Maintenance Dredging Baseline Document

Port of Tyne

Port of Tyne Authority

February 2018
Version 2

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CONTENTS

LIST OF ACRONYMS

AA	Appropriate Assessment
AL	Action Levels
BAP	Biodiversity Action Plan
BCD	Below Chart Datum
BTO	British Trust for Ornithology
CCME	Canadian Council of Ministers of the Environment
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CD	Chart Datum
DBT	Dibutyl tin
DEFRA	Department of Food and Rural Affairs
EA	Environment Agency
EC	European Commission
EU	European Union
EMS	European Marine Site
EQS	Environmental Quality Standards
FEPA	Food and Environment Protection Act
GEP	Good Ecological Potential
HAT	Highest Astronomical Tide
HMWB	Heavily Modified Water Body
HRA	Habitats Regulations Assessment
ISQGs	Interim Sediment Quality Guidelines
LPA	Local Planning Authority
MCZ	Marine Conservation Zone
MFA	Marine and Fisheries Agency
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MDP	Maintenance Dredge Protocol
MNCR	Marine Nature Conservation Review
MpSPA	Marine potential Special Protection Area
NE	Natural England
NMMP	National Marine Monitoring Programme
NWT	Northumberland Wildlife Trust
PAH	Polyaromatic hydrocarbons
PCB	Polychlorinated biphenyls
PEL	Probable Effect Levels
RBD	River Basin District
RBMP	River Basin Management Plan
SAC	Special Area of Conservation
SAP	Salmon Action Plan
SMP	Shoreline Management Plan
SPA	Special Protection Area
SSSI	Sites of Special Scientific Interest
TBT	Tributyl tin
TEL	Threshold Effect Levels
TOC	Total Organic Carbon
TPH	Total petroleum hydrocarbons
TraC	Transitional and Coastal Water Body
TSHD	Trailing Suction Hopper dredger
TSS	Total Suspended Sediment
UES	Uniform Emission Standards
WEBS	Wetland Bird Survey
WFD	Water Framework Directive

1 INTRODUCTION

1.1 Background

The Conservation Assessment Protocol (referred to as the Protocol hereafter) was published by the Department for Environment, Food and Rural Affairs (Defra) in 2007 and followed the draft pilot Protocol issued in 2003.

Where maintenance dredging operations around the coast of England have the potential to affect 'European Sites', also known as *Natura 2000* sites consisting of Special Areas of Conservation (SAC) and terrestrial or marine Special Protection Areas (SPA), the Government considers that maintenance dredging should be considered as a 'plan' or 'project', and assessed in accordance with Article 6(3) of the EC Habitats Directive (92/43/EC) (transposed into UK law by The Conservation of Habitats and Species Regulations 2010 - the 'Habitats Regulations'). Whilst not endorsing this interpretation, the ports industry has agreed to co-operate with Government to seek to devise arrangements which allow the effects of maintenance dredging on European sites to be assessed without placing a disproportionate burden on industry, Government, or its agencies.

Where maintenance dredging is found likely to have, or be having, a significant effect on a European Site, a port authorising or undertaking licensed, contracted or otherwise permitted maintenance dredging operations (including disposal) must exercise their functions in compliance with the requirements of the EC Habitats Directive. The Protocol provides assistance to operators and regulators seeking, or giving, approval for maintenance dredging activities that could potentially affect coastal and marine European sites. Following this process enables issues associated with the Directive to be dealt with in a streamlined and proportionate manner, assisting harbour and port authorities in fulfilling their statutory obligations, and minimising the delay and cost to port and marine operators in obtaining consents.

The requirements of the Water Framework Directive (WFD) extend further, to consider the entire aquatic environment, rather than specific designated sites. However, aiming to achieve Good Ecological Potential (GEP), which is required under the WFD for Heavily Modified Water Bodies, is also a key requirement for maintaining the designated sites in favourable condition; hence the two requirements overlap.

1.2 Objectives

The intention of the Protocol is to allow the effect of maintenance dredging on a European site to be assessed without placing a disproportionate burden on the promoter (or the Regulators). To provide a basis against which maintenance dredging applications can be assessed, the Protocol recommends the production of a 'Baseline Document', drawing on existing and readily available information to describe current and historic patterns of dredging in relation to the conservation objectives of European site(s) in the area. The objectives of the Baseline Document are as follows:

- To collate current and historical information on dredging activities and the existing environmental status of the study area and, in particular, the potential extent of impacts resulting from previous capital and maintenance dredging.

- To provide the necessary data to allow any maintenance dredging proposals for the study area to be assessed in compliance with the Habitats Regulations, to assist competent authorities in identifying 'likely significant effect' in respect of future maintenance dredging applications or proposals.

This Baseline Document will require regular updating as and when further information becomes available and if circumstances change, as it will support proposals (or applications for consent) for future maintenance dredging activities. The detail of this can be found in Section 5.4.1. Any information submitted will then be considered by the competent authorities in deciding whether the proposals, either alone or in-combination with other plans or projects, are likely to have a 'significant effect' on a European Site.

Where little or no change has occurred (or is expected to occur) to the long term practices related to those maintenance dredging operations as described in the Baseline Document, and where monitoring has revealed no deterioration to the conservation status of a European Site due to such activity, the competent authority will be expected to conclude no 'likely significant effect'. In this case there would be no further requirement for an Appropriate Assessment (AA) of the implications for the site in view of its conservation objectives.

In accordance with the Maintenance Dredge Protocol, the Baseline Document is primarily intended to address potential effects on sites which are important at European level (eg SPA's and SCA's) and not to consider sites which are important national or local level eg Sites of Special Scientific Interest (SSSI), or Biodiversity Action Plan (BAP) habitats. It is however recognised that there are marine habitats within the potential impact zone of dredging and disposal operations that do not form part of a European site for which an assessment nevertheless needs to be made. In particular the Coquet to St Mary's Marine Conservation Zones (MCZ), which was cited in 2016 under the Marine and Coastal Access Act, lies immediately adjacent to the North Tyne spoil ground and as such will also be considered as part of this assessment.

1.3 Study area

The study area is defined as the area in which both maintenance dredging and disposal operations are undertaken by the Port of Tyne. The dredge area commences at the upriver end of Bill Reach (known as St Anthony's Bend) and continues to the seaward end of the Entrance Reach, defined by the North and South Pier Lighthouses. It is recognized that the study area is dynamic and changeover time dependent upon regulatory and socio-economic factors. The original 2013 study area which consisted of of 8 channel areas and some 23 operational berths is shown on Figure 1.1. The current 2017 study area which consists of 8 channel areas and some 28 operational berths is shown on Figure 2.10.
There are two areas of sea currently authorised for the disposal of dredged material from the River Tyne. These are known as "North Tyne" and "Souter Point (outer)" as shown in Figure 1.2.

1.4 Information requirements

The Protocol clearly sets out a requirement for information to be provided on the details of previous and ongoing dredging activities. This includes (amongst other things) information on the following:

- The existing **need** for maintenance dredging in individual areas;
- The existing **volumes, frequencies and duration of dredging operations**. This should be based on actual dredge returns rather than volumes applied for in consents;
- The precise **locations of dredging and disposal**;

- **Methods of dredging, transport and disposal**, including requirements for relevant authorities to take into account plough dredging, agitation dredging and other hydrodynamic operations;

- **Any restrictions** imposed as license conditions or by physical constraints (e.g. depth, tidal flow, wave or weather conditions);

- **Material type and chemical status** (existing and historical);

- The **history of dredging and disposal** at particular locations, as well as the variability in material type and volumes due to natural changes;
- Any **monitoring requirements previously imposed** through licences, and the outcomes of such monitoring;

- Any **beneficial use and sediment cell maintenance schemes**, or **mitigation and compensation** schemes entered into; and,

- Any **other relevant information** from past studies or previous applications that have possible direct or indirect links to the maintenance dredging.

The documents should also include any information supplied by Natural England and other organisations (Defra, the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) and the Environment Agency) on the conditions and characteristics of the European sites in the area, in particular:

- The interest features of the sites and the conservation objectives which could be affected by maintenance dredging;

- The extent to which the ecological requirements of the sites have been achieved, maintained or restored since the requirements of the Birds or Habitats Directive were applied to the sites; and,

- A clear evaluation by Natural England of the impact of ongoing established dredging activities on the sites.

The steps of the Habitats Regulations Assessment and the test of Likely Significant
Effect including the Appropriate Assessment stage are set out in Figure 1.3.

This dredging information will also be important in the context of informing the Dredging Strategy for WFD compliance.

Figure 1.1 Maintenance dredge areas as of Q1 2013.

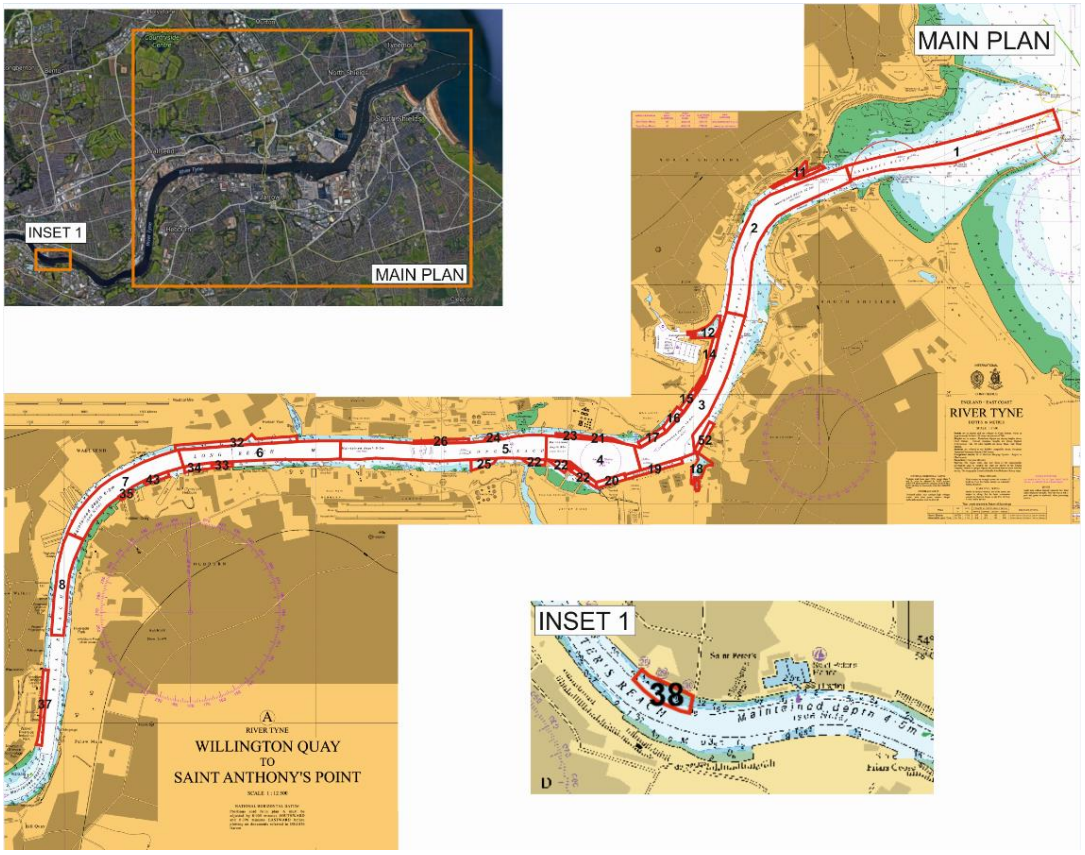
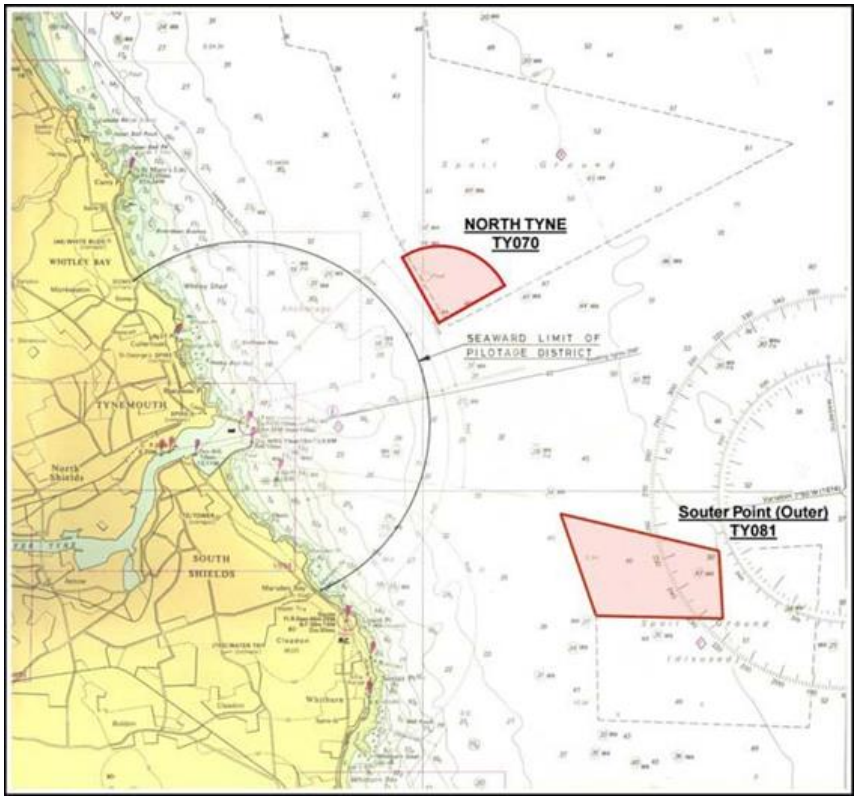


Figure 1.2 Tyne sediment disposal areas.



1.5 Methodology

In preparing this Baseline Document, a data gathering exercise was undertaken and the following data sources consulted:

- Northeast Coast – River Tyne to Flamborough Head Shoreline Management Plan (SMP);
- Northumberland and North Tyneside SMP2;
- New Tyne Tunnel Environmental Statement; and,
- New Tyne Crossing Hydraulic Modelling Report (Posford Duvivier, 2001).
- Tyne River basin Management Plan
- Cell 1 Sediment Transport Study (Royal Haskoning July 2014)
- Reconnaissance Investigations on Dredging Operations on the river Tyne Phase I and II (Prof. D. Graham and Dr. B. Wigham, Newcastle University December 2014 and January 2015)

The data gathering exercise has deliberately focused on those environmental parameters that could potentially be affected by maintenance dredging and are of relevance to the condition of the Northumbria Coast SPA and the Northumberland Marine Special Protection Area (SPA) and the Coquet to St Mary's Marine Conservation Zone (MCZ). These include the following:

- Coastal processes and geomorphology;
- Water and sediment quality;
- Marine and coastal ecology;
- Ornithology; and,
- Noise (with specific reference to potential disturbance of feeding or roosting birds)

In addition, for the purposes of meeting the specific requirements of the Protocol,

the following information has also been collated:

- Information on current dredging activities; and,
- Information on current designated sites.

Any requirements in relation to the assessment under the requirements of the WFD are adequately addressed by the above-mentioned topics.

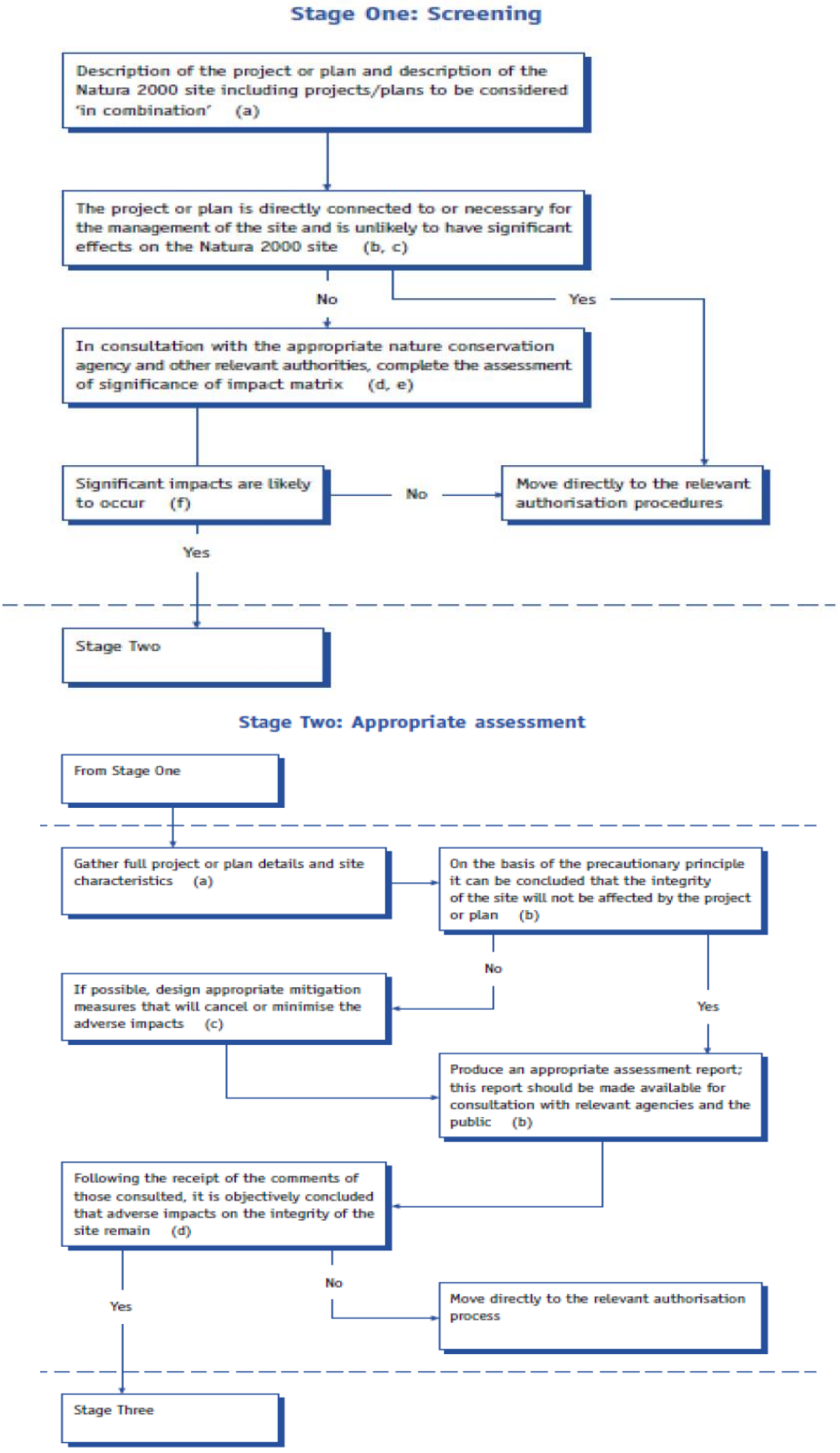


Figure 1.3 Relevant stages of the Habitats Regulations Assessment

1.6 Report structure

Following this introductory section, Section 2 details the history of dredging within the study area.

An overview of the Northumbria Coast SPA and Ramsar sites , the Northumberland Marine SPA and the Coquet to St Mary's MCZ is presented in Section 3. The baseline conditions of the estuary relevant to the condition of the SPA's, Ramsar site and MCZ are then considered in Section 4.

Section 5 concludes the report with comments regarding the potential for impact on the parameters identified and recommendations for taking the document forward.

2 EXISTING AND HISTORICAL DREDGING REGIME

2.1 Port of Tyne Statutory Responsibilities

The Port of Tyne Authority has a statutory duty to maintain navigation within the tidal River Tyne, from the tidal stone at Wylam stretching 17 miles downstream for one mile past the roundheads at the piers, located at the mouth of the Tyne Estuary. The Harbour Master also has the principal operational responsibility for safety of navigation in the River Tyne within the area described above and extending to three miles seaward of the piers for pilotage purposes.

As part of this responsibility, the Port of Tyne Authority maintains advertised dredge depths within the navigable channel and on its own berths and does so through a licensed maintenance dredging regime. All advertised depths are subject to change dependent upon navigational requirements. Vessels operate with a relatively small (1m minimum) under-keel clearance thus making the maintenance of advertised depths critical to navigational safety.

2.2 Current maintenance dredging operations

Dredging is usually undertaken over a 3 to 4 day period at any one time, using a Trailing Suction Hopper dredger (TSHD) operated by third party dredging companies under contract to the Port. Since 2011 the port has employed UK Dredging to undertake almost all of the dredging and disposal work however the port is also authorized to employ a number of alternative dredging service providers.

The Port applies certain constraints to its contract maintenance dredgers through Contract Documents. Restrictions are made with respect to the length of time vessels are allowed to over weir in various parts of the river and to levels of turbidity within the vicinity of the dredger during the dredging operation. Additionally, in recent contracts, various clauses have been added to address the issues when dredging in the proximity of known contaminated areas. To ensure compliance with the Port's conditions, dredging operations are monitored by periodic checking on and around the dredger by Port staff.

At other times the port's own plough dredger, Sir Bobby Robson, is used to remove any shoaling areas or high spots and ridges left by the TSHD to achieve the required navigable depth.

At present, the Port of Tyne Authority undertakes between two and three dredging campaigns each year, concentrating mainly on the channel at the Swinging Circle and the mouth of the river (between the buoys). The need to dredge within the port's operational areas is determined by the Harbour Master based upon navigational requirements and the analysis of multibeam survey data. Bathymetric surveys are carried out on a scheduled basis to inform the Harbour Master of navigational issues and to carry out predictive sediment modelling. Utilising historical data and current bathymetry, the Port has an in-depth knowledge of the areas of deposition and scour within the river system which aids in forward planning with respect to dredging.

The management of private berths is the responsibility of the berth operators. Although in most cases the port will be employed to undertake bathymetric surveys of private berths, the actual dredging is normally managed by the berth operators themselves.

A series of images detailing the areas of accretion (as defined by loss of navigable depth) that are dredged on a 'regular' basis, an assessment of frequency and the maximum depth dredged from each area are shown in Figures 2.1 to 2.9.

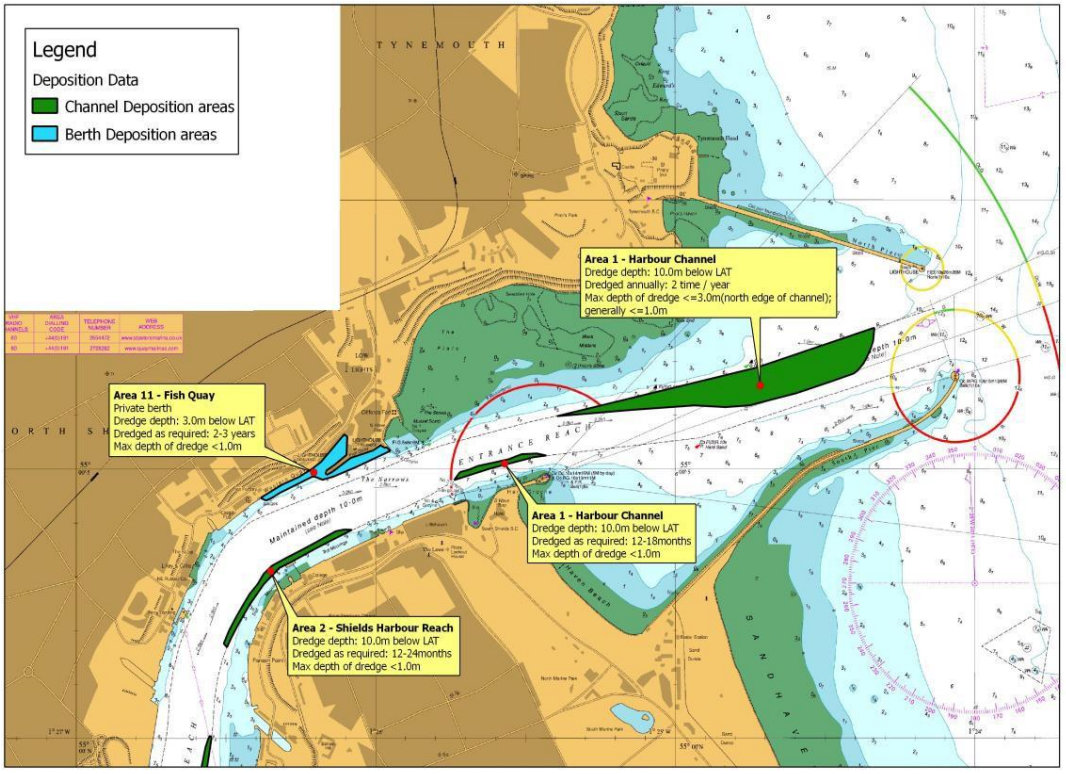


Figure 2.1 Deposition image showing Areas 1, 2 and 11.

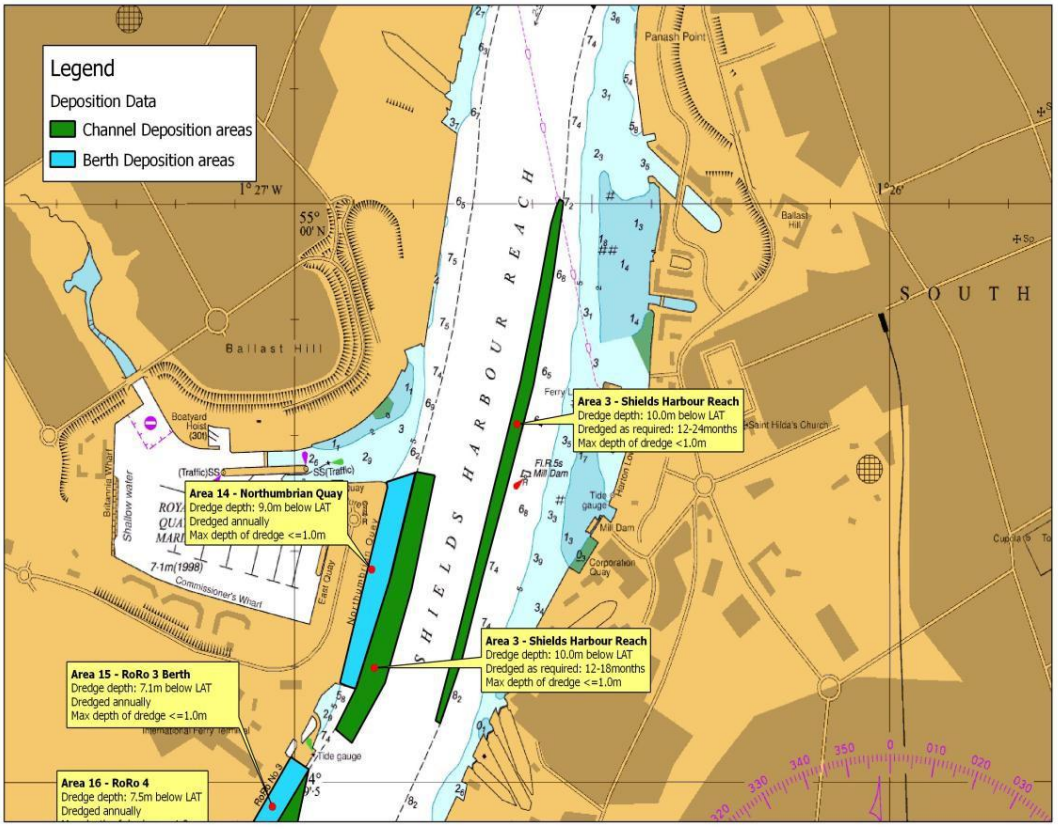


Figure 2.2 Deposition image showing Areas 3, 14, 15 and 16.

