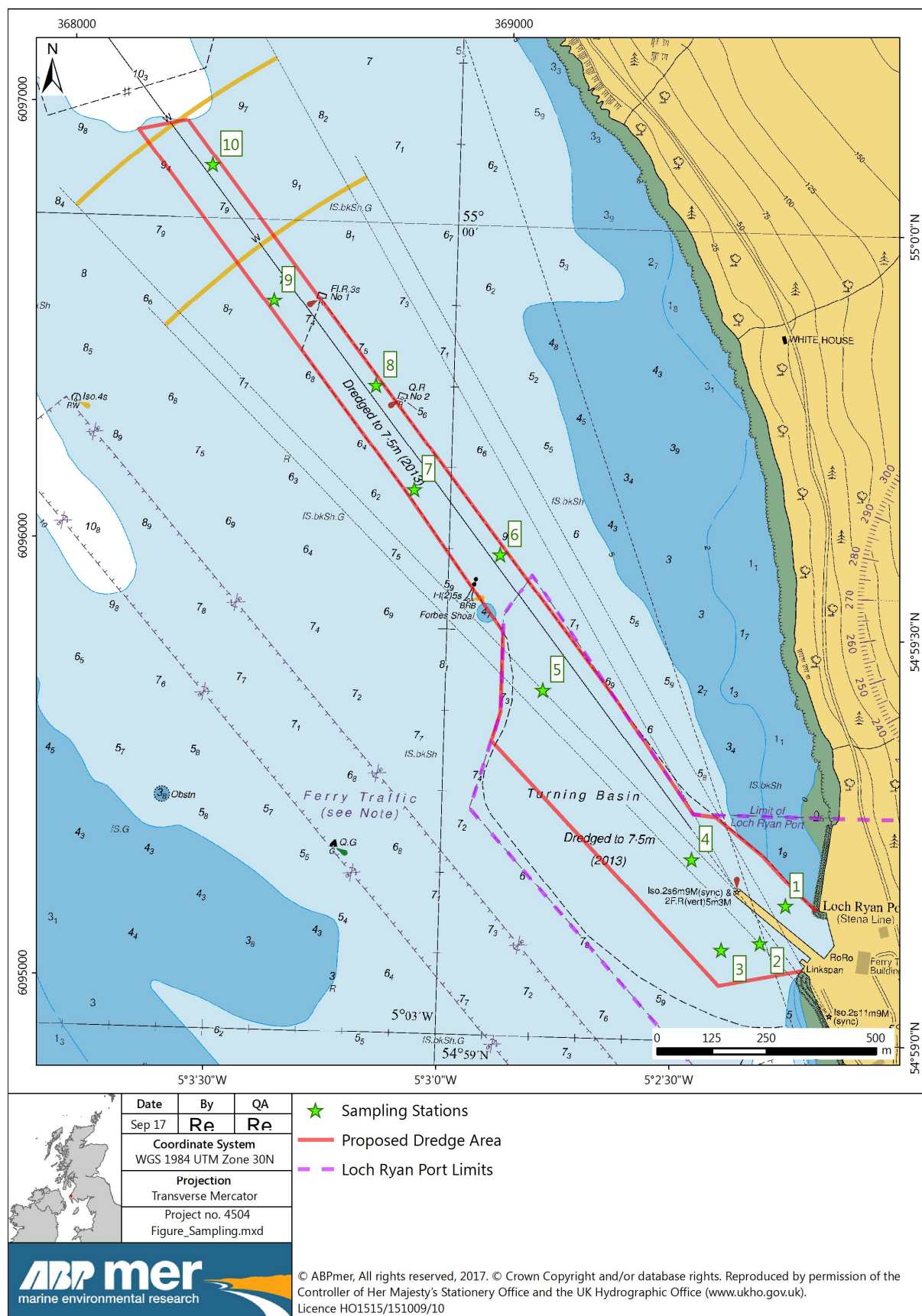


Figure 6 Sediment Sample Locations