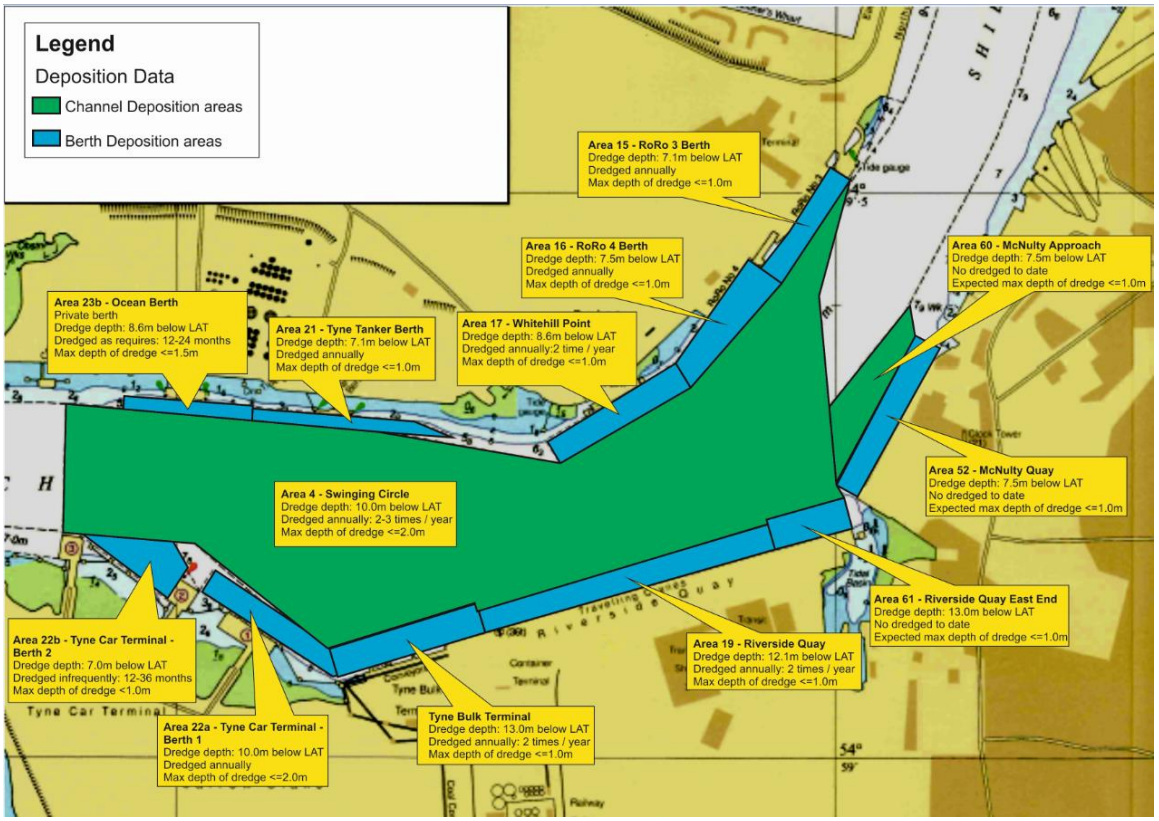


Figure 2.3 Deposition image showing Areas 3, 4, 15, 16, 17, 19, 21 , 22(a&b), 23(b), 52, 60 and 61.

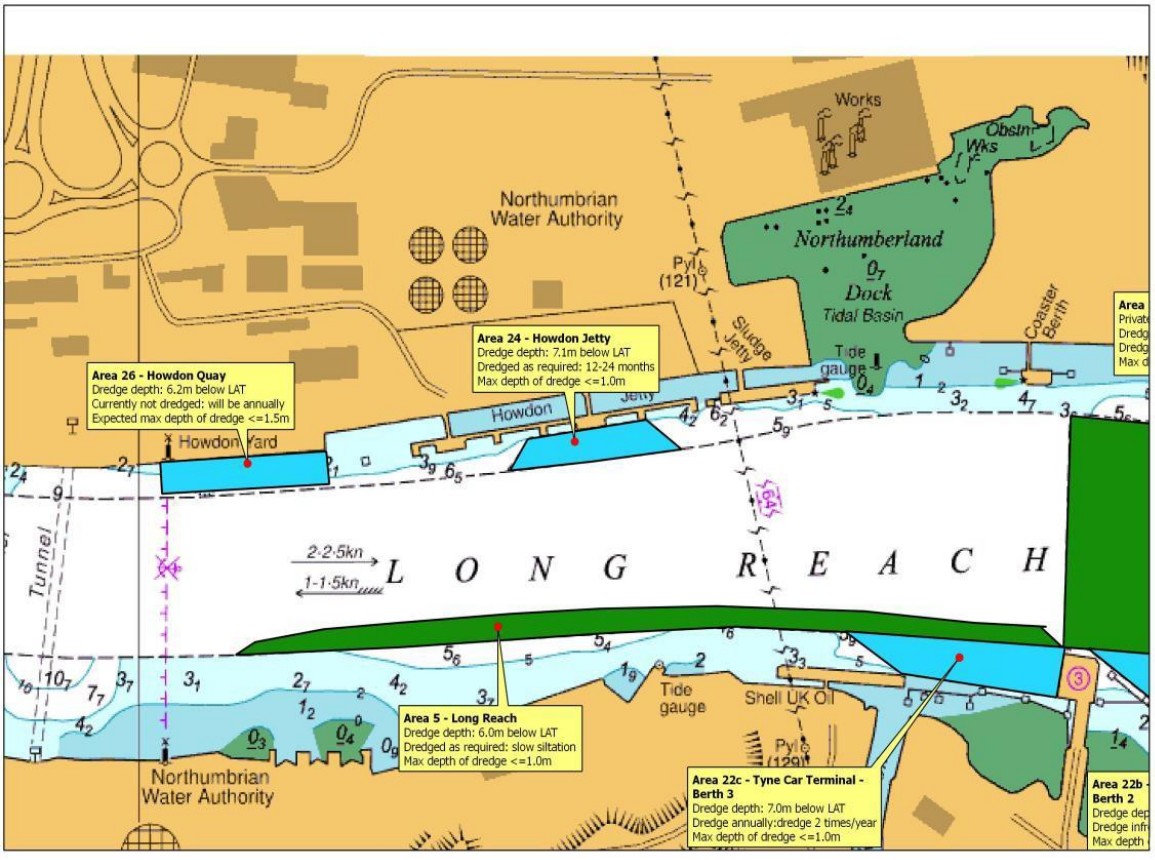


Figure 2.4 Deposition image showing Areas 5, 22(c), 24 and 26.

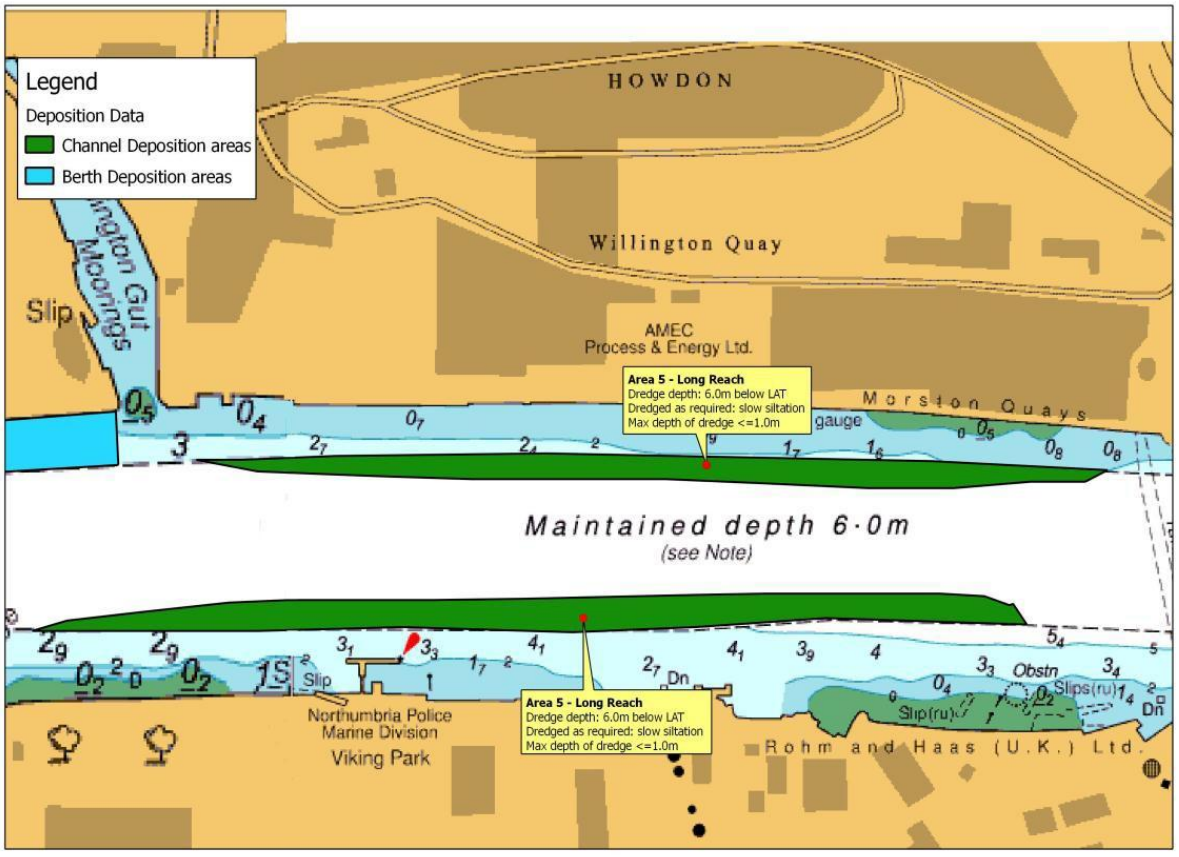


Figure 2.5 Deposition image showing Area 5.

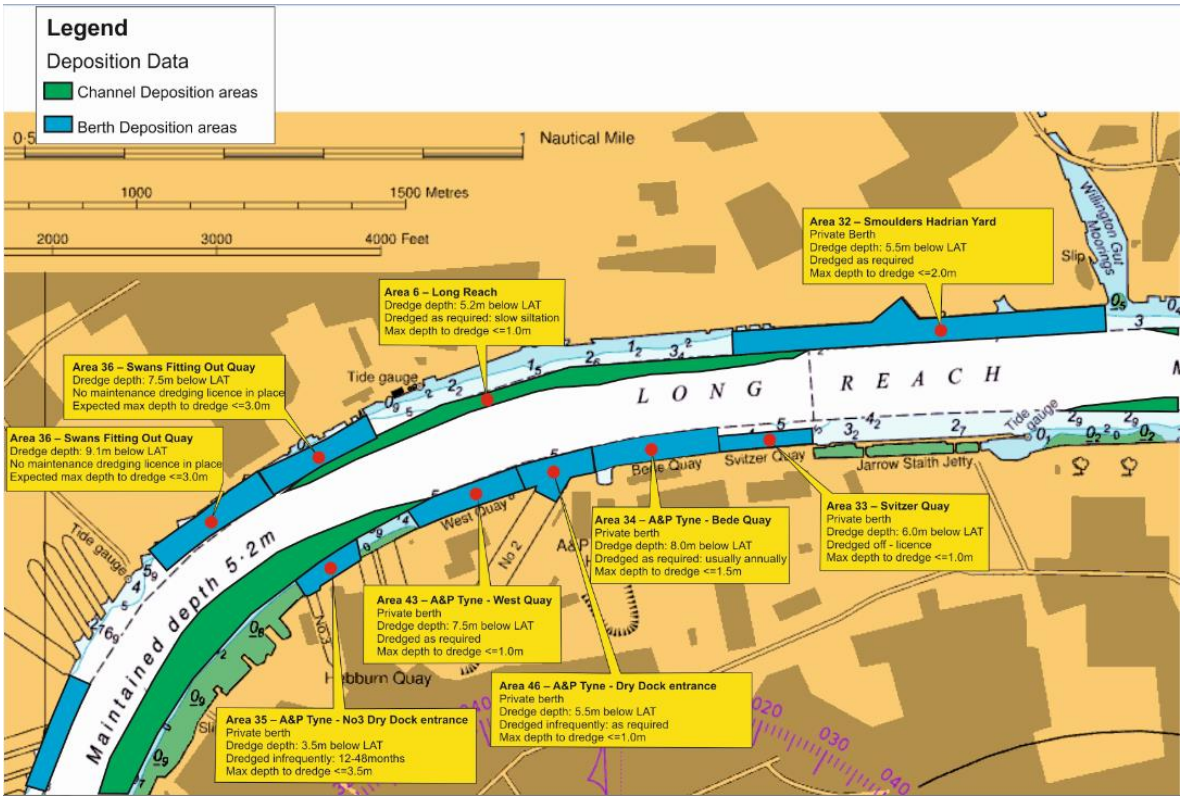


Figure 2.6 Deposition image showing Areas 6, 32, 33, 34, 35, 43 and 46.

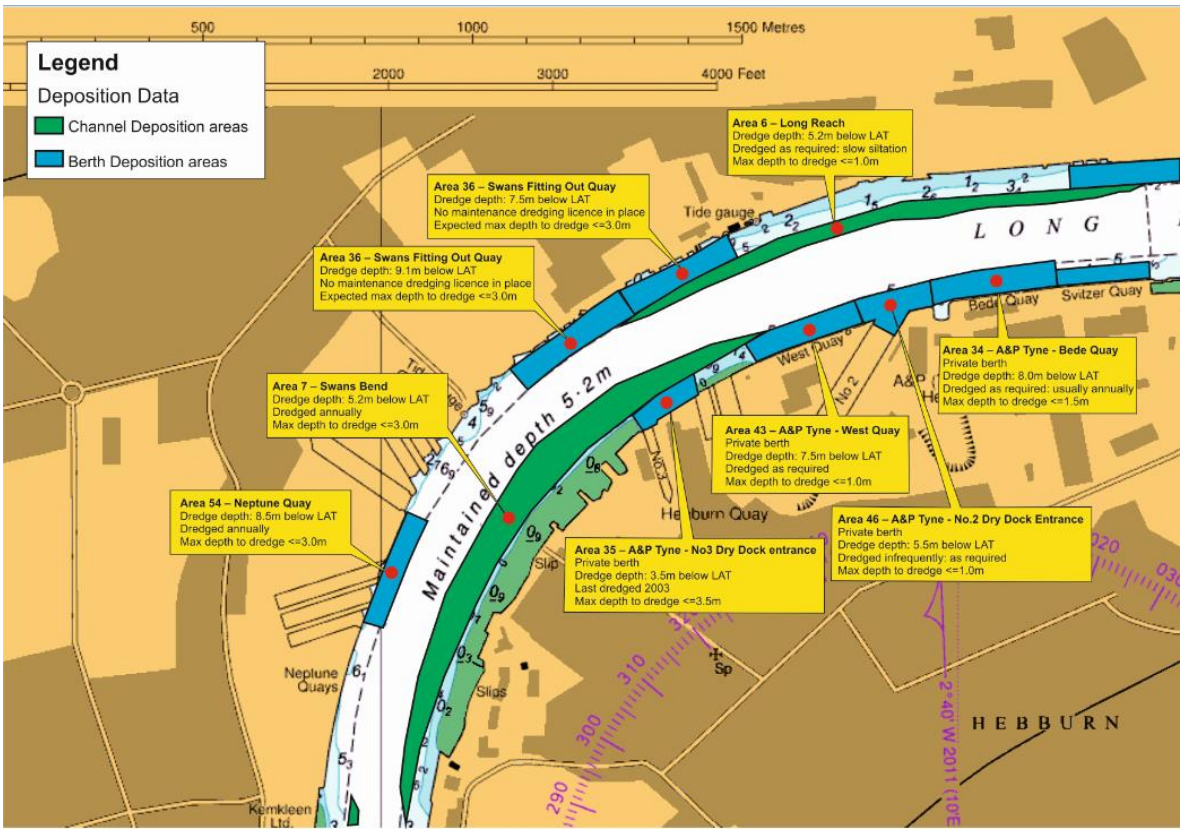


Figure 2.7 Deposition image showing Areas 6, 7, 34, 35, 36, 43, 46 and 53.

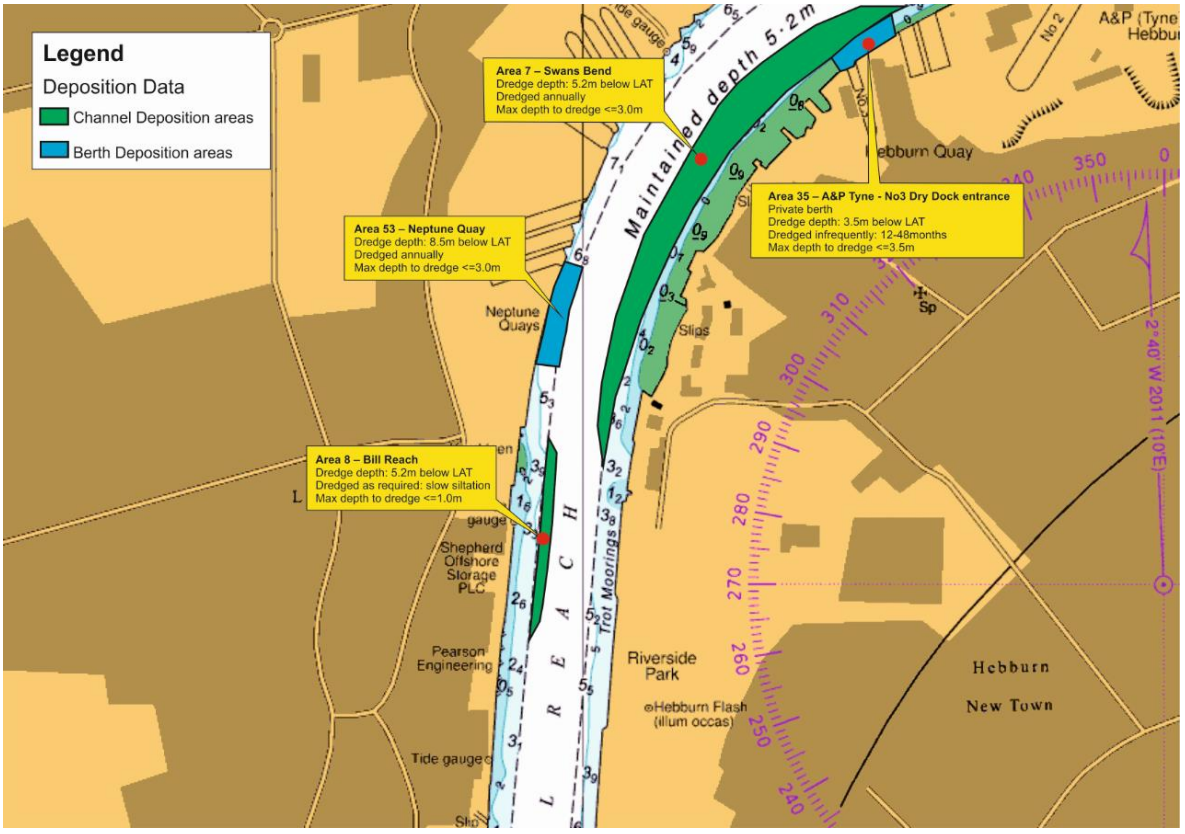


Figure 2.8 Deposition image showing Areas 7, 8, 35, and 53.

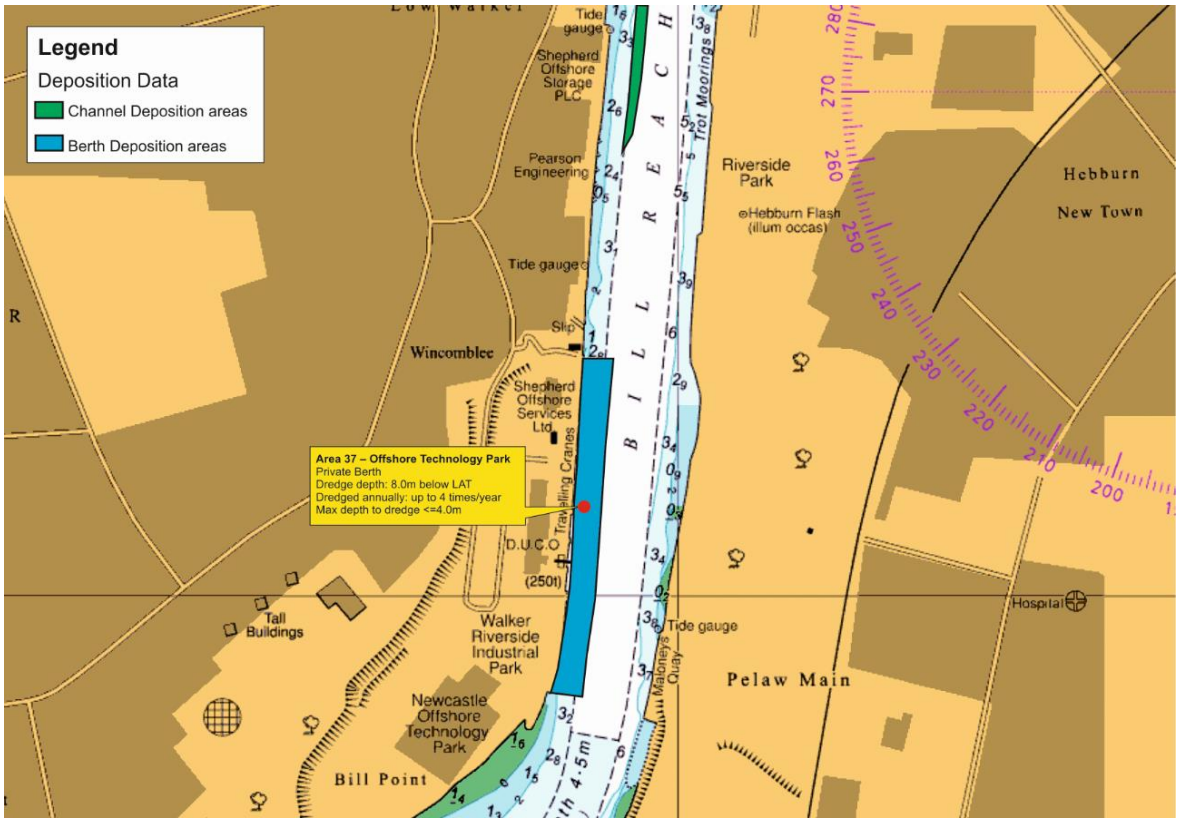


Figure 2.9 Deposition image showing Area 37.

2.3 FEPA License

Prior to September 2013 dredging and disposal activity in the Tyne estuary was authorized under a single disposal license, issued by the MFA (Marine and Fisheries Agency) under the Food and Environmental Protection Act (FEPA) and owned by the Port of Tyne. Though dredging on other berths was the responsibility of the berth operators it was monitored by the Port of Tyne Authority using bathymetric survey and an in-house dredge licensing system.

Figure 1.1 illustrates those areas which were active on the Port of Tyne's FEPA (Food and Environment Protection Act 1985) disposal license (34612/10/0) prior to September 2013. The maintenance dredge areas authorized by the license and depths were as follows:

Channel

Dredge Area	Dredge depth (m below Chart Datum)
Harbour Channel & Narrows to Swinging Circle (Areas 1-4)	10.0
Swinging Circle to Jarrow Staiths (Area 5)	6.0
Jarrow Staiths to Bill Point (where dredged) (Area 6-10)	5.2

Berths

Dredge Area	Dredge Depth (m below Chart Datum)
Fish Quay (Area 11)	3.0
Albert Edward Dock Entrance & approach (Area 12)	3.5
Harton Staiths and Mill Dam (Area 13)	No advertised depth
Northumbrian Quay (Area 14)	9.0
RoRo Berth No 3 (Area 15)	7.1
RoRo Berth No 4 (Area 16)	7.5
Whitehill Point Jetty (Area 17)	8.6
Tyne Dock Entrance (Area 18)	2.5
Riverside Quay (Area 19)	12.1
Tyne Bulk Terminal (Area 20)	13.0
Tyne Tanker Berth (Area 21)	7.1

Dredge Area	Dredge Depth (m below Chart Datum)
Tyne Car Terminal – Berth 1 (Area 22)	10.0
Tyne Car Terminal – Berth 2 (Area 22)	7.0
Tyne Car Terminal – Berth 3 (Area 22)	7.0
Simon Storage – Ocean Berth (Area 23)	8.0
Howdon Jetty (Area 24)	7.1
Cemex, Jarrow Quay (Area 25)	5.5
Howdon Quays (Area 26)	6.2
Hadrian Yard East (Area 27)	No advertised depth
Rohm & Haas (Area 28)	No advertised depth
Justwood Quay (Area 29)	No advertised depth
Willington Gut (Area 30)	No advertised depth
Jarrow Staith (Area 31)	No advertised depth
Hadrian Yard West (Area 32)	5.5 & 6.0
Svitzer Quay (Area 33)	5.3
A&P Tyne – Bede Quay (Area 34)	8.0
Hawthorn Leslie Dry Dock Entrance and approach (Area 35)	3.5
Offshore Technology Park (Area 37)	8.0
Newcastle Quay – Royal Marine Reserves (Area 38)	1.5
A&P Tyne – West Quay (Area 43)	7.0

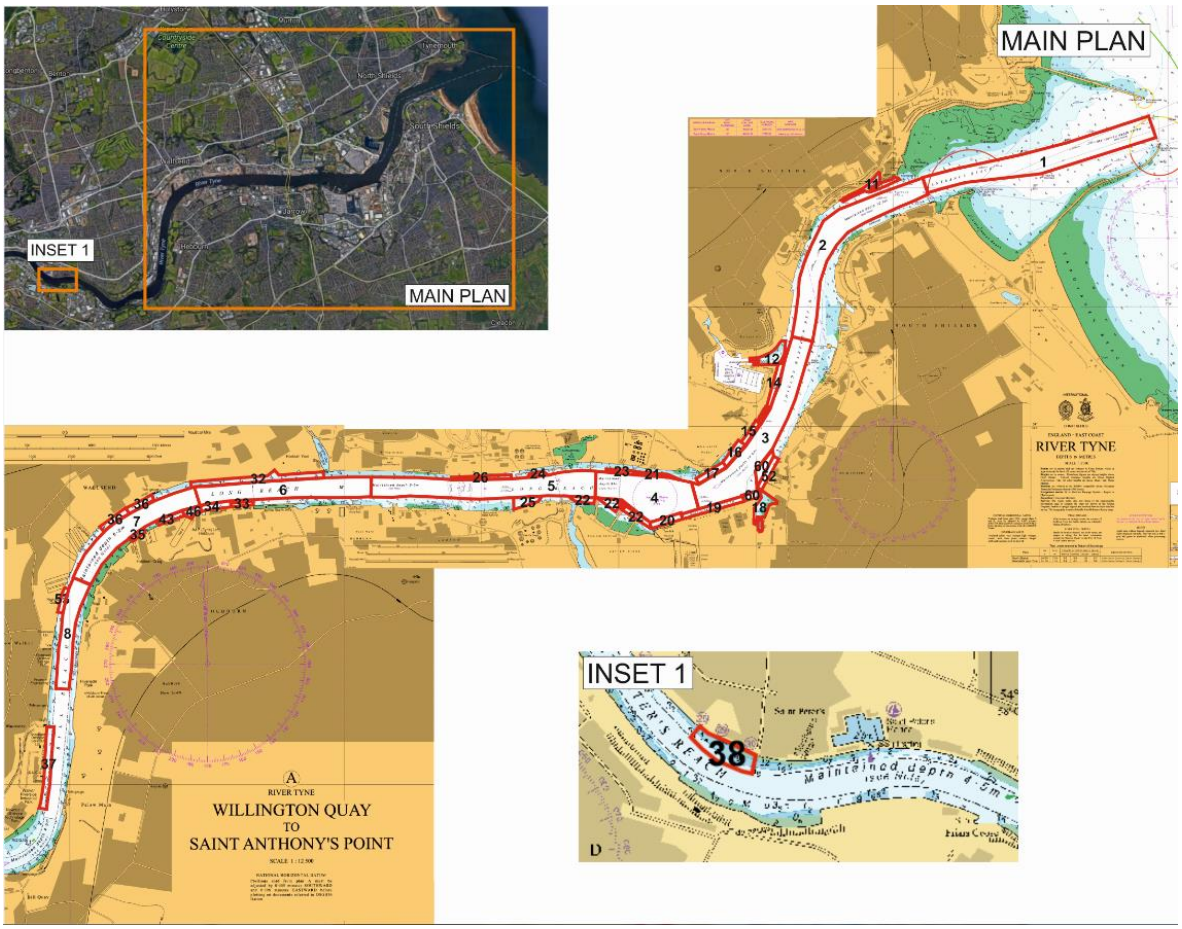
2.4 Marine and Coastal Access Act Licenses (see figure 1.2 below)

In 2009 the Marine and Coastal Access Act (MCAA) transferred marine licensing powers from the Marine and Fisheries Agency to the newly created Marine Management Organisation (MMO) subject to a transitional timetable.

In late 2013 the first marine licenses were issued under the MCAA to the Port of Tyne and also to a number of private berth operators on the Tyne authorizing them to undertake maintenance dredging of their own berths and the disposal of sediment to designated spoil grounds in the North Sea.

It should be noted that the previous FEPA license primarily authorized the disposal of dredged sediment to sea whilst the dredging activities themselves were authorized by the Port of Tyne (By virtue of its powers under the Port of Tyne Act) using an in house dredge licensing system. The MCAA however party revoked the port's dredge licensing powers and directly authorized both the dredging and the sea disposal activities through the new marine licenses issued by the MMO.

Figure 2.10 Areas Currently licensed under the Marine and Coastal Access Act



The following tables summarise the conditions within the initial Marine and Coastal Access Act licenses in force on the river Tyne along with a commentary on any variations since first issue.

2.4.1 Port of Tyne

In September 2013 the Port of Tyne obtained a 10 year marine license from MMO (ref L/2013/00288) under part 4 of the Marine and Coastal Access Act to maintain its own berth and channel areas.

License Ref: L/2013/00288/1
Issue Date: 17th September 2013
Expiry Date: 31st December 2022
Duration: 10 years
Disposal Quantity: 3.5 million tonnes

Dredge Area	Dredge depth (mBCD)	Disposal Quantity (te/annum)
Harbour Channel (Area 1)	10.0	48000
Shields Harbour Reach Downriver (Area 2)	10.0	25000
Shields Harbour Reach upriver (Area 3)	10.0	25000
Northumberland Dock to Jarrow Quay Corner Reach (Area 4)	10.0	125000
Long Reach Downriver (Area 5)	6.0	5000
Long Reach Upriver (Area 6)	5.2	5000
Swans Bend (Area 7)	5.2	35000
Bill Reach Downriver (Area 8)	5.2	5000
Fish Quay (Area 11)	3.0	1000
Northumbrian Quay (Area 14)	9.0	2000
Ro Ro Berth No.3 (Area 15)	7.1	1000
Ro Ro Berth No.4 (Area 16)	7.5	5000
Whitehill Point Jetty (Area 17)	8.6	5000
Tyne Dock Entrance (Area 18)	2.5	150
Riverside Quay (Area 19)	12.1	15000
Tyne Bulk Terminal (Area 20)	13.0	10000
Tyne Tanker Berth (Area 21)	7.1	5000
Tyne Car Terminal Berth 1 (Area 22a)	10.0	7000
Tyne Car Terminal Berth 2 (Area 22b)	7.0	1000
Tyne Car Terminal Berth 3 (Area 22c)	7.0	3000
Howdon Jetty (Area 24)	7.1	800
Howdon Quay (Area 26)	6.2	5000
McNulty Quay (Area 52)	No advertised depth	4100
McNulty Quay Approach (Area 60)	No advertised depth	5000
Svitzer Quay (area 33)	6.0	900
Royal Marine Reserve. Newcastle Quay (Area 38)	2.5	60

Table 2 shows the Actual dredge quantities between the years 2000 and 2016.

As the authorized quantities above suggest most arisings from maintenance dredging activities come from the stretch of river between the 'Swinging Circle' (Area 4) to the mouth of the river ('Harbour Channel', or Area 1).

The progressive reduction in vessel movements upstream of the Tyne bridges in recent years has reduced the need for dredging and allowed deposition of sediment and, as a consequence, shallowing of the river in this location. Furthermore the river channel and berths east of the Bridges to Swans Bend (Area 7) were progressively excluded from the FEPA marine license due to heavy metals contamination arising from upriver. As recently as 2010 the license authorized disposal of sediment from as far up river as Bill Point (Area 10) however due to the progressive migration of heavy metals containing sediment downriver areas 10 (Bill Point) and 9 (Bill Reach Upriver) were excluded from the FEPA license between 2010 and 2013. Area 8 (Bill Reach Downriver) and Area 33 (Svitzer Berth) were subsequently excluded from the above License from 2013 due to heavy metal (zinc) contamination.

The port of Tyne marine license was varied in June 2014 to authorize the use of another dredge service provider and its vessels. All other conditions of the license remained unchanged.

2016 Resampling

Although the port's marine license is for 10 years resampling of the license areas is required every 3 years. In Q3 2016 resampling of the licensed areas was undertaken. The results of both the 2013 and the 2016 sampling are included in appendix B. The 2016 sampling showed that average levels of heavy metals within the estuary to be very similar to those in 2013. There was however with some areas in particular Swans Bend which approached action level 2 for Zinc. Area 24 initially exceeded action level 2 for zinc based upon a single sample. This was however felt to be transitory material and resampling of berth showed it to be under action level 2. The measured levels of zinc in Area 8 (Bill Reach Downriver which had previously been excluded from the license in 2013 for zinc) proved under action level 2.

In November 2017 the Port of Tyne Varied its marine License for the fifth time to restore Area 8 to the license and to include the dredge pocket for the Riverside Quay extension designated as Riverside Quay East (Area 61). The permitted dredge volumes were however prorated to the remaining period of the license.

License Ref: L/2013/00288/5
Issue Date: 17th September 2013
Expiry Date: 31st December 2022
Duration: 10 years
Disposal Quantity: 3.34 million tonnes

Dredge Area	Dredge depth (mBCD)	Disposal Quantity (te/annum)
Harbour Channel (Area 1)	10.0	48000
Shields Harbour Reach Downriver (Area 2)	10.0	25000
Shields Harbour Reach upriver (Area 3)	10.0	19800
Northumberland Dock to Jarrow Quay Corner Reach (Area 4)	10.0	125000
Long Reach Downriver (Area 5)	6.0	5000
Long Reach Upriver (Area 6)	5.2	5000
Swans Bend (Area 7)	5.2	35000
Bill Reach Downriver (Area 8)	5.2	5000
Fish Quay (Area 11)	3.0	1000
Northumbrian Quay (Area 14)	9.0	2000
Ro Ro Berth No.3 (Area 15)	7.1	1000
Ro Ro Berth No.4 (Area 16)	7.5	1000
Whitehill Point Jetty (Area 17)	8.6	5000
Tyne Dock Entrance (Area 18)	2.5	150
Riverside Quay (Area 19)	12.1	13967
Tyne Bulk Terminal (Area 20)	13.0	10000
Tyne Tanker Berth (Area 21)	7.1	5000
Tyne Car Terminal Berth 1 (Area 22a)	10.0	7000
Tyne Car Terminal Berth 2 (Area 22b)	7.0	1000
Tyne Car Terminal Berth 3 (Area 22c)	7.0	3000
Howdon Jetty (Area 24)	7.1	800
Howdon Quay (Area 26)	6.2	5000
McNulty Quay (Area 52)	No advertised depth	2000
McNulty Quay Approach (Area 60)	No advertised depth	2500
Riverside Quay Extension (Area 61)*	13.0	5000
Royal Marine Reserve. Newcastle Quay (Area 38)	2.5	60

[* Note that area 61 was created following the extension of the Port of Tyne's Riverside Quay and the need to demarcate the sections of the quay with different dredge pocket depths. This change was authorized by the 4th revision of L/2013/00288 in November 2017]

2.4.2 Walker Technology Park

An initial 3 year marine license for the maintenance dredging of Walker Technology Park was issued under part 4 of the Marine and Coastal Access Act in December 2013. This permitted annual dredge and disposal quantities of 60480 te (apart from the first year when volumes were limited to 7620 te.
Table 2 shows the actual dredge and disposal volumes from the year 2000 until the end of 2016 which shows that dredge and disposal volumes have steadily increased since 2011 to current levels (~120 - 140 Kte/annum).

In response to these increasing volumes the marine license has been varied twice in that time. The first variation in September 2014 extended the permitted dredge and disposal quantity to 240 Kte/annum and the second in September 2015 increased the permitted quantity to 336 Kte/annum.

[It should however be noted that a significant proportion of the increase in volume has arisen from the progressive widening of the dredge pocket from 30m to 50m].

Due to its upriver location and proximity to off-license channel areas the license also contains a requirement to resample the berth annually in accordance with a sampling plan agreed in advance with MMO.

Annual Resampling

The tables contained in Appendix B summarise the results of re-sampling for the years 2010, 2013 and 2016.

License Ref: L/2013/00253
Issue Date: 4th December 2013
Expiry Date: 19th September 2016
Duration: 2 years 8 months
Disposal Quantity: 128580 tonnes

Dredge Area	Dredge depth (mBCD)	Disposal Quantity (te/annum)
Walker Technology Park Berth (Area)	8.0	60480

License Ref: L/2014/00294
Issue Date: 15th September 2014
Expiry Date: 14th September 2017
Duration: 3 years
Disposal Quantity: 720000 tonnes

Dredge Area	Dredge depth (mBCD)	Disposal Quantity (te/annum)
Walker Technology Park Berth (Area)	8.0	240000

License Ref: L/2015/00292
Issue Date: 21st August 2015
Expiry Date: 14th September 2017
Duration: 2 years
Disposal Quantity: 672000 tonnes

Dredge Area	Dredge depth (mBCD)	Disposal Quantity (te/annum)
Walker Technology Park Berth (Area)	8.0	336000

In October 2017 a 10year marine license was issued to Walker Technology Park

License Ref: L/2017/00373
Issue Date: 6th October 2017
Expiry Date: 10th October 2027
Duration: 10 years
Disposal Quantity: 3.36 Million tonnes

Dredge Area	Dredge depth (mBCD)	Disposal Quantity (te/annum)
Walker Technology Park Berth (Area)	8.0	336000

2.4.3 A and P Tyne

An initial 3 year marine license for the maintenance dredging of A and P Tyne's berths was issued under part 4 of the Marine and Coastal Access Act in October 2013. This permitted annual dredge and disposal quantities of 74000 te. Table 2 shows that actual dredge volumes have been variable and mainly driven by the frequency of storms under which most deposition is known to occur. In the last 2 years maintenance dredge volumes for the main berths have remained quite constant with around 22500 te being dredged from the Bede Quay and around 30000 from the West quay. Although the license authorizes an annual volume of 6000 te from the former Hawthorn Leslie dry dock 7 and quay nothing has been removed from this area for the last 15 years. The No.2 dry dock entrance (area 46) has been off license since 2013 due to heavy metal (zinc and TBT) contamination at levels in excess of Action level 2.

License Ref: L/2013/00323
Issue Date: 9th October 2013
Expiry Date: 8th October 2016
Duration: 3 years
Disposal Quantity: 222000 tonnes

Dredge Area	Dredge depth (mBCD)	Disposal Quantity (te/annum)
Bede Quay (Area 34)	8.0	35000
West Quay (Area 43)	7.5	33000
Dry Dock 7 and Quay (Area 35)	3.5	6000

Berth sampling for marine license reapplication purposes in Q4 2016 initially showed an increase in levels of heavy metals contamination within the Bede Quay with 2 sample areas exceeding action level 2. Resampling of Bede Quay three months later however showed levels of zinc to be back under Action level 2 for zinc. Sampling of the No.2 dry dock entrance in Q4 2016 however showed levels of zinc and TBT to be less than action level 2 and this area were subsequently restored to the license. It should be noted that the four areas have now been consolidated into one composite area called "A and P Tyne Frontage". In recognition of the reinstatement of the No.2 Dry Dock entrance the annual dredge volume has increased from 74000 te/annum to 84500 te/annum.

License Ref: L/2017/00166
Issue Date: 1st July 2017
Expiry Date: 30th June 2027
Duration: 10 years
Disposal Quantity: 845000 tonnes

Dredge Area	Dredge depth (mBCD)	Disposal Quantity (te/annum)
A and P Tyne frontage	Various	85000

2.4.4 Cemex

An initial 3 year marine license for the maintenance dredging of CEMEX's berths was issued under part 4 of the Marine and Coastal Access Act in November 2013. This permitted annual dredge and disposal quantities of 20000 te. Table 2 shows that very little routine maintenance dredging has been undertaken and the berth has been dredged in campaigns every 5 years on average with the last dredge campaign (~15000 te removed) undertaken in 2016.

License Ref: L/2013/00362
Issue Date: 14th November 2013
Expiry Date: 13st November 2016
Duration: 3 years
Disposal Quantity: 60000 tonnes

Dredge Area	Dredge depth (mBCD)	Disposal Quantity (te/annum)
Cemex Wharf, Jarrow (Area 25)	5.5	20000

The marine license for the berth expired in November 2016 and a new license was issued in December 2017.

License Ref: L/2017/00412
Issue Date: 20th December 2017
Expiry Date: 19th December 2027
Duration: 10 years
Disposal Quantity: 186000 tonnes

Dredge Area	Dredge depth (mBCD)	Disposal Quantity (te/annum)
Cemex Wharf, Jarrow (Area 25)	5.5	7200 (silt)
		1050 (sand)
		1050 (gravel)

2.4.5 **Interterminals** (formerly Simon Storage)

Interterminals operate three berths (the Ocean Berth, the coaster berth and the Tyne Tanker Berth) on the North side of the Tyne at the downriver end of the long reach. Prior to September 2013 all of these berths were on the Port of Tyne's FEPA license. An initial 3 year marine license for the maintenance dredging of the Ocean berth was however issued to Simon Storage (now Interterminals) under part 4 of the Marine and Coastal Access Act in November 2013. This authorized dredging from the Ocean Berth only permitted annual dredge and disposal quantities of 6000 te. The Tyne Tanker Berth remained on the port's marine license and therefore remained the port's responsibility to maintain the advertised depth. The coaster berth has been unlicensed since November 2013.

Table 2 shows that since 2010 an average of 5200 te/annum has been removed from the Ocean berth. The coaster berth has however not been dredged in that period.

License Ref: L/2013/00361
Issue Date: 14th November 2013
Expiry Date: 13th November 2016
Duration: 3 years
Disposal Quantity: 18000 tonnes

Dredge Area	Dredge depth (mBCD)	Disposal Quantity (te/annum)
Ocean Berth (Area 23)	8.6	6000

The marine license for the berth expired in November 2016 and a new license was issued to Interterminals in March 2017 which permitted an increase in annual dredge quantity from 3000 to 6000 te/annum.

License Ref: L/2016/00065
Issue Date: 13th March 2017
Expiry Date: 12th March 2027
Duration: 10 years
Disposal Quantity: 120000 tonnes

Dredge Area	Dredge depth (mBCD)	Disposal Quantity (te/annum)
Ocean Berth (Area 23)	8.6	12000

2.4.6 **Smulders Projects UK Ltd (**formerly Offshore Group Newcastle**)**

Offshore Group Newcastle operates a berth some 1km long (incorporating 3 heavy load out quays) on the North side of the long reach. Since the yard operates on a project to project basis dredging is undertaken dependent upon the project at being undertaken at the time. No dredging was undertaken between 2004 and 2011 due the yard being non-operational. In 2012 an initial dredge to achieve the required 7m depth was undertaken under the ports' FEPA disposal license which removed some 43000 te of material.

An initial 3 year marine license for the maintenance dredging of the berth was then issued to OGN under part 4 of the Marine and Coastal Access Act in December 2013. The license authorized a maximum annual dredge quantity of 48000 te total quantity for the 3 year license period of 100000 te. No interim sampling or monitoring requirements were however specified within the license.

Three further smaller dredge campaigns have been undertaken under the MMO marine license between 2014 to 2016 averaging around 9000 te each.

License Ref: L/2016/00389
Issue Date: 20th December 2013
Expiry Date: 19th December 2016
Duration: 3 years
Disposal Quantity: 100000 tonnes

Dredge Area	Dredge depth (mBCD)	Disposal Quantity (te/annum)
Offshore Group Newcastle (Area 32)	5.0	33333

The marine license for the berth expired in November 2016. The site is now operated by Smulders Projects UK Ltd to whom the following marine license was issued in June 2017. The license permitted and increase in average dredging and disposal quantities from 33333 te/annum to 48000 te/annum.

License Ref: L/2017/00191
Issue Date: 20th June 2017
Expiry Date: 23rd April 2019
Duration: 2 years
Disposal Quantity: 96000 tonnes

Dredge Area	Dredge depth (mBCD)	Disposal Quantity (te/annum)
Smulders Projects UK Ltd (Area 32)	5.0	48000

2.4.7 Neptune Quays

License Ref: L/2016/00187
Issue Date: 16th June 2016
Expiry Date: 30th June 2021
Duration: 5 years
Disposal Quantity: 172000 tonnes

Neptune Quays had not been dredged since before the year 2000 due to TBT contamination within the sediment arising from former ship building activities. A capital dredge of the berth was however undertaken in 2015 with the contaminated sediment being disposed of to land. A marine license was subsequently issued for the berth in June 2016 which permitted the dredging and disposal of some 31272 te/annum of sediment. Some 20000 te was removed during the second half of 2016. Due to its proximity to areas known to be contaminated with heavy metals the license contains a requirement to resample annually.

Dredge Area	Dredge depth (mBCD)	Disposal Quantity (te/annum)
Neptune Quays (Area 53)	8.0	34400

2.4.8 Royal Quays Entrance

The maintenance dredging of Royal Quays entrance and approach was historically authorized under the Port of Tyne's previous FEPA disposal license and the area was last dredged in 2008. When new licenses were issued under the marine and coastal access act in 2013 Royal Quays did not apply and as such maintenance dredging of the area is not permitted.

2.5 Capital dredging operations

Capital dredging activities along the River Tyne have been undertaken relatively consistently over the past 10 years or so. A dredging operation in 2006 saw the deepening of the channel (to the Swinging Circle and car berths) from 8.6m to 9.1m bCD. This was found to have no significant impact upon siltation rates experienced elsewhere within the river.

In March 2010 the first phase of a second deepening of the channel was undertaken where the Entrance Channel between the Tyne Piers and the Narrows, South Shields was deepened to 10.0m bCD. Approximately 204,000 tonnes of sand was recovered from dredging the channel and was re-used in the backfilling of the second Tyne Tunnel.

In April 2011 the second phase of the channel deepening was undertaken. The channel from the Narrows, South Shields to the Swinging Circle, Jarrow was deepened to 10.0m bCD.

Since deeper drafted vessels have become the norm on the Tyne the Tyne Bulk Terminal was also dredged to 13.0m bCD. During this exercise approximately 642,000 tonnes of silt, clay and rock were dredged of which 50,000 tonnes were placed ashore to aid in the infilling of Tyne Dock and the remaining dredged material was deposited equally between Souter Point and North Tyne disposal sites.

During 2011 the combined totals for capital and maintenance dredging came to just over 1 million tonnes of material. This was the largest amount dredged in one year in the history of the Port of Tyne. During this period the Port maintained close control on all dredging activity and at no point were there any environmental issues with either dredge operations or during disposal at sea.

In 2014/5 the port's Riverside Quay was extended by around 125m and a 125 m section of the existing suspended quay was upgraded. The project included a capital dredge of the dredge pockets in front of both the extended and upgraded sections of Riverside Quay to 13m bCD. As part of the quay extension project permission was also obtained to reclaim the former Tyne Dock entrance. The first stage of the reclamation was completed in 2015 and the remaining stage is scheduled for completion in 2017/18.

In 2017 the port's maintenance dredge license was varied to incorporate the extended Riverside quay. In order to demarcate the areas of Riverside quay by depth it has been divided into two areas known as Riverside Quay (area 19) which has an advertised depth of 12.1m and Riverside Quay East (area 61) which has an advertised depth of 13.0m.

A number of significant changes have also taken place within private berths upriver as follows:

- The former Swan Hunters East Fitting Out quays (area 36) were dredged to depths of 9.1 and 7.5 m respectively. Since this involved the removal of TBT contaminated sediments with the dredged material was disposed to landfill. A maintenance dredge license is however not in place for these berths.
- Walker Technology berth (area 37) was widened from 30 to 50m along the full length of the berth.

- Neptune quay (area 53) was also dredged back to a depth of 8.5m and the berth is now on license again. Since this also involved the removal of TBT contaminated sediment a significant proportion of that material was taken to landfill.
- A and P Tyne No.2 dry dock entrance (area 46) was also dredged back to 5.5m and is now back on license. In June 2017 the four areas of the A and P quays have now been consolidated onto a single maintenance dredge license as one large area called “A and P Frontage”.

2.6 Areas Excluded from Marine Licenses

A number of areas along the River Tyne have been excluded from the previous FEPA and now from the Marine and Coastal Access Act licenses since 1995 as a result of elevated metal concentrations. A limited number of sites have also been remediated and subsequently reinstated to a dredge license. Summary information is provided in Tables 1 and 1a below. A more detailed matrix of how the berths and channel areas of the river Tyne has been licensed since 2005 is included in Appendix C.

Table 1 Areas excluded from the marine Licenses

Area Ref	Period of exclusion	Area excluded	Reason for exclusion	License in force at time of exclusion
50	1998 to date	Millennium Bridge	High metal contamination	30260/98/0
N/A	2001 to date	St Peters Marina	High metal contamination	
N/A	2002	Hillgate Quay	Zinc concentrations 7 times greater than DEFRA Action	
49	2002	Newcastle Quay 12 – 19 berths	Zinc concentrations 9 times greater than AL1	31352/01/0
9	2002	Bill Reach Upriver	Zinc concentrations 6 times greater than AL1.	31804/02/2
10	2002	Bill Point Channel	Zinc concentrations 6 times greater than AL1. TBT concentrations 14 times greater than AL1	31804/02/2
45	2003	Newcastle Quay 22-26 berths	Zinc concentrations 7 times	32185/03/0
40	2007	Ouseburn Entrance	High concentrations of copper and	33736/07/1
42	2007	Newcastle Quay 5 – 9 berths	Zinc concentrations 9 times greater than AL1	33736/07/1
39	2007	Newcastle Quay 27-28 berths	Zinc concentrations 9 times	32185/03/1
56	2011 to date	Tyne Dock	Area Reclaimed	L2013/00288
36	2005	Swan Hunter East Fitting out	TBT concentration > AL2	32610/05/0
55	1998	Swan Hunter Slipway ends	TBT concentration > AL2	30260/98/1
44	2003	A and P Tyne Smiths Dock	TBT concentration > AL2	31804/03/0
41	2010	Lafarge Redland	Zinc concentration > AL2	34612/1/0
47	2003	Newcastle Quay to St Peters Marina	Zinc concentration > AL2	32185/03/0
48	2003	HMS Calliope	Zinc concentration > AL2	31804/03/0
51	2005	Middle Docks	TBT concentration > AL2	32610/05/0
53	1998	Neptune Yard	TBT concentration > AL2	30260/98/0
54	1995	A & P Wallsend dry docks	TBT concentration > AL2	389/95/0
57	2002	Felling Reach	Zinc concentration > AL2	31804/02/2
58	2002	St Peters Reach	Zinc concentration > AL2	31804/02/2
59	2005	Newcastle Quayside channel	Zinc concentration > AL2	32610/05/0
12	Sept 2013	Royal Quays entrance &	No license application	L2013/00288
13	Sept 2013	Harton Staithes and Mill Dam	Removed from license as berth no longer operational	L2013/00288
27	Sept 2013	Hadrian Yard East	Removed from license as berth no longer operational	L2013/00288
28	Sept 2013	Rohm and Haas	Removed from license as berth no longer operational	L2013/00288
29	Sept 2013	Justwood Quay	Removed from license as berth no longer operational	L2013/00288
30	Sept 2013	Willington Gut	Removed from license as berth no longer operational	L2013/00288
31	Sept 2013	Jarrow Staith	Removed from license as berth no longer operational	L2013/00288
23a	Sept 2013	Coaster Berth	Removed from license as berth no longer operational	L2013/00288
8	Sept 2013	Bill Reach Upriver	Zinc concentration > AL2	L2013/00288
33	Sept 2013	Svitzer Quay	Zinc concentration > AL2	L2013/00288

Table 1a **Previously excluded areas which have been reinstated onto a marine License**

Area Ref	Area Reinstated	Date of Reinstatement	Reason for reinstatement	License in force ate time of reinstatement
8	Bill Reach Downriver	Dec 2017	Zinc concentration <AL2	L2013/00288/5
53	Neptune Yard	Sept 2016	TBT contaminated sediment removed and disposed to land	L2016/00187
46	A&P No2 dry dock entrance	July 2017	TBT contaminated sediment removed and disposed to land	L/2017/00166

2.7 Quantities

Table 2 provides a summary of the total dredged material (wet tonnes) from each dredged area of the river.

A summary of material dredged (wet tonnes) for each individual area from 2000 – 2016 is provided in Appendix A and is summarised in the chart below. It should be noted that dredged material is composed of silt migrating into the estuary from upriver and sand migration into the estuary from the sea. Observations of dredged material suggest that the material dredged from areas 1 and 2 is primarily sea sand whereas material further upriver is predominantly silt which has migrated downriver.

The data highlights that dredge volumes have been highly variable in that period and in some years (in particular 2005 and 2006) are heavily influenced by storm events.

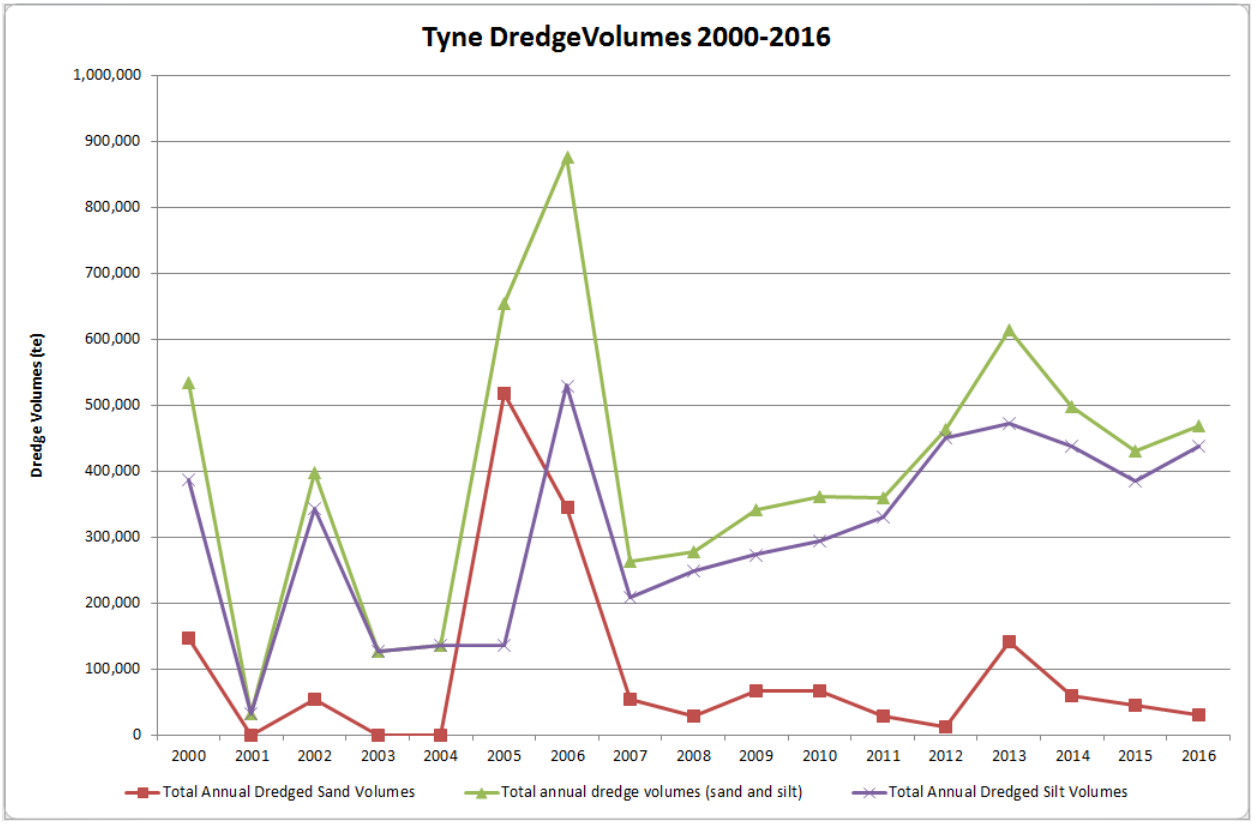


Table 2 Summary of total dredged volumes for the period 2000-2016 (tonnes)

Area	Location	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
1	Harbour Channel	93,226	0	54,186	0	0	128,470	103,917	35,936	25,126	41,221	14,862	29,715	12160	141728	60312	38161	30828	809,848
2	Channel: Shields Harbour down-river Reach	54,106	0	0	0	0	390,515	241,883	18,459	3,470	26,379	53,111	0	0	0	0	7150	0	795,073
3	Channel: Shields Harbour up-river Reach	119,900	0	0	0	0	0	35,968	8,615	4,012	3,537	20,878	0	13077	19486	44599	22031	6163	298,266
4	Channel: Northumberland Dock To Jarrow Quay Corner Reach	74,908	0	108,303	0	0	0	305,885	23,006	110,348	99,266	54,394	122,969	133214	187405	128090	81155	88848	1,517,791
5	Channel: Long Reach down-river	47,014	0	95,700	0	0	0	3,031	0	0	8,422	2,408	3,139	0	0	38845	4551	30053	233,163
6	Channel: Long reach up-river	0	0	0	0	0	0	0	0	0	0	46,575	3,139	0	0	0	0	0	49,714
7	Channel: Swan's Bend	54,036	0	58,047	0	3,528	0	24,457	0	0	15,666	43,578	28,913	0	37762	4809	25013	54979	350,788
8	Channel: Bill Reach down-river	0	0	2,520	0	0	0	0	0	0	0	0	0	1819	2306	0	0	0	6,645
11	Fish Quay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Royals Quays Marina & Approach	0	0	0	0	0	0	0	0	20,160	0	0	0	0	0	0	0		20,160
14	Northumbrian Quay	3,321	504	0	5,967	0	0	0	46,897	9,056	2,044	504	0	0	0	2306	1483	5564	77,646
15	RoRo Berth No. 3	0	0	1,946	0	883	504	4,536	0	504	0	2,871	0	0	0	1040	1123	1170	14,577
16	RoRo Berth No. 4	504	1,945	3,528	0	4,032	1,008	4,032	504	2,520	6,787	0	5,075	0	0	1040	3998	6050	41,023
17	Whitehill Point Jetty	2,561	1,512	3,528	6,481	2,520	7,545	8,497	2,520	8,064	8,498	6,048	5,340	8782.8	0	11042	5398	4001	92,338
18	Tyne Dock Entrance	0	0	2,520	10,009	3,528	10,584	0	2,520	0	0	6,048	0	1040	0	17684	0	2620	56,553
19	Riverside Quay	5,980	2,666	5,896	4,519	10,554	10,800	99,485	29,101	11,125	15,709	4,124	7,461	99849	33773	29797	10117	13034	393,990
20	Tyne Bulk Terminal	1,820	4,438	3,024	2,520	1,008	4,536	11,358	18,405	13,033	11,954	6,839	0	5715	3290	8310	16870	5260	118,380
21	Tyne Tanker Berth	4,168	5544	5,474	3,961	4,521	13,006	2,016	1,008	7,013	11,044	4,032	2,063	0	0	3120	0		66,970
22	Tyne Car Terminal	4,113	1,512	4,032	9,600	14,995	7,654	16,058	9,378	14,341	18,003	14,692	5,637	5109	0	4819	7449	5528	142,920
23	Simon Storage – Coaster and Ocean Berths	0	0	0	31,295	0	0	0	4,536	0	0	3,223	4,929	7119	10816	0	8306	2271	72,495
24	Howdon Jetty	0	0	0	3,024	1,512	0	0	0	0	2,016	0	0	0	0	0	0		6,552
25	CEMEX, Jarrow Quay	57,216	0	0	0	0	0	0	24,691	0	0	0	0	0	59966	0	0	14715	156,588
26	AMEC Howdon Yard	1,707	0	0	0	0	0	0	22,176	0	0	0	0	4966	0	0	0		28,849
32	AMEC Hadrian Yard West	4,401	0	34,274	5,544	14,112	0	0	0	0	0	0	0	43325	0	14230	5704	8117	129,707
33	Svitzer Quay	0	0	0	0	13,034	3,024	0	0	0	0	0	11,592	0	0	0	0		27,650
34	A&P Tyne – Bede Quay	0	0	1,008	0	32,470	34,981	0	0	0	0	9,752	19,861	4271	0	29361	19089	19273	170,066
35	Ex-Hawthorn Leslie Dry Dock	5,599	2,177	0	3,024	0	0	0	0	0	0	0	0	0	0	0	0		10,800
37	Walker Technology Park	0	6,443	13,938	41,118	11,503	14,940	14,751	16,136	49,699	57,313	34,558	97,476	111420	98060	98776	143062	121337	930,530
38	Newcastle Quay – TAVR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
43	A&P Tyne – West Quay, Hebburn	0	2,285	0	0	17,292	27,592	0	0	0	13,388	33,234	13,191	11271	19318	0	30299	28808	196,678
46	A and P Tyne No.2 Dry Dock entrance																	0	
52	McNulty Offshore Quays (Note: McNulty's FEPA Licence)	0	3,145	504	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,649
53	Neptune Quays	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19737	19,737
60	McNulty approach	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	Riverside Quay Extension																0	0	0
	Totals (Tonnes)	534,580	32,171	398,428	127,062	135,492	655,159	875,874	263,888	278,471	341,247	361,731	360,500	463,138	613,910	498,180	430,959	468,356	6,839,146

2.8 Disposal

Figure 2.10 details the tonnages of dredged material disposed of to sea during the period 2000 to 2016 inclusive.

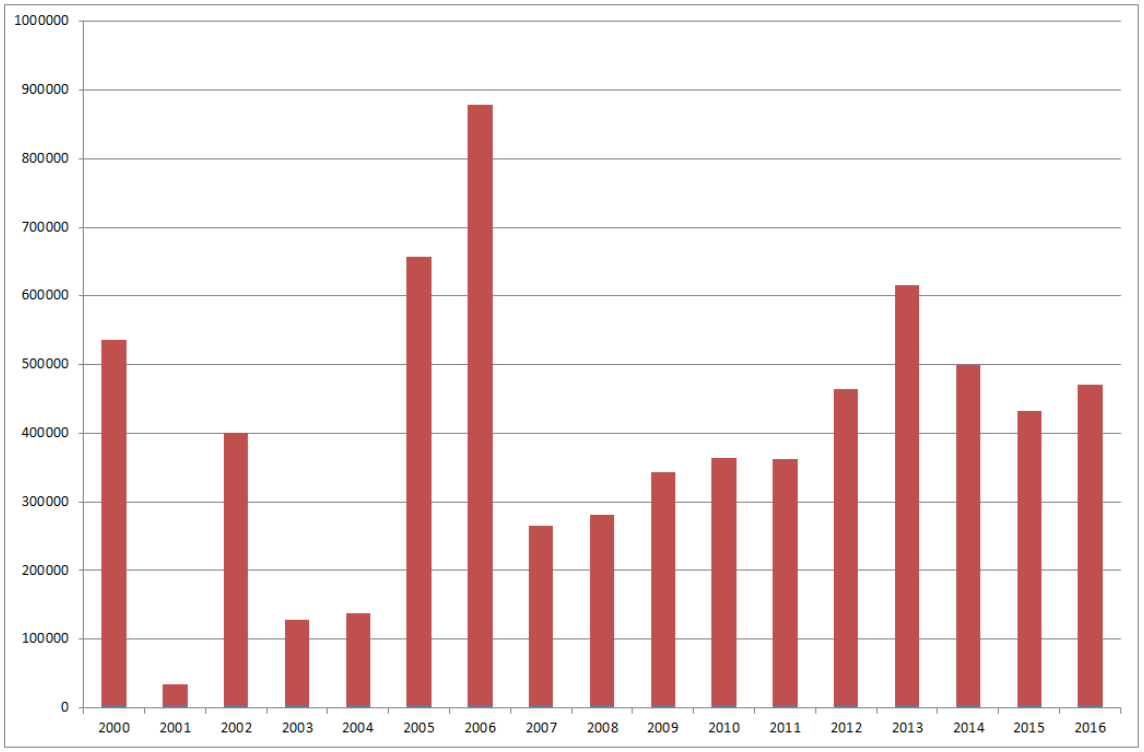


Figure 2.10 Total tonnage of dredged material disposed of to sea during the period 2000 to 2016 (inclusive)

Dredged material from the River Tyne and associated berths is deposited within two offshore disposal sites, namely North Tyne and Souter Point. Souter Point disposal site lies four miles off the coast in approximately 48m of water and is affected by relatively weak tides. It is a large disposal site, with a bathymetry which slopes away from the land. The sediments within the vicinity of the Souter Point disposal site are muddy sands; however, sediments may vary to a large extent following disposal of dredged material from the River Tyne (CEFAS, 2009). Souter Point disposal site is slightly less dispersive than the North Tyne site (DEFRA and the MFA, 2009). Material deposited within the North Tyne disposal site is made up of predominantly silt and sand.

A trial level bottom capping project was undertaken within the centre of the Souter Point disposal site during 2004 and 2005. The Port of Tyne disposed of 60,000m^3 of contaminated dredged material, which was to be covered with 100,000m^3 of silt and around 60,000m^3 of sand. On placement of the silt it was found that around 80% had been dispersed by tidal currents leaving a 1.5m cap. An additional 90,000m^3 of sand was later placed to make up for the shortfall caused by the loss of the sediment cap. Further material was deposited during 2006 and 2007 to further reinforce the integrity of the cap.

2.9 Beneficial use

Although the majority of dredged material is deposited at the offshore disposal sites, a number of 'beneficial uses' have previously been identified and implemented by the Port

of Tyne. These beneficial uses have utilised both maintenance dredged material and also material from other developments within the Port of Tyne's jurisdiction. For example, Tyne Dock was recently infilled with both contaminated and uncontaminated sediments excavated from the nearby New Tyne Tunnel Crossing, allowing for the creation of five hectares of new land to support future port-related activities. This option was also seen as an environmentally preferable alternative to the disposal of the excavated material at sea. An Environmental Statement (ES) was produced to accompany the planning application to South Tyneside Council as Local Planning Authority (LPA). In addition, clean sands dredged from the mouth of the river have been used as a 'capping' material for the immersed tunnel sections of the New Tyne Tunnel Crossing, representing a further beneficial use.

Future proposals include the utilisation of clean dredge material (sand) from the mouth of the river to fill a hollow in the dunes at Sandhaven beach, South Shields, as part South Tyneside Council's 'Sandhaven Beach Dune Management Plan' (Royal Haskoning, 2010). This requires further discussion between the Port of Tyne Authority and South Tyneside Council.

2.10 Monitoring requirements

The Port of Tyne Authority also has a three-month rolling bathymetric survey programme which includes the stretch of river between the estuary mouth and the swinging circle. This programme is rather complex as the river is split into channel and berths. The channel is covered by 19 river sheets.

- Sheets 1 to 4 (the harbour to the Swinging Circle) are sounded every 3 months.
- Sheet 7 (Swans Bend) is sounded every 6 months.
- Sheets 5, 6, 8, 9, 10 and 11 are sounded annually.
- Sheets 12-19 (above Newcastle Bridges) are sounded every 5 years.

The frequency of sounding depends on operational requirement (Sheets 1-4, 7) and siltation (all other sheets).

The Port's berths are sounded every 3 months, more in actuality because of ongoing dredging requirement, and the rest of the berths tend to be sounded annually for navigational purposes.

Bathymetric data is collected and, on occasions, side scan data. The data is charted and used to assess navigation requirements. Navigational depth is either reduced or dredge/plough the berth to advertised depth. Data is used to manage the dredgers and to 'predict' siltation. The Port's charts are available to their Marine Department and Pilots both internally and externally. Additionally, UK Hydrographic Office has access to all the charts which they use to update Admiralty Charts and Electronic Navigation Charts.

The remainder of the river channel under the Port of Tyne Authority's statutory control is surveyed annually, though recent sediment deposition means it has been necessary to undertake surveys at Swan's Bend more frequently. Surveying techniques employed include a detailed multibeam survey to measure channel depths and develop cross sections of the channel. Surveys indicate that the majority of sediment build-up is experienced in the same localities, such as the end of the berths.

3 NORTHUMBRIA COAST SPA AND RAMSAR SITE AND NORTHUMBERLAND MARINE SPA

3.1 Overview

3.1.1 Northumbria Coast SPA

The Northumbria Coast SPA includes much of the coastline between the Tweed and the Tees estuaries in north-east England (see Figure 3.1). The SPA consists of mainly discrete sections of rocky shore with associated boulder and cobble beaches. The SPA also includes parts of three artificial pier structures and a small section of sandy beach. The marine part of the Northumbria Coast SPA is also a European Marine Site (EMS), as defined by Regulation 8(4) of the Habitats Regulations 2010 ("any European Site so far as consisting of marine areas").

3.1.2 Northumbria Coast Ramsar

The Northumbria Coast Ramsar site comprises several discrete sections of rocky foreshore between Spittal, in the north of Northumberland, and an area just south of Blackhall Rocks in County Durham (see Figure 3.1). The rocky shore supports a rich algal flora and associated fauna and forms an important feeding area for wading birds.

3.1.3 Northumberland Marine SPA

Northumberland Marine SPA was designated in 2016 under Article 4 of the Birds Directive (2009/147/EC) to protect important areas of sea used for a variety of purposes, including maintenance and foraging behaviours by the qualifying interest features of a number of already-classified SPAs: Coquet Island, Farne Islands, Lindisfarne and Northumbria Coast, as well as potential additional features identified by a review of the seabird populations of those SPAs.

3.1.4 Durham Coast SAC

The Durham Coast SAC site comprises sea inlets (21%), machair (43%), islets (31%) and mesophile grassland (5%). The SAC covers an area of approximately 394 hectares and is the only example of vegetated sea cliffs on magnesian limestone exposures in the UK.

The Durham Coast SAC is located approximately 2km from where maintenance dredging takes place and is effectively contained within the estuary by the piers. As such it is considered that the dredging does not have the potential to affect the interest features of the SAC and, therefore, this designated site has been screened out of any further assessment.
The disposal of sediment at the North Tyne spoil grounds (located 6Km away from the Durham coast SAC) has the potential to impact the shoreline of the SAC. This is discussed further in section 5.

3.1.5 Coquet to St Mary's MCZ

The Coquet to St Mary's MCZ was designated in January 2016 under MCZ tranche 2 designations. It is a coastal site located off the coast of Northumberland in the northeast of England with an area of approximately 192km² which runs from Alnmouth in the north to Whitley Bay in the south. The seaward boundary nominally

runs parallel to the shore adjacent to the 1nM line, with the northern and southern parts of the site extending to the 3nm limit.

Whilst not a European site under the Marine and Coastal Access Act the impact of any dredging and disposal activities within 5Km the Coquet to St Mary's MCZ requires consideration. Since the Southerly tip of the MCZ is located immediately adjacent to the North Tyne disposal ground the impact of dredging and disposal operations is also considered in section 5.

3.2 Interest features

3.2.1 Northumbria Coast SPA

The following details in Table 3 are taken from the citation for the Northumbria Coast SPA as provided by Natural England. The Northumbria Coast SPA is of European importance because it is used by Annex I birds and regularly occurring migratory bird species.

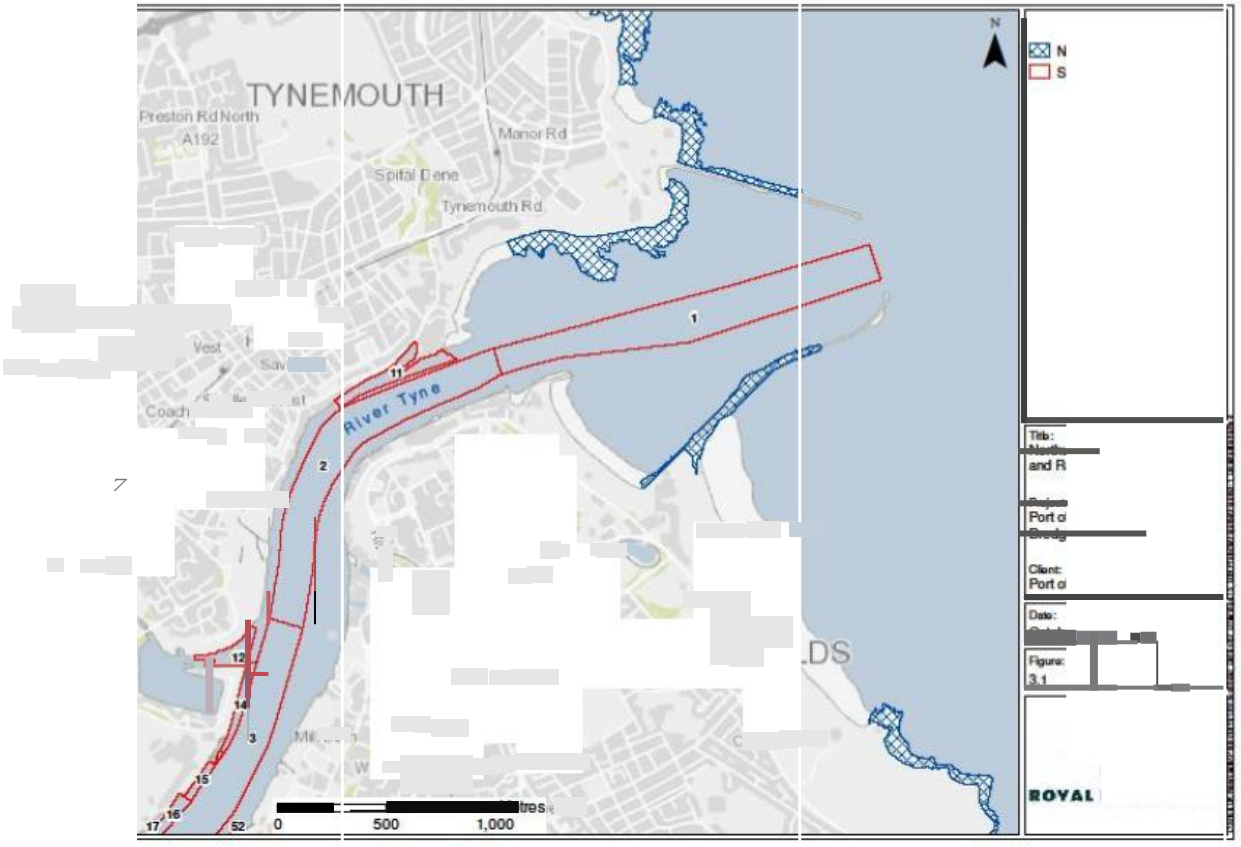


Figure3.1 Northumbria Coast SPA and Ramsar site

Table 3
Qualifying species and migratory species occurring at levels of international importance within the Northumbria Coast SPA (English Nature, 2000 – updated, citation 05/06/06)

Annex I Species	**5 year peak mean**	**Count years**
Little tern *Sterna albifrons* (Eastern Atlantic, breeding)	40 pairs (1.7% of the Great Britain breeding population)	1992/3 – 1996/7
Migratory species	**5 year peak mean**	**Count years**
Turnstone *Arenaria interpres* (Western palearctic, wintering)	1,739 individuals (2.6% of the Eastern Atlantic Flyway population)	1992/3 – 1996/7
Purple sandpiper *Calidris maritima* (Eastern Atlantic, wintering)	787 individuals (representing 1.6% of the Eastern Atlantic Flyway population)	1992/3 – 1996/7

Little tern does not occur in the vicinity of the Port of Tyne 's maintenance dredging operations; their main breeding site being located near the Long Nanny estuary at Low Newton, Beadnell Bay, Northumberland. Both turnstone and purple sandpiper occur in numbers greater than 1% of their total biogeographical populations, and thus numbers of both species qualify as SPA interest features in their own right.

3.2.2 Northumbria Coast Ramsar

The following details are taken from the citation for the Northumbria Coast Ramsar site, which supports populations occurring at levels of international importance. Tables 4 and
5 detail the qualifying populations identified for the designation of the site.

Table 4 Qualifying species occurring at levels of international importance in the

Northumbria Coast Ramsar site (English Nature, 2000 - updated citation 13/06/08)

Species	**5 year peak mean**	**Count years**
Little tern	43 pairs (2.2% GB)	2000
Purple sandpiper	291 pairs (1.6% GB)	1998/9 – 2002/3
Ruddy turnstone	978 pairs (1% GB)	1998/9 – 2002/3

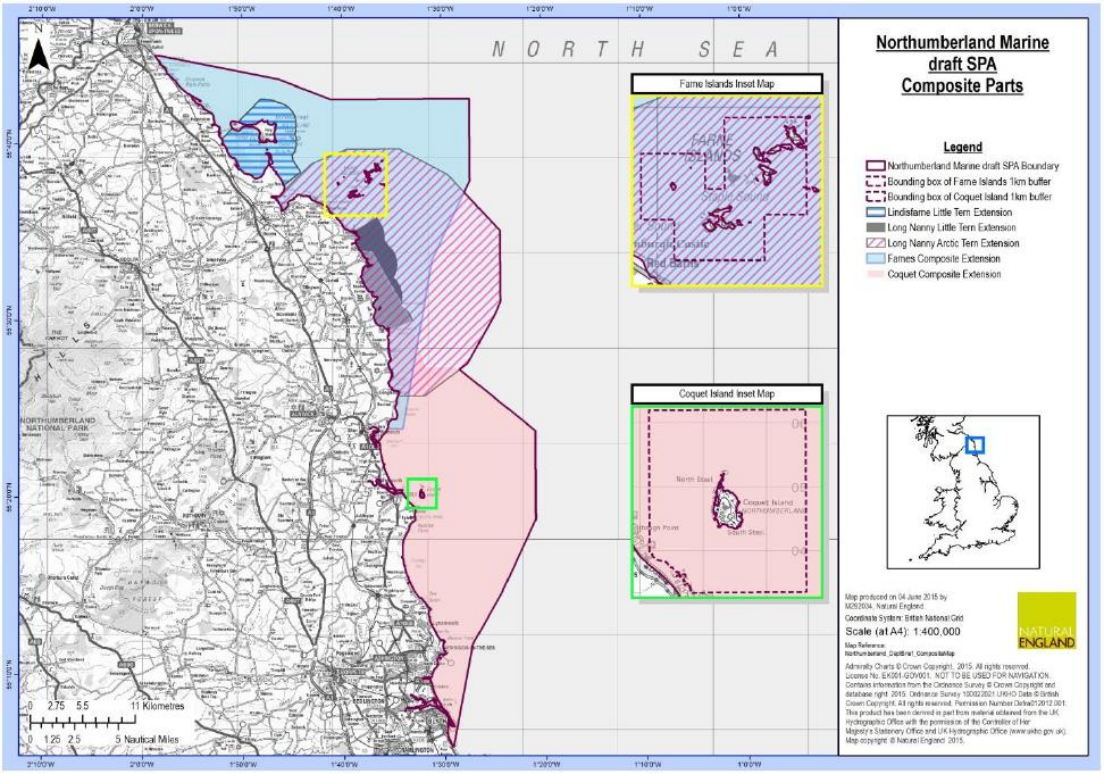
Table 5 Bird species occurring at levels of national importance in the Northumbria Coast

Ramsar site (English Nature, 2000 - updated citation 13/06/08)

Species	**5 year peak mean**	**Count years**
Great cormorant	248 pairs (2.9% GB)	2000
Black legged kittiwake	4,070 pairs (1.1% GB)	2000
Arctic tern	1,200 pairs (2.2% GB)	2000
European golden plover	2,911 individuals (1.1% GB)	1998/9 – 2002/2
Common eider	1,361 individuals (1.8% GB)	1998/9 – 2002/3
Sanderling	419 individuals (2% of GB)	1998/9 – 2002/3

3.2.3 Northumbria Coast Marine SPA

The following details are taken from the citation for the Northumberland Marine SPA consultation document provided by Natural England. The Northumberland Marine SPA has been designated to protect important areas of sea used for a variety of purposes, including maintenance and foraging behaviours by the qualifying interest features of a number of already-classified SPAs which support Annex I birds and regularly occurring migratory bird species.



Northumberland Marine pSPA qualifies under Article 4 of the Birds Directive (2009/147/EC) for the following reasons:

The site regularly supports more than 1% of the Great Britain breeding populations of five species listed in Annex I of the EC Birds Directive. Therefore the site qualifies for SPA Classification in accordance with the UK SPA selection guidelines (stage 1.1).

The site regularly supports more than 1% of the biogeographical population of two regularly occurring migratory species not listed in Annex I of the EC Birds Directive. Therefore the site qualifies for SPA Classification in accordance with the UK SPA selection guidelines (stage 1.2).

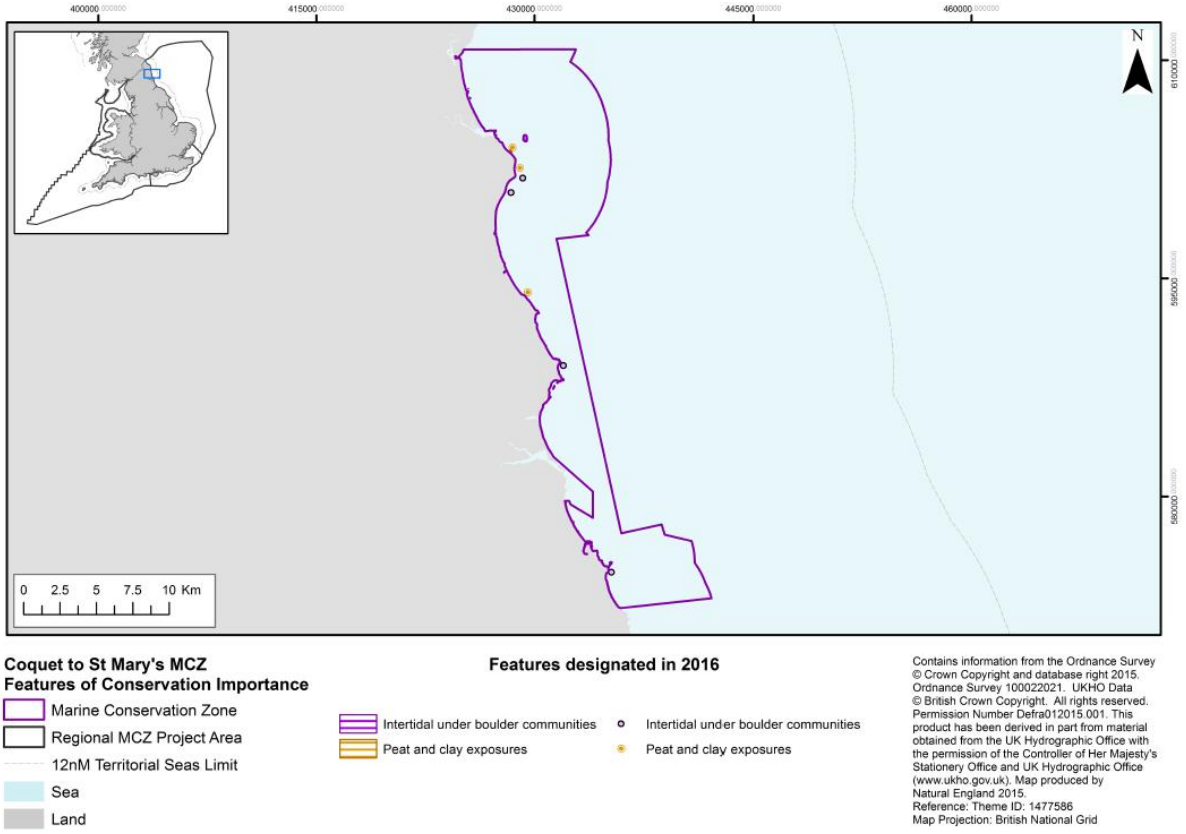
The site regularly supports an assemblage of more than 20,000 individual breeding seabirds. Therefore the site qualifies for SPA Classification in accordance with the UK SPA selection guidelines

Table 6 Summary of Qualifying ornithological interest in the Northumberland Marine SPA (English Nature citation 2016)

Species	5 year peak mean	Count years
Sandwich tern (Sterna sandvicensis)	4,324 individuals (19.66% of GB population)	(2010-2014)
Common tern (Sterna hirundo)	2,572 individuals (12.86% of GB population)	(2010-2014)
Arctic tern (Sterna paradisaea)	9,564 individuals (9.02% of GB population)	(2010-2014)
Roseate tern (Sterna dougallii)	160 individuals (93.02% of GB population)	(2010-2014)
Little tern (Sternula albifrons)	90 individuals (2.37% of GB population)	(2010-2014)
Puffin (Fratercula arctica)	108,484 individuals (1.05% of biogeographic population)	(2008-2013)
Guillemot (Uria aalge)	65,751 individuals (1.72% of biogeographic population)	(2010-2014)
Internationally seabird assemblage of over 20,000 individuals (including the 7 qualifying species listed above plus: great cormorant, European shag, black-headed gull and black-legged kittiwake as main components of the assemblage)	214,669 Individuals	(2010-2014)

3.2.4 Coquet to St Mary's Marine Conservation Zone

The seabed across the site is composed of a mosaic of intertidal and subtidal rock and various sediment features. Within the boundary, the pMCZ contains a broad range of intertidal and subtidal rock and sediment broad-scale habitats. Habitat Features of Conservation Importance which have been identified as important components of biodiversity include intertidal underboulder communities, and peat and clay exposures. The diversity of subtidal habitats supports varied benthic communities and includes sessile species such as anemones, soft corals, sea squirts, hydroids and bryozoans. In addition, these complex habitats and communities support starfish, sea urchins, crabs and lobsters.



3.3 Conservation objectives

3.3.1 Northumbria Coast EMS

Under Regulation 35(3) (a) of the Habitats Regulations 2010, Natural England has a duty to advise other relevant authorities as to the conservation objectives for the EMS. The conservation objectives which apply to the Northumbria Coast EMS are provided below1) For the internationally important populations of the regularly occurring Annex I bird species is as follows:

- Subject to natural change, maintain in favourable condition the habitats for the internationally important populations of the regularly occurring Annex I bird species (little tern *Sterna albifrons*), under the Birds Directive, in particular:
  - Sandy beaches; and,
  - Shallow inshore waters.

2) For the internationally important populations of regularly occurring migratory bird species is as follows:

- Subject to natural change, maintain in favourable condition the habitats for the internationally important populations of regularly occurring migratory bird species purple sandpiper *Calidris maritima* and turnstone *Arenaria interpres*, under the Birds Directive, in particular;
  - Rocky shores with associated boulder and cobble beaches; and,
  - High-tide artificial roost sites.

Rocky shore areas with reefs have small areas of sand interspersed amongst the main

reefs. Rocky shore and the strandline support high densities of invertebrates which are an important food source for waterfowl. Purple sandpiper are almost entirely restricted to the rocky shore where they feed on a variety of marine invertebrates, preferring mussels, winkles and dog whelks, and at the strandline where they eat kelp fly and their larvae. They also roost on offshore reefs and the mainland shore. Turnstone diet is more varied, but is mainly composed of winkles, shrimps and barnacles, feeding on seaweed-covered rocks and congregating at high tide to roost on the mainland shore or continue to feed on the strandline.

The River Tyne South Pier is used as a high-tide roost, the top and sides used by birds throughout the tidal cycle. Though the top is above Highest Astronomical Tide (HAT), areas below HAT, such as the pier sides, are used by birds and hence included as a sub-feature in the advice from Natural England.

The relevant favourable condition targets for the Northumbria Coast EMS are presented in Table 6.

3.3.2 Coquet to St Mary's MCZ

The following table summarises the interest features of the habitat and the management strategy to protect them. The overarching conservation objective is to maintain the site in favourable condition.

Protected features	General management approach
Low energy intertidal rock	Maintain in favourable condition
Moderate energy intertidal rock	Maintain in favourable condition
High energy intertidal rock	Maintain in favourable condition
Intertidal mixed sediments	Maintain in favourable condition
Intertidal coarse sediment	Maintain in favourable condition
Intertidal sand and muddy sand	Maintain in favourable condition
Intertidal mud	Maintain in favourable condition
Intertidal underboulder communities	Maintain in favourable condition
Peat and clay exposures	Maintain in favourable condition
Moderate energy infralittoral rock	Maintain in favourable condition
High energy infralittoral rock	Maintain in favourable condition
Moderate energy circalittoral rock	Maintain in favourable condition
Subtidal coarse sediment	Maintain in favourable condition
Subtidal sand	Maintain in favourable condition
Subtidal mixed sediments	Maintain in favourable condition
Subtidal mud	Maintain in favourable condition

Table 6 Favourable condition table for the Northumbria Coast European Marine Site (English Nature, 2000)

Feature	Sub-feature	Attribute	Measure	Target	Comments
Internationally important populations of regularly occurring Annex I and migratory bird species	All habitats	Disturbance	Reduction or displacement of birds	No significant reduction in numbers or displacement of wintering birds attributable to disturbance from an established baseline, subject to natural change.	Significant disturbance attributable to human activities can result reduced food intake and / or increased energy expenditure. Disturbance in minimised through wardening of the tern breeding colony.
Internationally important populations of regularly occurring Annex I bird species	Shallow inshore waters	Extent of habitat	Area (ha) measured once during the reporting cycle	No decrease in extent from an established baseline, subject to natural change.	Little terns feed in the shallow inshore waters along the Long Nanny estuary near the Low Newton colony.
		Food availability	Presence and abundance of marine fish, crustaceans, worms and molluscs. Measures periodically (frequency to be determined).	Presence and abundance of food species during the breeding period should not deviate significantly from the established baseline, subject to natural change.	Crustacea, annelids, sandeel and clupeidae are important for little tern.
	Sandy beaches	Extent of habitat	Area (ha) measured once during the reporting cycle	No decrease in extent from an established baseline, subject to natural change.	Little tern nest on the beach at Low Newton, near the estuary of the Long Nanny. Enough sand should be present to ensure adequate nesting areas for the colony so they do not have to risk flooding. A beach height grading to >30cm above water level would be suitable.
		Vegetation cover	Open ground with sparse vegetation and bare surfaces	Vegetation height throughout areas used for breeding should not deviate significantly from	Open areas maintained naturally. Vegetation cover (<10%) is required throughout the areas used for nesting.

Feature	Sub-feature	Attribute	Measure	Target	Comments
				established baseline, subject to natural change.	
Internationally important populations of regularly occurring migratory species	Rocky shores with associated boulder and cobble beaches	Extent of habitat	Area (ha) measured once during the reporting cycle	No decrease in extent from an established baseline, subject to natural change.	Important for feeding and roosting purple sandpiper and turnstone.
		Food availability	Abundance of epibenthic invertebrates amongst rotting seaweed. Measured periodically (frequency to be determined).	Presence and abundance of food species during the wintering period should not deviate significantly from established baseline, subject to natural change.	*Balanus, Mytilus, Carcinus, Gammarus, Littorina, Nucella*, dipteran flies and kelp fly larvae are important in the winter for purple sandpiper and turnstone.
		Vegetation characteristics	Open, short vegetation or bare ground predominating.	Vegetation height throughout areas used for breeding should not deviate significantly from established baseline, subject to natural change.	Open areas maintained naturally. Vegetation cover of <10cm is required throughout the areas used for roosting purple sandpiper and turnstone.
		Absence of obstructions to viewlines.	Openness of terrain unrestricted by obstructions.	Visibility should not deviate significantly from established baseline, subject to natural change.	Areas with unrestricted views over >200m for purple sandpiper and turnstone to allow for early detection of predators when feeding and roosting.
	Artificial high tide roost sites	Extent	Presence of structure	No loss of favoured roost areas, subject to natural change.	Favoured artificial roost sites are River Tyne South Pier and Seaham Harbour pier.

4 DESCRIPTION OF BASELINE CONDITIONS

This section sets out the baseline conditions which are relevant to support the interest features of the Northumbrian Coast SPA. The potential impacts of dredging on the sub-features (habitats) set out in Table 6 are assessed in Section 5.

4.1 Morphology

The Tyne Estuary is relatively long and narrow with steep banks. High levels of industrialisation and development along the length of the estuary limits the available intertidal area, though a narrow band of mudflats is present. The outer Tyne Estuary is confined by the north and south piers, within which lie areas of accumulated sandy sediments and an area of rocky foreshore (a sandstone bedrock platform known as 'Black Middens'). The small intertidal area suggests a relatively small tidal exchange meaning that there must be a relatively small exchange of sea water between the estuary and the North Sea on every tide (i.e. the estuary has a relatively small tidal prism). Furthermore, much of the intertidal has been reclaimed and, therefore, the tidal prism has been reduced from its 'natural' state.

The estuary narrows considerably upstream of Fish Quay, and a change in processes occurs between the embayed outer estuary and the narrow upper estuary. The largest degree of non-cohesive sediment exchanges with the open coast occur in the outer embayed area, reflected in the accumulation of sandy sediment in the area confined by the piers. The confined estuary channel is dominated by finer sediments, with dredging evidence suggesting the estuary is a sink for sediments (Royal Haskoning, 2007).

4.2 Hydrodynamics

4.2.1 Tides

The Tyne Estuary is strongly ebb-dominant with a moderate tidal range (ABPmer, 2007). The overall length of the tidally influenced stretch of the River Tyne is approximately 38km, from its mouth to a weir near Wylam. The hydrology of the River Tyne is influenced by the urbanised nature of the area.

A hydraulic model of a 12.5km stretch the River Tyne was developed in 2001 to assist in the design of the New Tyne Crossing (Posford Duvivier, 2001). The results of the hydrodynamic modelling exercise demonstrated the dominance of tidal forces in hydrodynamics and sediment transport under normal fluvial conditions.

4.2.2 Waves

The River Tyne to Flamborough Head Shoreline Management Plan 2 (Royal Haskoning, 2007) presented the following tidal levels and extreme sea levels (Table 7) and the following offshore significant wave heights (Table 8) for this section of coastline.

Table 7 Astronomical Tidal Levels and Extreme Sea Levels

Astronomical Tidal Level (mODN)			**Extreme Sea Level for Stated Return Period (mODN)**				
MLWS	MHWS	HAT	1:10yr	1:25yr	1:50yr	1:100yr	1:200yr
-2.15	2.15	2.85	3.04	3.17	3.23	3.34	3.41

(source: Royal Haskoning, 2007)

Table 8 Offshore Significant Wave Heights (m) for Different Wave Directions

Return Period (years)	Significant Offshore Wave Height (m)
0.1	4.24
1	6.08
10	7.92
20	8.48
100	11.61

(Source: Royal Haskoning, 2007)

The majority of waves approach the shoreline from between 0°N and 120°N, with the highest from between 0°N and 90°N.

4.3 Sedimentary processes

Extensive modelling work has been undertaken in recent years to understand sediment transport processes along the northeast coast (Royal Haskoning 2014).

This work suggests that to the north of the estuary, there is limited nearshore sediment transport within the Seaton Sluice to River Tyne unit. This lack of sediment transport is the result of limited supply and the rock features that act as barriers to movement of sediment. Tynemouth North Pier has the greatest influence, marking a barrier to the southern movement of nearshore sediment.

"The presence of numerous natural headlands, estuaries and their associated control structures, such as harbour piers, can cause locally complex physical processes due to wave sheltering, tidal gyres and localised sediment accumulations or drift reversals". (Royal Haskoning 2014)

The work also re-confirms what has been known for many years that the longshore sediment drift is predominantly from North to South albeit very slowly. The following table summarises measured sediment transport rates at areas up and down the coast from the Tyne estuary at both Mean high water and mean low water. It can be seen net longshore sediment transport rate is between 600 and 2500 m3/year at mean high water and between 370 and 2200 m3/yr at mean low water.

Longshore sediment transport rates (MHWS and MLWS) for selected transects.

	Drift Potential (m3/yr) at MHWS			Drift Potential (m3/yr) at MLWS		
Profile	Gross N Drift (-ve)	S Drift (+ve)	Net Drift	Gross N Drift (-ve)	S Drift (+ve)	Net Drift
Lynemouth Bay	3,604	-1,057	2,547	3,028	-932	2,096
Cambois Bay	1,492	-195	1,297	1,179	-147	1,032
Blyth South Beach - Centre	2,030	-346	1,684	1,245	-251	994
Blyth South Beach - South	1,370	-770	600	867	-499	368
Whitley Bay - Centre	2,264	-440	1,824	1,230	-280	950
Whitley Bay - South	1,691	-784	907	981	-461	520
Tynemouth Longsands	1,709	-508	1,201	2,877	-652	2,225
Salterfen Rocks	1,534	-240	1294	2234	-453	1781

Within the estuary mouth, Littlehaven Beach (which is not designated) extends between Herd Groyne and South Pier. These structures, which are owned and maintained by the Port of Tyne Authority, act as 'control points', retaining beach sand within the frontage and limiting the exchange of sand along the coast. The Herd Groyne in particular was

specifically constructed to prevent sand being transported northwards and deposited within the navigation channel of the estuary. The beach is backed by accreting sand dunes at its northern end and a sea wall. The underlying solid geology bedrock is Coal Measures.

The beach is defined as a 'spending beach' for the harbour, meaning that its function is to significantly dissipate wave energy propagating through the harbour entrance structures of the North Pier and South Pier before it would otherwise move upstream via the main estuary channel. Mussel Scarp, on the northern bank, also functions as a wave trap.
Further south from Littlehaven beach, the Sandhaven beach (which is designated) is held in place by South Pier (to the north) and Trow Point (to the south). Trow Point is important as a barrier to sediment transport to the south and South Pier provides protection from dominant waves (Royal Haskoning, 2007)

To the south of the estuary, South Pier intercepts southerly sediment transport from the north of the Tyne. The build-up of sand adjacent to South Pier is probably due to the sheltering effect to north-easterly waves of the pier, possibly inducing a local reversal in transport direction in its lee (Royal Haskoning, 2007).

The dredging campaigns tend to be in response to bad weather conditions which either drive sand in from the North Sea or draw sediment down from the Pennines. Sand deposition leading to the need to undertake maintenance dredging tends to arise mostly over the winter months, with silt deposition arising following summer storms. This pattern of dredging, largely in response to episodic events, suggests that the material being dredged is largely 'excess' material, with material that typically constitutes the sediment budget of the estuary (i.e. the material that is not deposited during such episodic events) not requiring regular dredging.

Observation of siltation rates in the navigable channels and berths since the deepening the channel has shown that there has been no noticeable increase in the amount of maintenance dredging required to maintain these areas at depth.

As noted above, North Pier and South Pier act as significant, dominant controls on nearshore sediment transport along the coastline. Since the sediment dredged from within the estuary is deposited at two well defined spoil grounds (North Tyne and Souter Point) which are 5 and 7 miles offshore respectively and that the slow migration of this material will be to the south it does not have the potential to influence nearshore sediment transport. The dredging does not, therefore, interrupt coastal processes that influence habitats within the coastal designated sites and cannot affect the two designated marine sites (Northumberland Marine SPA and Coquet to St Mary's MCZ) as both of these lie to the North of the North Tyne spoil ground.

4.4 Sediment quality within the River Tyne

4.4.1 Existing data

Sediment quality is of direct relevance to the 'health' of intertidal and subtidal flora and fauna and, hence, can affect the quality of food sources and habitats available for SPA species. This section therefore describes the known physical and chemical characteristics of sediments within the Tyne Estuary.

Sediment quality data has been obtained from CEFAS in relation to historic FEPA licences held by the Port of Tyne. Data gathered as part of the Environment Agency's National Marine Monitoring Programme (NMMP) has also been obtained.

Unlike water quality, there are no quantified UK Environmental Quality Standards (EQS) for *in-situ* sediment quality. The only guidance for sediment quality is defined as "standstill (no deterioration)" and is required for most EC Dangerous Substances List 1 parameters. In the absence of appropriate UK standards, data for the Tyne Estuary have been compared against two sets of guidelines to provide a basic assessment regarding the existing degree of contamination within the sediments. These are:

- Canadian Sediment Quality Guidelines for the Protection of Aquatic life; and,
- CEFAS guideline Action Levels for the disposal of dredged material.

4.4.2 Canadian Sediment Quality guidelines

These guidelines were developed by the Canadian Council of Ministers of the Environment (CCME) as broadly protective tools to support the functioning of healthy aquatic ecosystems (CCME, 2001). They are based on field research programmes that have demonstrated associations between chemical and biological effects by establishing cause and effect relationships in particular organisms. Comparison of measured concentrations of various contaminants within the sediments with these guideline values will, therefore, provide a basic indication on the degree of contamination.

The guidelines consist of threshold effect levels (TELs) and probable effect levels (PELs). The TELs and PELs are used to identify the following three ranges of chemical concentrations with regard to biological effects. The levels are summarised as follows:

- Below the TEL - the minimal effect range within which adverse effects rarely occur.
- Between the TEL and PEL - the possible effect range within which adverse effects occasionally occur.

- Above the PEL - the probable effect range within which adverse effects frequently occur.

Table 9 lists the existing sediment quality guidelines for some of the parameters monitored during the various surveys where they exist.

There are no Interim Sediment Quality Guidelines (ISQGs) for the following determinands:

- Metals (aluminium, boron, iron, manganese, nickel, selenium, silver, vanadium);
- Tributyl tin (TBT);
- Dibutyl tin (DBT);
- Total petroleum hydrocarbons (C6-C30) (TPH);
- Aldrin;
- Endosulfan;
- Benzo (k) fluoranthene;
- Indeno (1-2-3-cd) anthracene;
- Benzo (ghi) perylene; and,
- Brominated flame retardants.

The Canadian ISQGs should however, be used with caution and the findings treated as indicative. These guidelines were designed specifically for Canada and are based on protection of pristine environments. The guidelines are presented here because it has become commonplace for these guidelines to be used in the UK and their use is supported within the 'weight of evidence' approach used by a number of the regulatory and statutory bodies.

Table 9 **Selected interim marine sediment quality guidelines (ISQGs)/threshold effect levels (TELs) and probable effect levels (PELs) (dry weights)**

Substance	Units	ISQG/TEL	PEL
Arsenic	mg/kg	7.24	41.6
Cadmium	mg/kg	0.7	4.2
Chromium	mg/kg	52.3	160
Copper	mg/kg	18.7	108
Lead	mg/kg	30.2	112
Mercury	mg/kg	0.13	0.7
Zinc	mg/kg	124	271
DDD*	µg/kg	1.22	7.81
DDE*	µg/kg	2.07	374
DDT*	µg/kg	1.19	4.77
Dieldrin	µg/kg	0.71	4.3
Endrin	µg/kg	2.67	62.4
Heptachlor epoxide	µg/kg	0.6	2.74
Lindane (HCH)	µg/kg	0.32	0.99
Nonylphenol	µg/kg	1.0	-
PCBs: total PCBs	µg/kg	21.5	189
Acenaphthene	µg/kg	6.71	88.9
Acenaphthylene	µg/kg	5.87	128
Anthracene	µg/kg	46.9	245
Benz(a)anthracene	µg/kg	74.8	693

Benzo(a)pyrene	µg/kg	88.8	763
Chrysene	µg/kg	108	846
Dibenz(a,h)anthracene	µg/kg	6.22	135
Substance	**Units**	**ISQG/TEL**	**PEL**
Fluoranthene	µg/kg	113	1494
Fluorene	µg/kg	21.2	144
2-Methylnaphthalene	µg/kg	20.2	201
Naphthalene	µg/kg	34.6	391
Phenanthrene	µg/kg	86.7	544
Pyrene	µg/kg	153	1398

4.4.3 CEFAS Action Levels

CEFAS guideline Action Levels (AL) for the disposal of dredged material are not statutory contaminant concentrations for dredged material, but are used as part of a weight of evidence approach to decision-making on the disposal of dredged material to sea. The Action Levels are presented in Table 10. Action Levels are not pass/fail criteria, but triggers for further assessment. Accordingly, if concentrations are below Action Level 1, the refusal of disposal at sea on the grounds of contamination is unlikely. If concentrations fall between Levels 1 and 2, then further assessment is likely to be required. If concentrations exceed Level 2, then the dredged material may not be acceptable for disposal at sea. All data is considered on a case by case basis.

Table 10 CEFAS guideline Action Levels for dredged material (CEFAS, 2006)

Contaminant / compound	Action Level 1	Action Level 2
	mg/kg dry weight (ppm)	mg/kg dry weight (ppm)
Arsenic	20	100
Mercury	0.3	3
Cadmium	0.4	5
Chromium	40	400
Copper	40	400
Nickel	20	200
Lead	50	500
Zinc	130	800
Organotins; TBT DBT MBT	0.1	1
Polychlorinated Biphenyls (PCB), sum of ICES 7	0.01	none
PCB's, sum of 25 congeners	0.02	0.2
DDT	*0.001	none
Dieldrin	*0.005	None
	*these levels were set in 1994	

4.4.4 Overview of sediment quality in relation to sediment quality guidelines

Sediment quality data for the locations within the estuary which are subject to routine dredging are presented in Appendix B. The sediment quality data is limited in that sediment movement along the river is dynamic whereas sampling takes place at either 1 or 3 yearly intervals for the purposes of marine license validation. The data can therefore only be considered as being indicative of current sediment quality.

Results are highlighted in the tables in Appendix B using a colour coding system, with orange indicating concentrations which exceed the CEFAS AL1 and red indicating exceedances above AL2. Where CEFAS Action Levels are not available and ISQG exist, cells are highlighted yellow where results exceed the TEL/ISQG. A summary of sediment quality, where data is available, is provided below.

Metals and organotins

The existence of heavy metals in the estuary is well understood having arose from historic lead mining in the headwaters of the Tyne catchment where heavy metals containing water enters the catchment along with spent ore particles from the numerous spoil heaps in the area. The presence or organotins in the estuary is a legacy of shipbuilding and ship repair activities on the Tyne which involved the widespread use of TBT containing marine-antifoulant coatings.

Metals are of concern in the aquatic environment because of their toxicity, persistence and their potential to bio-accumulate in living organisms. The most recent analytical data for the areas currently licensed under the deemed marine licence indicate widespread exceedances of AL1, and occasions where AL2 has been approached or exceeded. All areas contained elevated concentrations above AL1 for at least one metal with the exception of Area 2 which contained no elevations above AL1.

In order to assess whether heavy metals concentrations in sediment are increasing over time the average levels for 2007, 2013 and 2016 have been compared in the following table. This clearly shows that the average levels between 2007 and 2016 are broadly constant.

Average heavy metal and organotin levels from sediment sampling 2007-2016.

Year	n	Parameter	AS	CD	CR	CU	HG	NI	PB	ZN	DBT	TBT
2007	24	Average Concentration (mg/kg)	23.96	1.03	45.17	54.48	0.46	33.58	166.17	360.63	0.03	0.12
		Minimum Concentration (mg/kg)	10.00	0.00	12.00	8.60	0.05	9.00	20.00	39.00	0.00	0.01
		Maximum Concentration (mg/kg)	34.00	3.20	83.00	125.00	1.30	50.00	352.00	652.00	0.09	0.53
2013	95	Average Concentration (mg/kg)	25.52	1.33	43.79	60.35	0.36	34.20	197.92	396.58	0.02	0.07
		Minimum Concentration (mg/kg)	12.27	0.11	14.31	12.10	0.07	12.34	46.44	67.10	0.00	0.00
		Maximum Concentration (mg/kg)	37.21	3.11	70.67	241.37	1.03	51.48	320.30	1125.91	0.06	0.63
2016	102	Average Concentration (mg/kg)	19.42	1.38	45.20	34.47	0.26	28.95	177.96	366.27	0.02	0.05
		Minimum Concentration (mg/kg)	6.82	0.17	21.85	24.88	0.14	22.8	89.8	151.35	0.0093	0.019
		Maximum Concentration (mg/kg)	34.55	3.1	79.29	100	0.41	47.37	372.39	826.06	0.056	0.37

Polycyclic aromatic hydrocarbons (PAH)

The presence of PAH's within the Tyne estuary is well known to have arisen from the industrial heritage of the river. Numerous coal tar processes were operated adjacent to the river in the late 19th and early 20th century. The most notable of these was the St Anthony's tar works at Walker which provided a significant ongoing source of PAH into the lower estuary until 2016 when the site was remediated via the installation of a slurry wall barrier.

PAHs are of particular concern due to their persistence in the environment. The concentrations of the individual PAH compounds are shown to be variable, with the majority of concentrations exceeding AL1 in Areas 1, 2, 3, 5, 14, 21, 24, 34, 37 and 43. A number of the compounds, in the same areas, also contained concentrations which exceeded the PEL (in the absence of AL2 for these substances).

Polychlorinated biphenyls (PCB)

Due to their hydrophobic nature, PCBs tend to be adsorbed quickly by organic matter. Concern arises from their persistence and potential to bioaccumulate within the food chain. The data indicate that there are occasional elevated concentrations of PCBs above AL1 found in Areas 3, 5, 24, 3 and 43. However, there were no elevated concentrations of PCBs above AL2.

A series of images detailing the areas from which dredged material is excluded from sea disposal and the excluded dredge areas due to elevated levels of contamination are shown in Figures 4.1 to 4.5. Further details on the areas which have been excluded from sea disposal and the justification for this are included within section 2.6

Figure 4.1 Areas excluded from sea disposal due to elevated levels of heavy metal (as supplied by Port of Tyne Authority)

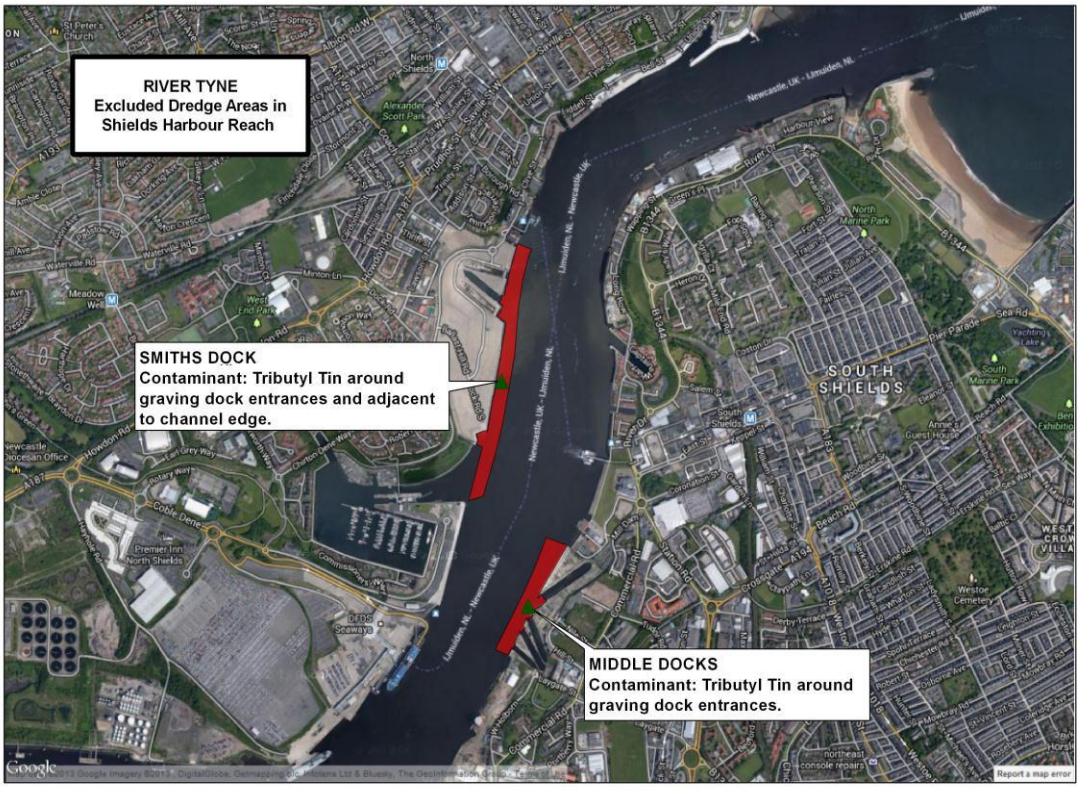


Figure 4.2 Excluded dredge areas in Shields Harbour Reach (as supplied by Port of Tyne Authority)

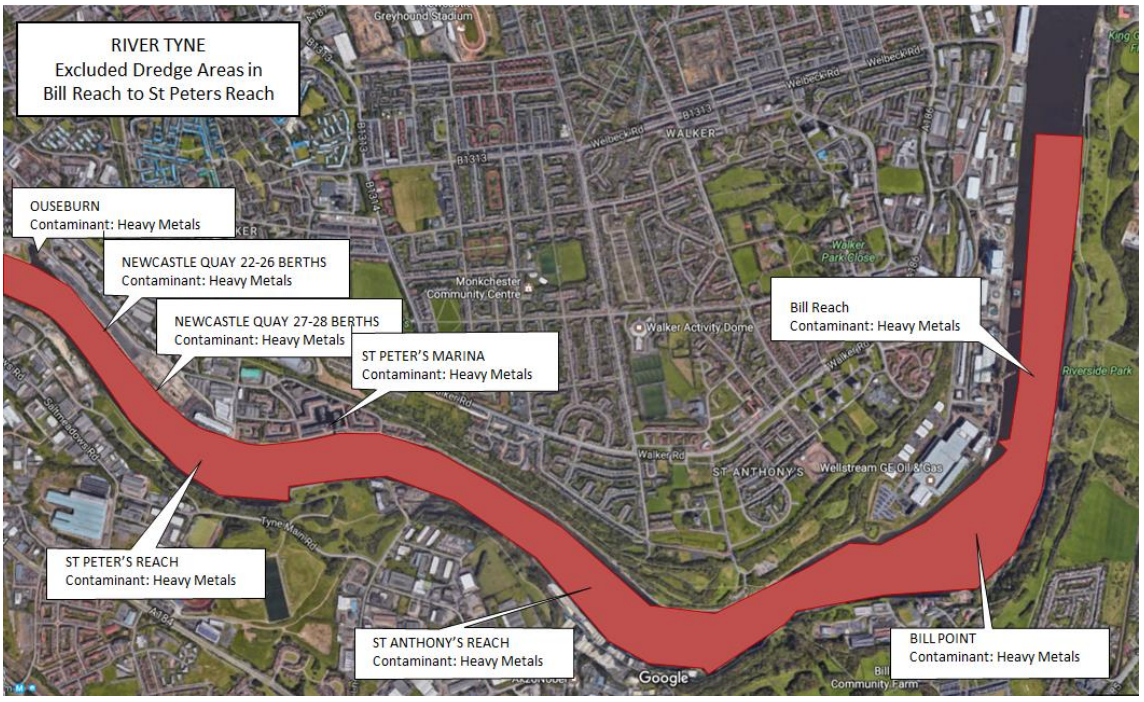


Figure 4.3 Excluded dredge areas in Bill Reach and St. Peter's Beach (as supplied by Port of Tyne Authority).

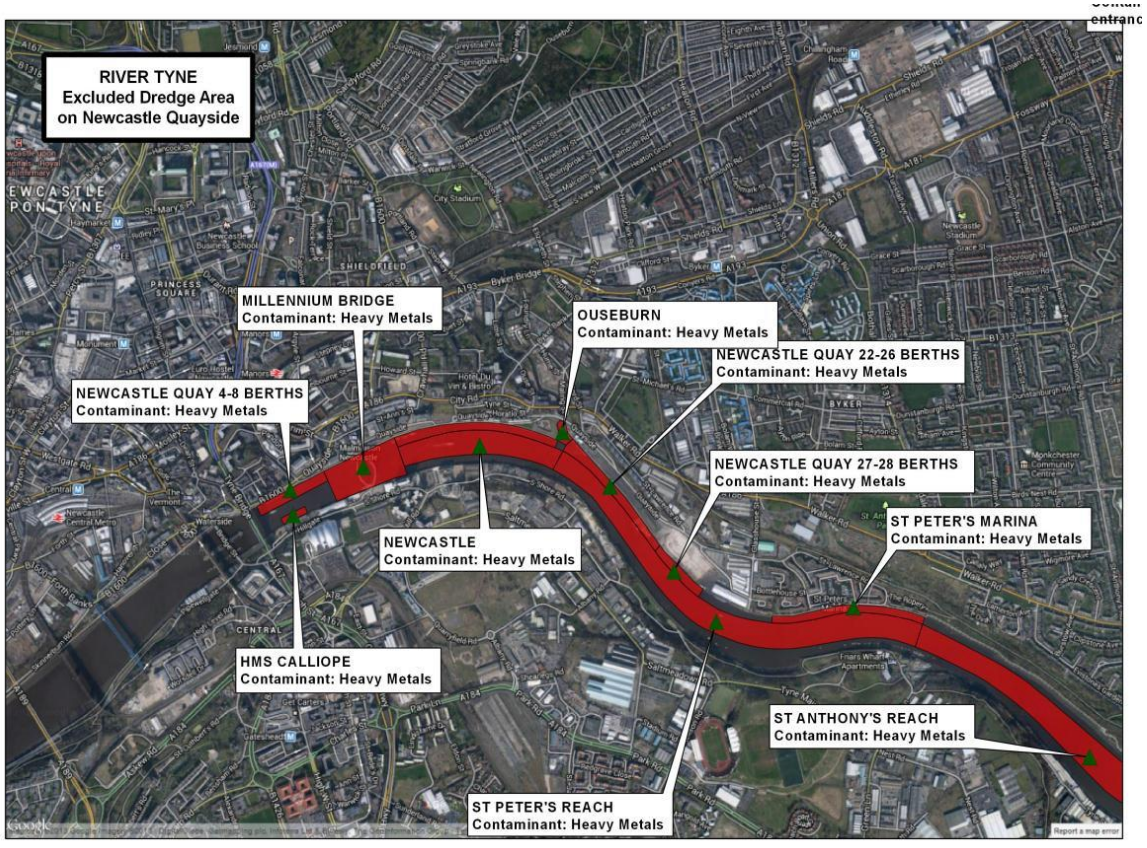


Figure 4.4 Excluded dredge areas on Newcastle Quayside (as supplied by Port of Tyne Authority)

4.4.5 Analysis of fish liver tissue data

The concentrations of PCBs, lead and chromium within fish liver tissue recovered from fish within the River Tyne at the Ferry Crossing since 2000 has been provided by the Environment Agency. Preferred target species are flounder (*Platichthys flesus*) and dab (*Limanda limanda*). Plaice (*Pleuronectes platessa*) may be considered in areas where flounder and dab are absent and whiting (*Merlanguis merlangus*) may also be considered. These data have been used to assess the bioaccumulation of contaminants within fish livers. A discussion regarding the concentrations of these contaminants within the livers is provided below.

PCB concentrations

The environmental persistence and lipophilic nature of PCBs means that PCBs bio-accumulate in aquatic food chains.

The trend lines illustrated on the data provided by the Environment Agency illustrate that the concentrations of PCBs within fish liver size ranges 1 – 4 have decreased since 2000. The trend for PCB concentrations within fish liver size range 5 indicates increasing concentrations in all PCB bands with the exception of PCB – 028.

The figures also indicate that the concentration of PCB bands has increased within fish liver size ranges 3, 4 and 5 from 2005/2006 to 2007. This suggests that there has potentially been an elevated concentration of PCB present within the aquatic environment over this period, which has accumulated within fish livers.

Metal concentrations

The concentration of cadmium within fish liver tissue indicates a gradual reduction across all size ranges since 2000. Fish liver size range 4 has exhibited a relatively large increase in cadmium concentration from 2006 to 2007. This is an isolated increase in cadmium, as the concentration within all other fish liver size ranges have decreased over this period (where data are available).

The concentration of lead within the fish livers has been more dynamic in comparison with the cadmium concentrations; however, the concentrations also display a general decreasing trend. This indicates that there is potentially a reduced concentration of lead available within the aquatic environment.

4.4.6 Analysis of mussel data collected from the River Tyne at Ferry Crossing

The concentrations of metals, PAHs and PCBs within mussels collected from the River Tyne at the Ferry Crossing since 2002 has been provided by the Environment Agency. These data have been used to determine bioaccumulation within mussels. A discussion regarding the concentrations of these contaminants within the mussels is provided below.

Insecticides
The trend lines illustrated on the information provided by the Environment Agency indicate that concentrations of insecticides within the mussels have gradually increased since 2002. The concentrations of isodrin are shown to increase at a higher rate, with more variable concentrations in comparison with aldrin, dieldrin and endrin.

PCBs
The concentrations of PCBs within mussels are shown to remain low across all bands until February 2008, where there is a significant increase in the concentration in samples recovered at the sampling time of 14:00 hours. It is unknown whether these readings were anomalous as data have not been provided subsequent to this date.

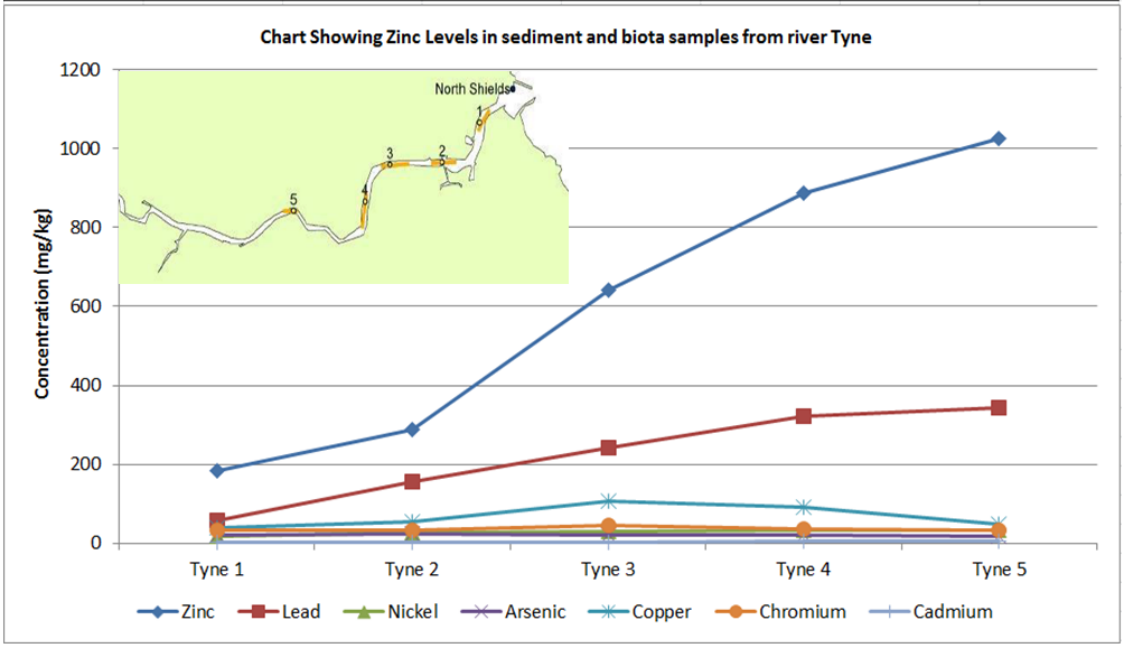
PAHs
The concentration of the individual PAH compounds within mussels are shown to generally increase marginally from 2003 to 2008. The trend lines for fluoranthene and pyrene indicate gradually reducing concentrations over this time period.

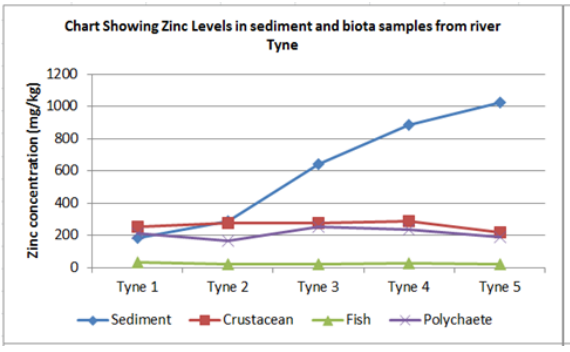
Metals
The trend lines for metals within mussels illustrate decreasing concentrations during the monitoring period. The exception to this is the trend line for chromium, which indicates a marginal increase in concentration.

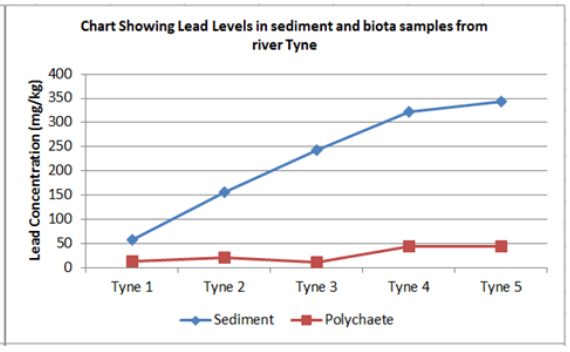
4.4.7 Newcastle University research work.

Work was undertaken by Newcastle University on behalf of the River Tyne Sediment Group in 2014 (Reconnaissance Investigations into dredging and Disposal on the river Tyne 2015, Phases I and II) to assess whether sentinel organisms in both the river Tyne and at the spoil grounds are being affected by the presence of heavy metals within the sediment. The report concluded that there is no apparent linkage between the measured levels of heavy metals within the organism tissues and the levels of metals within the sediment. The charts below clearly show that, whilst levels of zinc and lead within Tyne sediment increase significantly from the piers to Newcastle, the level within the marine organisms remains constant. This suggest that the organisms are either not uptaking the heavy metals (possibly because the metals are not bioavailable) or if they are, that they have metabolic processes to expel them.

	Zinc	Lead	Nickel	Arsenic	Copper	Chromium	Cadmium
Tyne 1	182.94	58.17	17.21	20.64	39.58	33.22	0.57
Tyne 2	287.45	156.43	26.88	22.39	55.26	33.05	1.43
Tyne 3	642.26	242.15	30.53	20.29	105.61	43.5	2.99
Tyne 4	886.51	321.11	33.25	19.29	90.84	35.69	3.59
Tyne 5	1024.52	342.43	33.75	17.55	48.17	33.1	3.84







4.5 Water quality

Water quality within the River Tyne is of importance to the general health of the environment, as well as the habitats and food sources upon which the SPA species rely. The information provided below is collated from the results of monitoring undertaken by the Environment Agency at a number of sites within the River Tyne and estuary (Lloyds Hailing Station, upstream and downstream of Howdon, Hebburn and Tyne Bridge). The water samples were recovered by the Environment Agency to ensure compliance with designation requirements and specific water quality directives. General information on the quality of water within the River Tyne is provided in Table 11.

Table 11 Summarised averaged water quality data (Environment Agency 2000-2010 unless specified)

Determinand	Lloyds Hailing Station	Tyne background upstream of Howdon	Tyne background downstream of Howdon	Tyne at Hebburn	Tyne at Tyne Bridge
Temperature (^{o}C)	10.09	9.96[b]	10.18 [c]	10.19	10.56[a]
Salinity (g/l)	27.49	22.66[d]	22.17 [c]	19.63	15.10 [a]
pH	7.97[e]	7.78[f]	7.83 [e]	7.81	7.74 [a]
Determinand	**Lloyds Hailing Station**	**Tyne background upstream of Howdon**	**Tyne background downstream of Howdon**	**Tyne at Hebburn**	**Tyne at Tyne Bridge**
Turbidity (FTUs)	5.72[g]	10.7 [c]	41.5 [c]	9.35 [g]	No data
Dissolved Oxygen (% saturation)	90.24	79.66 [d]	78.76 [c]	84.58	81.41 [a]
Ammoniacal Nitrogen (mg/l)	0.23 [h]	0.51[c]	0.69 [c]	0.46[h]	0.31 [h]

[a] February 2000 to September 2003; [b] March 2000 to January 2007; [c] March 2000 to November 2002; [d] March 2000 to October 2006; [e] April 2001 to November 2002; [f] April 2001 to October 2006; [g] January 2004 to August 2010; [h] February 2000 to September 2002.

4.5.1 Dangerous Substances

The EC Dangerous Substances Directive was adopted in 1976 to control pollution caused by certain dangerous substances on the aquatic environment. The Directive established List I substances, which are regarded as particularly dangerous because of their toxicity, persistence and bioaccumulation. Pollution by these substances must be eliminated. List II substances are regarded as less dangerous but have a deleterious effect on the aquatic environment; input of these substances must be reduced.

The Dangerous Substances Directive stipulates uniform emission standards (UESs, also known as limit values) and EQSs as approaches for the control of List I substances. For List II substances, all member states are required to establish EQSs on a national level. EQSs for List II substances have been implemented in the UK by the Surface Waters (Dangerous Substances) (Classification) Regulations 1997 and 1998. The EQSs for List I and List II substances form the assessment criteria for water quality concerning dangerous substances.

The EQSs for selected List I substances are shown in Table 12.

Table 12 Selected List I dangerous substances*

Substance**	EQS Type	Estuarine EQS (annual average, μg/l)
Mercury (dissolved)	Annual average	0.5
Cadmium (dissolved)	Annual average	5
HCH (Lindane)	Annual average	0.02
Total DDT	Annual average	0.025
ppDDT	Annual average	0.01
Pentachorophenol	Annual average	2
Aldrin	Annual average	0.01
Dieldrin	Annual average	0.01
Endrin	Annual average	0.005
Isodrin	Annual average	0.005

Total 'Drins'	Annual average	0.03
Hexachlorobenzene	Annual average	0.03
Hexachlorobutadiene	Annual average	0.1
Carbon tetrachloride	Annual average	12
Chloroform	Annual average	12
1,2-dichloroethane	Annual average	10
Trichloroethyleme	Annual average	10
Perchloroethylene	Annual average	10
Trichlorobenzene	Annual average	0.4

* EQS List I taken from www.environment-agency.gov.uk

**total concentration (i.e. without filtration) unless specified

EQSs for List II substances have been implemented in the UK by the Surface Waters (Dangerous Substances) (Classification) Regulations 1997 and 1998. The EQSs for selected List II substances are shown in Table 13.

Table 13 Selected List II dangerous substances*

Substance	EQS Type	Estuarine EQS (annual average, µg/l)
Arsenic (dissolved)	Annual average	25
Chromium (dissolved)	Annual average	15
Copper (dissolved)	Annual average	5
Lead (dissolved)	Annual average	25
Nickel (dissolved)	Annual average	30
Tributyl tin (TBT)	Maximum concentration	0.002
Zinc (total)	Annual average	40

*The full EQS List II is available on www.environment-agency.gov.uk

Water quality data has been provided by the Environment Agency for the years 2000 – 2012 (where possible). The data is summarised in Tables 14 to 19.

Table 14 Summarised dangerous substances data for the Lloyds Hailing Station site (surface)

Determinand (dissolved)	Minimum (µg/l)	Maximum (µg/l)	Mean (µg/l)	EQS (µg/l)	No. of Data	No of < than data	No. of Data Exceeding EQS
Cadmium	<0.040	0.045	0.040	5	58	55	0
Mercury	<0.01	0.062	0.01435	0.5	52	36	0
Arsenic	<1.00	1.86	1.144	25	44	21	0
Chromium	<0.35	94.20	3.12	15	42	26	1
Copper	0.211	12.40	1.322	5	43	16	1
Lead	<0.20	8.45	0.967	25	34	12	0
Nickel	0.27	2.49	0.822	30	44	10	0
Zinc	<2.00	67.00	9.55	40	40	3	1
HCH (Lindane – 3 isomers)	<0.003	0.015	0.010	0.02	27	15	0
ppDDT	<0.00050	<0.00400	0.00123	0.01	41	41	0
Pentachlorophenol	<0.0200	<1.00	0.11897	2	39	39	0
Chloroform	<0.1	1.77	0.211	12	54	38	0
Carbon tetrachloride	<0.1	<1.0	0.129	12	42	42	0
Tributyl tin	<0.004	0.033	0.00806	0.002	54	22	54
Total 'Drins'	-	-	-	0.03	-	-	-

Hexachlorobenzene	<0.0003	<0.005	0.0008	0.03	42	40	0
Hexachlorobutadiene	<0.001	<0.005	0.0024	0.1	42	42	0

Table 14 indicates that the majority of the substances are present in concentrations below the EQS at Lloyds Hailing Station. Isolated elevated concentrations of chromium, copper and zinc were identified above the EQS during January 2002. One major exception is TBT, which has been identified at elevated concentrations above the EQS in all water samples recovered. TBT was used widely as an anti-fouling agent for ships hulls, with the Tyne containing a number of active ship repair yards throughout its industrial history.

Table 15 Summarised dangerous substances data for the River Tyne background downstream of Howdon site (surface)

Determinand (dissolved)	Minimum (µg/l)	Maximum (µg/l)	Mean (µg/l)	EQS (µg/l)	No. of Data	No of < than data	No. of Data Exceeding EQS
Cadmium	0.04	0.10	0.083	5	19	18	0
Mercury	No data available			0.5	-	-	-
Arsenic	1.00	1.00	1.00	25	6	5	0
Chromium	0.50	0.50	0.50	15	6	6	0
Copper	<0.1	4.56	1.32	5	18	5	0
Lead	0.418	5.13	1.65	25	19	0	0
Nickel	<0.300	1.90	0.34	30	6	1	0
Zinc	4.87	31.8	13.74	40	19	0	0
HCH (Lindane – 3 isomers)	No data available			0.02	-	-	-
ppDDT	No data available			0.01	-	-	-
Pentachlorophenol	No data available			2	-	-	-
Chloroform	No data available			12	-	-	-
Carbon tetrachloride	No data available			12	-	-	-
Tributyl tin	0.0005	0.00121	0.00087	0.002	6	0	0
Total 'Drins'	No data available			0.03	-	-	-
Hexachlorobenzene	No data available			0.03	-	-	-
Hexachlorobutadiene	No data available			0.1	-	-	-

The information provided for the River Tyne downstream of Howdon indicates that there are no elevated concentrations of substances above the EQS within the water samples.

Table 16 Summarised dangerous substances data for River Tyne upstream of Howdon site (surface)

Determinand (dissolved)	Minimum (µg/l)	Maximum (µg/l)	Mean (µg/l)	EQS (µg/l)	No. of Data	No of < than data	No. of Data Exceeding EQS
Cadmium	<0.1	<0.1	0.1	5	11	11	0
Mercury	0.024	0.024	0.024	0.5	1	0	0
Arsenic	No data available			25	-	-	-
Chromium	No data available			15	-	-	-
Copper	0.416	3.77	1.20	5	34	6	0
Lead	0.35	2.22	1.119	25	11	0	0
Nickel	No data available			30	-	-	-
Zinc	6.80	18.2	10.9	40	10	0	0
HCH (Lindane – 3 isomers)	No data available			0.02	-	-	-

ppDDT	No data available	0.01	-	-	-
Pentachlorophenol	No data available	2	-	-	-
Chloroform	No data available	12	-	-	-
Carbon tetrachloride	No data available	12	-	-	-
Tributyl tin	No data available	0.002	-	-	-
Total 'Drins'	No data available	0.03	-	-	-
Hexachlorobenzene	No data available	0.03	-	-	-
Hexachlorobutadiene	No data available	0.1	-	-	-

The information provided for the River Tyne upstream of Howdon indicates that there are no elevated concentrations of substances above the EQS within the water samples.

Table 17 Summarised dangerous substances data for the River Tyne at Hebburn site (surface)

Determinand (dissolved)	Minimum (μg/l)	Maximum (μg/l)	Mean (μg/l)	EQS (μg/l)	No. of Data	No of < than data	No. of Data Exceeding EQS
Cadmium	0.027	<1.00	0.189	5	29	27	0
Mercury	<0.01	0.148	0.017	0.5	46	36	0
Arsenic	<1.00	1.67	1.08	25	20	17	0
Chromium	<0.35	2.66	0.685	15	10	5	0
Copper	0.421	4.22	1.37	5	34	4	0
Lead	0.255	7.12	1.75	25	48	0	0
Nickel	0.779	2.97	1.44	30	10	0	0
Zinc	4.2	48.4	15.6	40	48	0	2
HCH (Lindane – 3 isomers)	No data available			0.02	-	-	-
ppDDT	No data available			0.01	-	-	-
Pentachlorophenol	<0.10	<1.00	0.139	2	23	23	0
Chloroform	No data available			12	-	-	-
Carbon tetrachloride	No data available			12	-	-	-
Tributyl tin	<0.0005	0.053	0.0062	0.002	46	14	29
Total 'Drins'	No data available			0.03	-	-	-
Hexachlorobenzene	No data available			0.03	-	-	-
Hexachlorobutadiene	No data available			0.1	-	-	-

The information provided for the River Tyne at Hebburn indicates that there are two elevated concentrations of zinc above the EQS. The elevated concentrations were identified in water samples recovered during January 2006 and July 2007. A number of elevated concentrations of TBT were identified in water samples recovered from February 2000 to July 2008.

Table 18 Summarised dangerous substances data for the Tyne Bridge site (surface)

Determinand (dissolved)	Minimum (μg/l)	Maximum (μg/l)	Mean (μg/l)	EQS (μg/l)	No. of Data	No of < than data	No. of Data Exceeding EQS
Cadmium	<0.1	<0.1	0.1	5	10	10	0
Mercury	<0.01	0.077	0.026	0.5	8	4	0
Arsenic	<1.00	1.49	1.06	25	13	11	0
Chromium	<0.35	3.59	1.022	15	10	5	0
Copper	<1.00	1.92	1.224	5	10	7	0

Lead	0.517	5.73	2.22	25	10	0	0
Nickel	1.13	2.17	1.60	30	10	0	0
Zinc	5.90	44.8	20.73	40	10	0	1
HCH (Lindane – 3 isomers)	0.003	0.015	0.011	0.02	10	0	0
ppDDT	<0.001	<0.004	0.002	0.01	9	9	0
Pentachlorophenol	<0.10	<0.10	0.10	2	10	10	0
Chloroform	<0.10	2.5	0.40	12	9	4	0
Carbon tetrachloride	<0.10	<0.20	0.13	12	10	10	0
Determinand (dissolved)	**Minimum (μg/l)**	**Maximum (μg/l)**	**Mean (μg/l)**	**EQS (μg/l)**	**No. of Data**	**No of < than data**	**No. of Data Exceeding EQS**
Tributyl tin	<0.004	0.020	0.0092	0.002	14	2	14
Total 'Drins'	0.008	0.011	0.009	0.03	9	0	0
Hexachlorobenzene	<0.0003	<0.0010	0.00051	0.03	10	10	0
Hexachlorobutadiene	<0.002	<0.003	0.00230	0.1	10	10	0

The information provided by the Environment Agency for the River Tyne at Tyne Bridge indicates that there is one water sample containing an elevated concentration of zinc above the EQS. This sample was recovered during October 2001. There were no elevated concentrations of zinc identified during the following year, when the monitoring / analysis appears to have ceased. All samples recovered (from February 2000 to September 2003) contained elevated concentrations of TBT above the EQS.

Table 19 Summarised dangerous substances data for the Scotswood Bridge site (surface)

Determinand (dissolved)	**Minimum (μg/l)**	**Maximum (μg/l)**	**Mean (μg/l)**	**EQS (μg/l)**	**No. of Data**	**No of < than data**	**No. of Data Exceeding EQS**
Cadmium	No data available			5			
Mercury	No data available			0.5			
Arsenic	<1.00	1.66	1.22	25	9	5	0
Chromium	0.35	2.90	0.63	15	9	7	0
Copper	<1.00	1.39	1.11	5	9	5	0
Lead	0.70	5.39	3.12	25	10	0	0
Nickel	1.65	2.14	1.92	30	9	0	0
Zinc	8.8	49.6	24.87	40	10	0	2
HCH (Lindane – 3 isomers)	No data available			0.02			
ppDDT	No data available			0.01			
Pentachlorophenol	No data available			2			
Chloroform	No data available			12			
Carbon tetrachloride	No data available			12			
Tributyl tin	<0.004	0.013	0.00725	0.002	8	4	8
Total 'Drins'	No data available			0.03			
Hexachlorobenzene	No data available			0.03			
Hexachlorobutadiene	No data available			0.1	10	10	0

The information provided for the River Tyne at Scotswood Bridge indicates that there are two elevated concentrations of zinc above the EQS. The elevated concentrations of zinc were identified in water samples recovered during February 2000 and October 2001. There were no elevated concentrations of zinc identified during the following year, when the monitoring / analysis appears to have ceased. All samples recovered

(from February 2000 to September 2002) contained elevated concentrations of TBT above the EQS.

2012-2016 Update

Water quality data for priority substances for the period 2012-2016 is summarized in the table in the following table. Although the current data monitoring suite is less extensive than that of the 2000-2012 it shows that water quality still consistently fails for tributyl tin. Pentachlorobenzene is a generic PCB has also been added to the routine test suite by virtue of it being a WFD priority substance. There are a number of marginal breaches of the EQS for this substance.

	Lloyds Hailing Station						Jarrow					Whitehill Point				
	2013 - 2016						2013 - 2016					2013 - 2016				
	No. of Samples	*Mean*	*Max*	*Min*	*EQS*	*Fails*	*No. of Samples*	*Mean*	*Max*	*Min*	*Fails*	*No. of Samples*	*Mean*	*Max*	*Min*	*Fails*
	ug/l						ug/l					ug/l				
alachlor	1	0.0001	1E-04	0.0001	0.3	0										
aldrin	6	0.00085	0.001	0.0001	0.01	0										
ammonia (as N)	2	0.2405	0.206	0.275	0.6	0										
anthracene	5	0.01	0.01	0.01	0.1	0										
arsenic	16	1.03	1.17	1	25	0										
cadmium and its compounds	6	0.03	0.03	0.03	0.2	0										
chromium (III)	2	15.25	30	0.5	4.7	1										
copper	7	0.4	0.249	0.566	5	0	16	0.64	0.249	0.95	0					
dieldrin	6	0.0017	0.002	0.0001	0.01	0										
endrin	6	0.003	0.003	0.0001	0.01	0										
fluoranthene	6	0.0089	0.01	0.009	0.1	0										
hexachlorobenzene (HCB)	6	0.00085	0.001	0.0001	0.01	0										
hexachlorobutadiene (HCBD)	6	0.0025	0.003	0.0001	0.1	0										
isodrin	6	0.0009	0.001	0.0001	0.01	0										
lead and its compounds	8	0.56	0.951	0.096	7.2	0						45	0.96	6.6	0.159	0
mercury and its compounds	6	0.01	0.01	0.01	0.05	0										
naphthalene	6	0.01	0.01	0.01	1.2	0										
nickel and its compounds	8	0.75	1.25	0.375	20	0										
pentachlorobenzene	6	0.0007	0.001	0.0001	0.0007	4										
benzo(a)pyrene	6	0.0013	0.003	0.0009	0.05	0										
benzo(b)fluoranthene	6	0.0014	0.003	0.0009	0.03	0										
benzo(g,h,i)perylene	6	0.0014	0.003	0.0008	0.002	1										
benzo(k)fluoranthene	6	0.00069	0.001	0.0005	0.03	0										
indeno(1,2,3-cd)pyrene	6	0.0015	0.003	0.001	0.002	1										
tributyl tin compounds (TBT) (tributyltin-cation)	6	0.00039	5E-04	0.0002	0.0002	6										
zinc	7	3.55	6.18	0.86	40	0										

4.6 Marine ecology

The following description of intertidal and subtidal ecology is based on existing, available information and as such is a historic description. The present circumstances may, therefore, be different to that described, particularly with respect to the areas of mudflat and saltmarsh quoted. In addition the Port survey as much of the river as they can but are driven by navigational needs. Most of the intertidal areas are inaccessible to the Port due to the depth of water.

4.6.1 Intertidal ecology

The extent of intertidal area in the Tyne Estuary is limited. Only 60ha of intertidal surface is present which comprise cobble banks near the upper limit of marine influence and steep banks in the mid-estuary. Much of the intertidal area has been lost due to reclamation, although several areas of intertidal mudflats are still present (Arup, 2002).

Approximately 5km upstream, the River Don flows into the Tyne. An intertidal survey of Don Gut undertaken on behalf of the Port of Tyne Authority (Royal Haskoning, 2008) found evidence of both mudflat and saltmarsh, though saltmarsh vegetation was very sparse within the rubble matrix of the Gut. Mudflats were composed of a thin veneer of sediment over the man-made channel margins and bed, with limited depth and a high likelihood of sediment mobility; hence they were believed to have limited ecological functionality.

Intertidal surveys undertaken in the vicinity of the location for construction of the New Tyne Tunnel found intertidal sediments to range from sandy mud to muddy sand, and dominated by polychaete worms and a small mollusc component, typical of muddy shores subject to variable salinity (Arup, 2002). Both locations showed high abundance of the polychaete *Capitella capitata* (up to 60,000 individuals per m^2), indicative of levels of high organic pollution. Samples taken from the intertidal shores either side of the estuary entrance (at Tynemouth and South Shields) were representative of sandy environments with associated low species diversity, dominated by polychaetes.

4.6.2 Subtidal ecology

The riverbed of the Tyne estuary consists of a mixture of mud, muddy sand and gravel. 92.4% of the area of the estuary is sublittoral, with the lower estuary composed of sublittoral muddy sand with oligochaetes (Arup, 2002). The mid-estuary is recorded as sublittoral estuarine mud with sparse infauna.

Subtidal surveys undertaken for the New Tyne Tunnel found that sediments were generally composed of sandy mud, with *C. capitata* the most numerous species. *C. capitata* was dominant in samples nearer to the river banks, whereas the oligochaete *Tubificoides benedii* was dominant within the main channel. Other dominant polychaetes and oligochaetes found were also species considered to be indicative of 'disturbed' benthic conditions, or those exposed to organic enrichment (Arup, 2002).

4.6.3 Fish

The River Tyne is amongst the best Atlantic salmon rod fisheries in England and Wales and has been classified as a principal salmon river under the Freshwater Fish Directive (2006/44/EC). In coastal waters, the Environment Agency has authority for the

management of fisheries of catadromous (e.g. salmon and sea trout) and anadromous (e.g. eel) species which migrate to spawn between the sea and freshwater.

CEFAS has undertaken a tracking programme on the movement and behaviour of salmon and sea trout in the River Tyne since 2003, including both government- and commercially-funded research (Bendall, 2007). Peak months for salmon smolts to run out of the Tyne are April and May, with very few smolts running after this (Environment Agency, 2009b).

Numbers of salmon and sea trout caught on rod and line are collated by the Environment Agency for all major rivers in the north-east of England. The Tyne salmon fishing season runs from 1 February to 31 October, with the sea trout season from 3 April to 31 October (Tyne Rivers Trust, 2010).

In response to EU Council Regulation No 1100/2007/EC 'establishing measures for the recovery of the European Eel', DEFRA have published UK-wide Eel Management Plans (DEFRA, 2008). These have been established at the River Basin Management Plan (RBMP) level as defined under the WFD, with the River Tyne falling under the Northumbria River Basin District (RBD). This plan was implemented in July 2009 and aims to establish measures for the recovery of the European eel stock. The Environment Agency has also produced an individual Salmon Action Plan (SAP) for the Tyne, reviewed most recently in July 2008 (APEM, 2008).

These species are also subject to a Biodiversity Action Plan (BAP) produced by the Northumberland Wildlife Trust (NWT) which covers freshwater fish species, including salmon, brown and sea trout and the European Eel.

Though not 'true' fish, the Tyne is also host to protected species of lamprey, the river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus*.

4.7 Ornithology

4.7.1 Designations

The Northumbria Coast SPA and Ramsar site extends northwards to encompass areas of foreshore on the northern side of the estuary mouth, including much of the North Pier. In winter nationally important populations of turnstone *Arenaria interpres* and purple sandpiper *Calidris maritima* are present.

These areas also receive national designation as part of the Northumberland Shore SSSI. Unit 21 of the Northumberland Shore SSSI covers 12.87ha of 'Littoral rock' on the northern shore of the estuary mouth (which incorporates the 'Black Middens'). The condition of this site was deemed 'Favourable' on its last assessment on the 8 January 2009, and still meeting target condition, as was Unit 3, which covers littoral rock at the seaward base of North Pier (Natural England, 2010). However, a decline in numbers of purple sandpiper was recognised as part of a wider national trend (Natural England, 2010).

The majority of the South Pier and some of the adjacent shoreline are designated as part of the Northumbria Coast SPA and Ramsar site. These areas, and the adjacent Sandhaven Beach between MHWS and MLWS, are also designated as part of the Durham Coast SSSI, primarily for the protection of sanderling *Calidris alba* and purple sandpiper, for which the intertidal boulder habitat at South Pier itself is noted as an important high tide roost (Natural England, 2009).

Whilst the sandy foreshore at Littlehaven beach is not subject to national conservation designation, it is a locally designated wildlife corridor and the beach is considered to be environmentally sensitive as it provides feeding habitat for bird species for which the Durham Coast SSSI is designated.

The Tyne Estuary is relatively isolated from other estuarine habitat in the region; for example, interchange between the Blyth or Wear Estuaries (to the north and south respectively) is limited on a day-to-day basis, though areas which overlap with the SPA boundaries at the mouth do see some interchange. The implication is that any effect on waterbird populations of the Tyne Estuary is unlikely to have implications on other designated areas in the region.

4.7.2 WeBS data

In addition to Regulation 35(3) advice from Natural England regarding the interest features of the Northumbria Coast SPA, Wetland Bird Survey (WeBS) data has been obtained from the British Trust for Ornithology (BTO) to further understand the ornithological value of the Tyne Estuary.

WeBS Core Count data concentrate primarily on the winter period, but at selected sites, (such as the Tyne Estuary), counts are made once per month throughout the year. Counts are usually made at high tide when birds are most easily counted at roosts (BTO, 2010). Core Count data were obtained from the BTO for the most recent five available 'years' (i.e. 2006/07 to 2010/11) for the following count sectors:

- Tyne Estuary (54475);
- Tyne Estuary – North Pier to Fish Quay (54470); and,
- Tyne Estuary – Wallsend (54473).

Much of the length of the lower estuary is not counted, partly due to access difficulties but also because most of the intertidal flats are typically only a few metres wide, with limited usability for birds.

Counts are also made upstream of the Redheugh Bridge to Newburn, where large flocks of waders use the mudflats on the southern shore at low tide (Musgrove *et al*, 2003).

In addition to Core Count data, WeBS Low Tide Count data were obtained. These counts are conducted at most large estuaries at least one winter every six years, with up to four counts being made through the period November to February. The most recent counts for the Tyne Estuary are from the winter of 2007/08. Low Tide Counts are designed to complement the estuarine Core Count data and are principally concerned with illustrating bird distributions, allowing the identification of those parts of estuaries, inlets or bays which are important for birds (BTO, 2010).

Core count data

Data for the count sector 'North Pier to Fish Quay' are presented below (Tables 20 to 22). This particular sector has been discussed as a result of its location within the Northumbria Coast Ramsar and SPA boundaries. This sector is located at the mouth of the estuary and includes rocky foreshore areas such as the 'Black Middens'. It is clear to see that this sector is of major importance for the bird populations of the estuary overall, with greatest numbers present during the autumn and winter periods, though the sector also holds a significant percentage of total Tyne Estuary bird populations through the spring. It can also be seen that substantially more numbers of non-designated birds can be found in this area than designated.

Table 20 **Summary of peak monthly totals and seasonal peaks in waterbird populations at North Pier to Fish Quay over the period 2006/07 to 2010/11 (N = Non-designated)**

Year	Month	North Pier to Fish Quay									
		Peak Monthly Total[1]	Seasonal peak[2]								
			Autumn			Winter			Spring		
			SPA	SSSI	N	SPA	SSSI	N	SPA	SSSI	N
2006/07	Sep	1419	7	67	1673	26	162	1468	18	71	378
2007/08	Sep	1418	28	94	1564	54	188	1543	8	62	390
2008/09	Oct	1386	5	53	1516	23	145	1268	8	45	324
2009/10	Nov	1331	12	91	1253	33	226	1781	2	35	506
2010/11	Dec	969	12	70	829	34	162	1100	1	33	562
MEAN			*13*	*75*	*1367*	*34*	*177*	*1432*	*7*	*49*	*432*

1 Peak monthly total = maximum of the sum of the counts of all species within each month

2 Seasonal peak = sum of the maximum counts of designated and non-designated species within each season

Table 21 **Summary of peak monthly totals and seasonal peaks in waterbird populations at Tyne Estuary over the period 2006/07 to 2010/11 (N = Non-designated)**

Year	Month	Tyne Estuary								
		Peak Monthly Total	Seasonal peak							
			Autumn			Winter			Spring	
			SPA	SSSI	N	SPA	SSSI	N	SPA	SSSI	N
2006/07	Jan	6070	13	507	4340	40	1613	6006	37	152	1363
2007/08	Feb	5674	28	501	4792	54	1299	6251	9	119	1885
2008/09	Sep	4859	5	541	5116	31	1235	4553	30	106	1047
2009/10	Dec	4865	13	828	3407	34	993	5252	6	68	1319
2010/11	Jan	4874	17	287	3697	34	981	5932	3	50	1431
MEAN			*15*	*533*	*4270*	*39*	*1224*	*5599*	*17*	*99*	*1409*

Table 22 **The relative usage of North Pier to Fish Quay and the Tyne Estuary by waterbirds over the period 2006/07 to 2010/11 (based upon data presented in Tables 20 & 21)**

Year	North Pier to Fish Quay as % of Tyne Estuary			
	Peak Monthly	Autumn	Winter	Spring
2006/07	23%	36%	21%	30%
2007/08	25%	31%	23%	23%
2008/09	29%	28%	24%	32%
2009/10	27%	32%	29%	39%
2010/11	20%	23%	18%	40%

The 'Wallsend' sector is also within the study area and covers the area upstream of the Swinging Circle to Low Walker (downstream of Swan's Bend) (Tables 23 to 25). Whilst this count sector holds slightly lower numbers of birds than the North Pier to Fish Quay

sector, it is still of major significance for the bird populations in the estuary due to areas of intertidal mudflat providing important feeding areas. It can also be seen that substantially more numbers of non-designated birds can be found in this area than designated.

Table 23 Summary of peak monthly totals and seasonal peaks in waterbird populations at Wallsend over the period 2006/07 to 2010/11 (N = Non-designated)

Year	Month	Wallsend									
		Peak Monthly Total	Seasonal peak								
			Autumn			Winter			Spring		
			SPA	SSSI	N	SPA	SSSI	N	SPA	SSSI	N
2006/07	Jan	1554	6	55	818	14	38	1831	19	88	336
2007/08	Feb	1052	0	35	440	0	19	1130	1	54	401
2008/09	Feb	900	3	60	606	13	53	1273	22	46	216
2009/10	Dec	975	2	53	717	12	38	1416	4	34	247
2010/11	Jan	1356	5	25	686	1	28	1932	2	24	280
MEAN			*3*	*46*	*653*	*8*	*35*	*1516*	*10*	*49*	*296*

Table 24 The relative usage of Wallsend and the Tyne Estuary by waterbirds over the period 2006/07 to 2010/11 (based upon data presented in Table 23 & 21)

Year	Wallsend as % of Tyne Estuary			
	Peak Monthly	Autumn	Winter	Spring
2006/07	26%	18%	25%	28%
2007/08	19%	9%	15%	23%
2008/09	19%	12%	23%	23%
2009/10	20%	18%	23%	20%
2010/11	28%	18%	28%	21%

Low Tide Count Data

Low Tide count data were obtained for winter 2007/08 for three sectors (see Figure 4.6) nearest to the estuary mouth: ET012, ET013 and ET014 (see Table 25). This demonstrates the importance of the outer sector (ET014) for waders and cormorant. Distribution maps produced from data for the winter of 1998/99 also confirm that species such as purple sandpiper and turnstone occur mainly at the mouth of the estuary at North Shields, in areas which overlap with the SPA boundary (Musgrove *et al*, 2003).

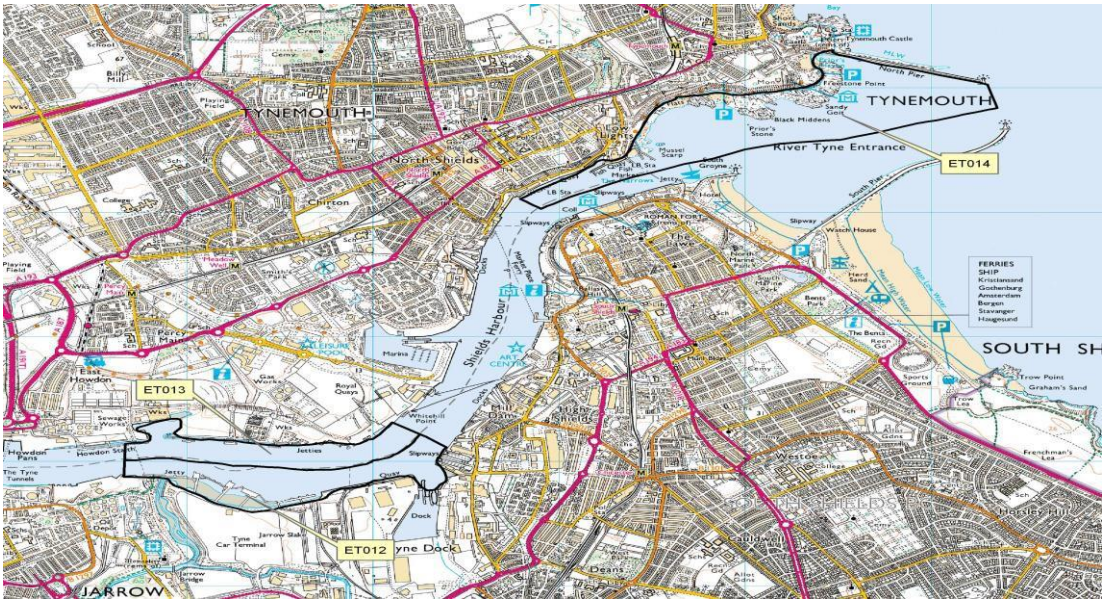


Figure 4.6 Map showing Sectors ET012, ET013 and ET014 (as supplied by BTO)

Table 25 WeBS Low Tide Count data (winter 2007/08), Tyne Estuary (BTO, 2010)

Species	Preferred habitat	Maximum count (Month), winter 07/08- Tyne Estuary	Mean site count				Mean site density (birds/hectare)			
			ET012	ET013	ET014	Tyne Estuary	ET012	ET013	ET014	Tyne Estuary
Cormorant	All habitats	70 (Dec)	-	6	38	44	-	0.19	0.38	0.25
Eider	Subtidal	18 (Feb)	2	1	10	13	0.06	0.02	0.13	0.09
Ringed plover	Intertidal	10 (Jan)	1	-	7	7	0.05	-	0.3	0.2
Sanderling	Intertidal	4 (Jan)	-	-	1	1	-	-	0.05	0.03
Purple sandpiper	Intertidal	17 (Feb)	-	-	10	10	-	-	0.43	0.27
Redshank	Intertidal & Non-tidal	334 (Feb)	15	142	47	203	1.48	47.17	2.13	5.8
Turnstone	Intertidal	37 (Feb)	-	-	24	24	-	-	1.1	0.69

4.8 Noise

4.8.1 Explanation of the units

Decibel (dB)

Decibel is a unit which indicates that a quantity has a certain level above a pre-defined reference value. It uses a logarithmic amplitude scale, thereby compressing a wide range of amplitude values to a small set of numbers. The decibel is the unit of measurement used for sound pressure levels. The threshold of hearing is 0dB and the threshold of pain is 120dB. In practical terms these limits are seldom experienced and typical levels lie within the range 30dB (a quiet night time level in a bedroom) to 90dB (at the kerbside of a busy city street).

Free-Field

A free-field is a sound field in a homogeneous, isotropic medium free from boundaries. In practice it is a sound field in which the effects of the boundaries are negligible over the region of interest, in which there are no reflective surfaces and thus no significant reflections of sound occur. BS7445 suggests that free-field environmental noise measurements should be made at least 3.5m from any reflecting structure other than the ground.

LAeq,T

The equivalent steady sound level in dB containing the same acoustic energy as the actual A-weighted fluctuating sound level within the specified time interval T.

LA10,T

The A-weighted sound pressure level of non-specific noise at the measurement location that is exceeded for 10% of the given time period, T.

LA90,T

The A-weighted sound pressure level of non-specific noise at the measurement location that is exceeded for 90% of the given time period, T. Often referred to as the background noise level since the noise level is below the LA90 level for only 10% of the time.

4.8.2 Background noise

Noise above the general background baseline may cause disturbance to SPA species. The Tyne Estuary is heavily industrialised and the location for a number of ongoing commercial activities and vessel movements. As such, ambient noise levels in those areas of the estuary within and adjacent to the SPA are greater than those experienced in less densely built-up/developed locations elsewhere along the coast. Whilst no data on existing noise levels is available for the current study, ambient noise levels recorded as part of the New Tyne Crossing Environmental Statement were dominated by traffic noise and in the region of 60-70 dB ($L_{A10\ 18\ hour}$) on both the north and south sides of the river (Arup, 2002).

4.8.3 Noise from vessels during maintenance dredging activities

Noise produced as a result of dredging activity has been derived for a number of Environmental Statements for proposals which require dredging. A predicted source noise level of 109dBL_W has been used previously for operations using a TSHD. In the absence of site-specific data, this value has been used here as the Port of Tyne Authority uses a TSHD for the majority of their dredging operations.

Indicative noise levels from a TSHD are provided in Table 26 below.

Table 26 Indicative noise levels from a TSHD

Dredger	Distance from Dredge area (m)	Noise level dB LA_{eq}
TSHD (109dBA)	50	67
	100	61
	300	52
	500	47
	1000	41

These noise levels assume the highest noise level, or that the suction dredger is operating for 100% of the time. Noise levels will, most probably, be less than indicated because the predictions only account for geometrical spreading. Ground absorption, air absorption and barrier effects will all contribute to reduce the noise levels lower than are indicated at the specific distances.

4.8.4 Noise level at the location of receptors

Twelve random receptor locations were selected, all of which were on the dredging side of the SPA and Ramsar designated areas. Figure 4.7 and Table 27 show the receptor locations alongside the assumed distance – source to receptor – and predicted receptor level. The dredger source noise level (109dB Lw) has been assumed from the edge of the defined dredge area (all Area 1). As stated earlier, the actual receptor noise levels will, most probably, be less than indicated because the predictions only account for geometrical spreading. Additionally, ground absorption, air absorption and barrier effects will all contribute to reduce the noise levels lower than are indicated at the specific distances. The predicted receptor levels assume the highest noise level and that the suction dredger is operating for 100% of the time.

Table 27 Points A – L (shown on Figure 4.2) showing source to receptor and predicted noise level at the receptor

	Assumed Distance - Source to Receptor (m)	Predicted noise level at receptor (dB)
A	412	56.7
B	95	69.5
C	135	66.4
D	289	59.8
E	983	49.1
F	1195	47.5
G	506	54.9
H	256	60.8
I	232	61.7
J	376	57.5
K	657	52.6
L	1961	43.2
Assumed Dredging Source Noise Level - 109dB Lw		

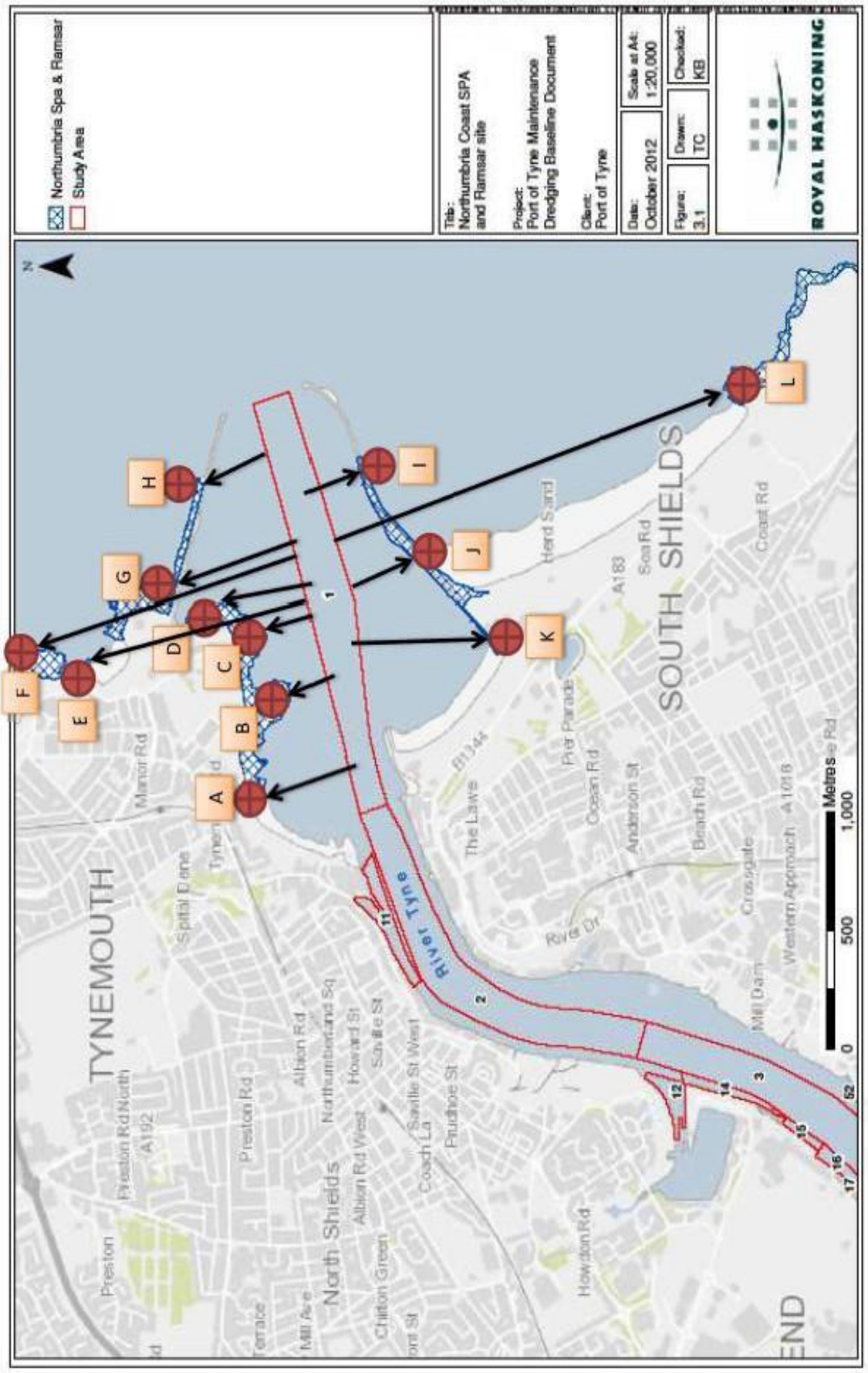


Figure 4.7 Twelve random receptor locations (associated data shown in Table 26)

5 DISCUSSIONS AND RECOMMENDATIONS

5.1 Potential impacts on the SPA, Ramsar site and MCZ

5.1.1 Potential impact upon morphology of the site

Maintenance dredging operations in the Tyne Estuary have been relatively consistent over the past ten years, and a phased capital dredging campaign in 2010 and 2011 to deepen the main channel depth from 9.1 to 10.0m BCD (to the Swinging Circle) has had no significant effect upon siltation rates or maintenance dredging requirement (Phil Lynch, *pers comm*.). The current maintenance dredging regime is, therefore, part of the existing estuary regime, and is essentially unchanged from the time when the estuary was being classified under the requirements of the Water Framework Directive between 2006 and 2008 (see Section 5.3 for further details).

The dredging campaigns tend to be in response to bad weather conditions which either drive sand in from the North Sea or draw sediment down from the Pennines. Sand deposition leading to the need to undertake maintenance dredging tends to arise mostly over the winter months, with silt deposition arising following summer storms. This pattern of dredging, largely in response to episodic events, suggests that the material being dredged is largely 'excess' material, with material that typically constitutes the sediment budget of the estuary (i.e. the material that is not deposited during such episodic events) not requiring regular dredging. Given this pattern, it is considered that maintenance dredging does not have the potential to significantly affect the sediment budget of sedimentary habitats in the estuary system.

North Pier and South Pier act as significant dominant control of the nearshore sediment transport along the coastline. In this context, maintenance dredging itself does not have the potential to influence sediment transport as any material dredged in the outer estuary does not form a significant part of the longshore transport of sediment (i.e. it deposits in the outer channel is response to the episodic events referred to above). Dredging within the estuary does not, therefore, interrupt coastal processes that influence habitats within the coastal designated sites.

As shown in Table 6, a number of the sub-features of the SPA that support the designated features are not sedimentary habitats (i.e. shallow inshore waters, rocky shores with associated boulder and cobble beaches and artificial high tide roosts). Given that dredging could only potentially affect the morphology of sedimentary habitats there is no potential for effect on these sub-features and, therefore, the designated features they support. It is recognised that waterbirds supported by these sub-features will also use sedimentary habitats within the system and, therefore, there is the potential for an indirect link between impact on habitat and the waterbird populations. However, for the reasons set out above, it is considered that maintenance dredging does not have the potential to significantly affect the sediment budget of sedimentary habitats in the estuary system.

Should maintenance dredging activity continue at a similar rate to that currently employed, it can be assumed that the sediment regime will continue to operate as at present. As the relevant SSSI units are currently assessed as in 'favourable' condition, it can be concluded that the continuation of the current maintenance dredging regime will have no negative effect on the habitats within the SPA and, therefore, the designated interest features of the site.

5.1.2 Potential impact on the site through smothering/abrasion by suspended sediments

Intertidal rocky shores with associated boulder and cobble beaches are used by internationally important numbers of purple sandpiper and turnstone for feeding and roosting and these species are highly sensitive to removal or smothering of the shore and removal of their favoured roosts, leading to a possible increase in predation and energy expenditure.

A change in substrate may lead to it being lost as a feeding resource through supporting less suitable prey species. Rocky shores are moderately sensitive to abrasion and siltation resulting in the dislodgement of individual organisms and clogging or blocking of feeding/respiratory organs of rocky shore invertebrates. This may put additional pressures on remaining areas leading to unsustainable depletion of resources through density-dependent mortality.

Removal of seaweed, on which invertebrates such as kelp fly larvae depend, can also impact upon the food resource for purple sandpiper and turnstone.

Given that the amount and pattern of maintenance dredging has not significantly changed, the volume of material in suspension as a result of dredging and frequency of dredging has not changed over time. Consequently, there is no potential for a change in impact on the sub-features of the designated sites due to dredging. Furthermore, dredging has not been shown to result in any temporary or permanent accumulation of material on rocky intertidal areas and, therefore, does not give rise to a smothering issue for these areas. In light of this, there are no issues regarding temporary effects of dredging on rocky intertidal habitats during particular seasons (i.e. there is no effect).

5.1.3 Potential impact on the site though resuspension of contaminated sediment

Contaminants such as heavy metals and organochlorides are toxic and can bioaccumulate in birds, leading to sub-lethal consequences or individual mortality. Such substances may impact upon adults and larvae of key prey species for purple sandpiper and turnstone, by either reducing their abundance and hence availability, or through making them less palatable. Organic enrichment can adversely affect the quantity and diversity of prey species available through the growth of algal mats or blooms, which can cause anoxic conditions during decomposition. TBT can also impact on periwinkles, who are key algal grazers. A reduction in periwinkles can lead to algae spreading across rocks.

Given that the dredged sediment, that is proposed to be disposed of to sea, is chemically analysed through the MMO's licensing process, no contaminated sediment that is deemed to pose a risk to the environment can be disposed of to sea. This control mechanism therefore manages any risk of an adverse effect on the sub-features of the designated sites.

5.1.4 Potential Impacts upon the habitat sites arising from the disposal of dredged sediment

Sediment dredged from within the estuary is deposited at two spoil grounds (North Tyne and Souter point) the nearest of which is 6 miles from the shore. A recent (2014) coastal sediment transport study undertaken by Royal Haskoning on Behalf of Scarborough Borough Council concluded that the longshore transport of sediment is effectively a very slow drift in a southerly direction and furthermore that there is little or no interaction between nearshore and longshore sediment transport. Since the spoil grounds are several miles offshore and significantly to

the South of the Northumbria coast SPA and EMS, it follows that the disposal of sediment at the spoil grounds cannot therefore affect these coastal or marine habitats. The North Tyne spoil ground is located at the Southern tip of the Coquet to St Mary's MCZ and material deposited at North Tyne moves to the South thereby not impacting upon the MCZ. Although fine material deposited at the spoil grounds may remain in suspension the rate of sedimentation is nevertheless rapid when compared to the longshore drift rates and the material will settle before it has the potential to impact upon the Durham coast SAC.

5.1.5 Potential impact on the site due to changes in water quality

Water quality can be affected by dredging operations in two main ways: through increased turbidity of the water column due to the resuspension of sediments; and through desorption of contaminants from remobilised sediments, leading to a potential deterioration in water quality. The dredging campaigns tend to be in response to bad weather conditions which either drive sand in from the North Sea or draw sediment down from the Pennines. Sand depositon tends to arise mostly over the winter months and silt issues arise as a consequence of summer storms.

An increase in turbidity as a result of dredging could potentially impact upon food resources for SPA and other bird species. However, due to the relatively short term nature of operations and the predominantly sandy nature of sediments at the estuary mouth, it is likely that material in this location would re-settle rapidly. This material is also much less likely to contain contaminants as they have a greater tendency to adsorb to sediments with particle size distributions towards the smaller fraction size and with a higher Total Organic Carbon (TOC) content (i.e. mud and silt).

Concentrations of Total Suspended Sediments (TSS) could potentially affect dissolved oxygen levels in the water column, particularly during the summer months, due to an increase in microbial activity associated with increased organic matter and nutrient availability. However, monitoring work undertaken during construction of the New Tyne Tunnel crossing has shown that turbidity of the Tyne is naturally highly variable and it is considered unlikely that operations related to maintenance dredging activities have the capacity to adversely affect the condition status of the SPA.

Given that the amount and pattern of maintenance dredging has not significantly changed, the volume of material in suspension as a result of dredging and frequency of dredging has not changed over time. Consequently, there is no impact on the sub- features of the designated sites.

5.1.6 Potential impact of noise upon ornithological interests

Noise and visual disturbance can cause birds to move to less suitable sites and cause energy expenditure through escape responses, which may have an impact upon their survival. There are currently no restrictions under the Port's current maintenance dredging licence as to when to dredge. The dredging campaigns tend to be in response to bad weather conditions. In addition the Port works with very tight under keel clearances on the river and there is a wish to minimise the amount of material that is taken to sea and, therefore dredging is 'little and often'.

Given the existing ambient noise levels and that dredging operations undertaken near to the SPA boundary only occur two to three times a year, each time

within a relatively short timescale, the potential for adverse impacts upon the SPA due to noise from dredging operations are predicted to be minimal, and as such will not cause a change in the condition status of the SPA. This therefore has no impact on the sub-features of the designated sites.

5.2 Cumulative impacts

It is understood that there are no/limited developments currently planned on the Tyne estuary, therefore no cumulative impacts have been identified and subsequently no further assessment has been undertaken.

5.3 The Water Framework Directive

5.3.1 Introduction

The WFD requires that environmental objectives are set for all surface and ground waters in England and Wales to enable them to achieve good ecological status (or good ecological potential for heavily modified / artificial water bodies) by a defined date. Through River Basin Management Plans (RBMP), the current status / potential of all water bodies is defined; the Directive requires that the status of a water body is considered when all new activities in the water environment are planned.

The environmental objectives of the WFD fall under Article 4(1) of the Directive, which states:

"Member States shall protect, enhance and restore all bodies of surface water, subject to the application of subparagraph (iii) for artificial and heavily modified bodies of water, with the aim of achieving good surface water status at the latest 15 years after the date of entry into force of this Directive."

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"Member States shall protect, enhance and restore all bodies of surface water, subject to the application of subparagraph (iii) for artificial and heavily modified bodies of water, with the aim of achieving good surface water status at the latest 15 years after the date of entry into force of this Directive."

The following sections detail the current status of, and pressures upon, the TYNE Transitional and Coastal (TraC) Water Body (Figure 5.1). Actions identified within the Northumbria The environmental objectives of the WFD fall under Article 4(1) of the Directive, which states:

"Member States shall protect, enhance and restore all bodies of surface water, subject to the application of subparagraph (iii) for artificial and heavily modified bodies of water, with the aim of achieving good surface water status at the latest 15 years after the date of entry into force of this Directive."

The following sections detail the current status of, and pressures upon, the TYNE Transitional and Coastal (TraC) Water Body (Figure 5.1). Actions identified within the Northumbria RBMP, and those being implemented, are also discussed.

Figure5.1 TYNE Transitionaland Coastal(TraC) Water Body

5.3.2 TYNE Transitional and Coastal (TraC) Water Body (GB510302310200)

Current status

The TYNE water body is classified as a 'Heavily Modified Water Body' (HMWB) for reasons of flood protection, navigation and quay line. Given its status as a HMWB, the Tyne water body is required to meet Good Ecological Potential (GEP) and good surface water chemical status by 2015. Annex B of the Northumbria RBMP states that the current status of the water body is Moderate Ecological Potential. Elements of the water body that are considered to be achieving less than good ecological potential are identified within Table 28.

Table 28 Tyne TraC water body elements which are less than good ecological potential

Element	Current status (and certainty of less than good)	Predicted Status by 2015	Justification for not achieving good status by 2015
Biological Elements			
Invertebrates	Moderate (uncertain)	Moderate	Not required (MS)[1]
Chemical Elements			
Tributyltin Compounds	Moderate (very certain)	Moderate	Technically infeasible

[1] MS = 'Morphology Sensitive'. Some biological elements are identified as being sensitive to morphological pressures. The specific elements vary depending on the water body type (for rivers, these elements are fish, macroinvertebrates and macrophytes). As these elements are sensitive to morphological pressures, it is difficult to determine whether these biological elements in Artificial and Heavily Modified Water Bodies are at less than good status due to the effects of morphological changes alone or also the impacts from other pressures. Where indicated by the use of this decision code [i.e. MS], these elements have therefore not been included in the classification or objective setting processes for the Artificial and Heavily Modified Water Bodies concerned. In these instances, the status of the morphology-sensitive biological element cannot lead to an alternative objective being set.

A number of mitigation measures which have a defined ecological potential are currently in place within this water body. These include:

- Altering the timing of dredging / disposal;
- Reducing sediment re-suspension;
- Reducing the impact of dredging;
- Preparing a dredging / disposal strategy;
- Avoiding the need to dredge;
- Flow manipulation; and,
- Modifying structure or reclamation.

Pressures

Annex G of the Northumbria RBMP provides a summary of the significant pressures and risks resulting from human activities on the status of surface water and groundwater. Within these pressures those that are relevant to the maintenance dredging include:

- Physical or morphological alteration pressures.

Actions

Annex C of the Northumbria RBMP (Environment Agency, 2009) identifies actions that are already taking place within the River Basin District and also further actions and when it is planned to achieve these. Those that are relevant to maintenance dredging include:

- Apply national guidance framework on dredging and disposal of dredgings to provide guidance to all those undertaking or permitting navigation dredging and disposal activities to assist in achieving the objectives of the WFD and related EQS Directive (2008/105/EEC) and refine local measures as appropriate (where not disproportionately costly or technically infeasible).
    - Current status: The Port is preparing a document demonstrating their compliance with the WFD.
- Sediment monitoring, modelling and bioaccumulation studies on heavy metals which may be related to sediment movements.
    - Current status: There has been a substantial body of work carried out during Phase 1 of the Tyne Sediment Study, which is ongoing.
- Ports, harbours and navigation authorities to prepare a dredging and disposal strategy, such as this Baseline Document as recommended under the Maintenance Dredging Protocol.

Permission must be sought from the Environment Agency, via a compliance assessment, to ensure that the dredging is in compliance with the WFD, with no deterioration to the existing status of the water body.

5.3.3 Consideration of the maintenance dredging under the WFD

In April 2010, the Environment Agency published draft guidance entitled '*Clearing the waters: A user guide for marine dredging activities*' (Environment Agency, 2010a), developed in association with the UK Major Ports Group, the British Ports Association and other interested parties.

Stage 1 of the process (Screening) applies to pre-existing (maintenance) dredging and associated disposal activities. Pre-existing means those which were started or ongoing during the period 2006 – 2008, the period when the classification of water bodies was being undertaken by the Environment Agency. As such, the Environment Agency considers that it has taken account of any significant effects or impacts upon status from activities undertaken during this period. Assuming there have been no significant changes and that no new information about impacts has become available, the continuation of the dredging or disposal activity should not cause deterioration in water body status.

The screening process therefore allows ongoing maintenance dredging and disposal activities to be 'screened-out' of further assessment as those activities will not cause deterioration or failure of the water body to meet its WFD objectives.

5.4 Recommendations

5.4.1 Updating of the Baseline Document

It is recommended that this Baseline Document be reviewed and updated every 3 years following any significant changes or events. The Port will record these changes with the use of their daily log on Sharepoint, which documents all of the dredging activities on the river (whether it be plough dredging or dredging involving disposal at sea) as well as any other activities that may be taking place on the river. Furthermore, an annual update of the Baseline Document will be undertaken to collate these changes which would be in the form of supplementary information and would be sent to Natural England for their records. This will allow the Port of Tyne to monitor the potential impact of any changes which may be made to the existing maintenance dredging regime, and of any other

changes or activities which may have the potential to have an impact upon the SPA in combination with this activity. Regular updating of this document will ultimately assist the regulators and the Port of Tyne in the licensing process.

6 REFERENCES

APEM (2008). River Tyne Salmon Action Plan Review.

Arup (2002). New Tyne Crossing Environmental Statement.

Bendall B (2007). CEFAS research on movements and behaviour of salmon and sea trout in the River Tyne. Report December 2007.

CEFAS (2006). CEFAS guideline Action Levels for dredged material.

CEFAS (2009). Dredged Material Disposal Site Monitoring across England and Wales: results of sampling under SLAB5 (2008-09).

DEFRA (2008). Eel Management Plans for the United Kingdom: Eel Management Plan for the Northumbria River Basin District. December 2008.

Environment Agency (2010a). Clearing the waters: A user guide for marine dredging activities. April 2010.

Environment Agency (2009a). Northumbria River Basin District, River Basin Management Plan December 2015.

Environment Agency (2009b). New Tyne Crossing Dredging proposals – Questions and Answers, June 2009.

Musgrove, A J, Langston, R H W, Baker, H and Ward, R M (eds). 2003. Estuarine Waterbirds at Low Tide: the WeBS Low Tide Counts 1992/93 to 1998/99. WSG/BTO/WWT/RSPB/JNCC,Thetford.

Natural England (2010). Nature on the map website. Accessed November 2010. http://www.natureonthemap.org.uk/

Royal Haskoning (2007). River Tyne to Flamborough Head Shoreline Management Plan (SMP) 2. Scarborough Borough Council.

Tyne Rivers Trust (2010). Accessed November 2009.
http://www.fishpal.com/England/Tyne/index.asp?dom=Tyne

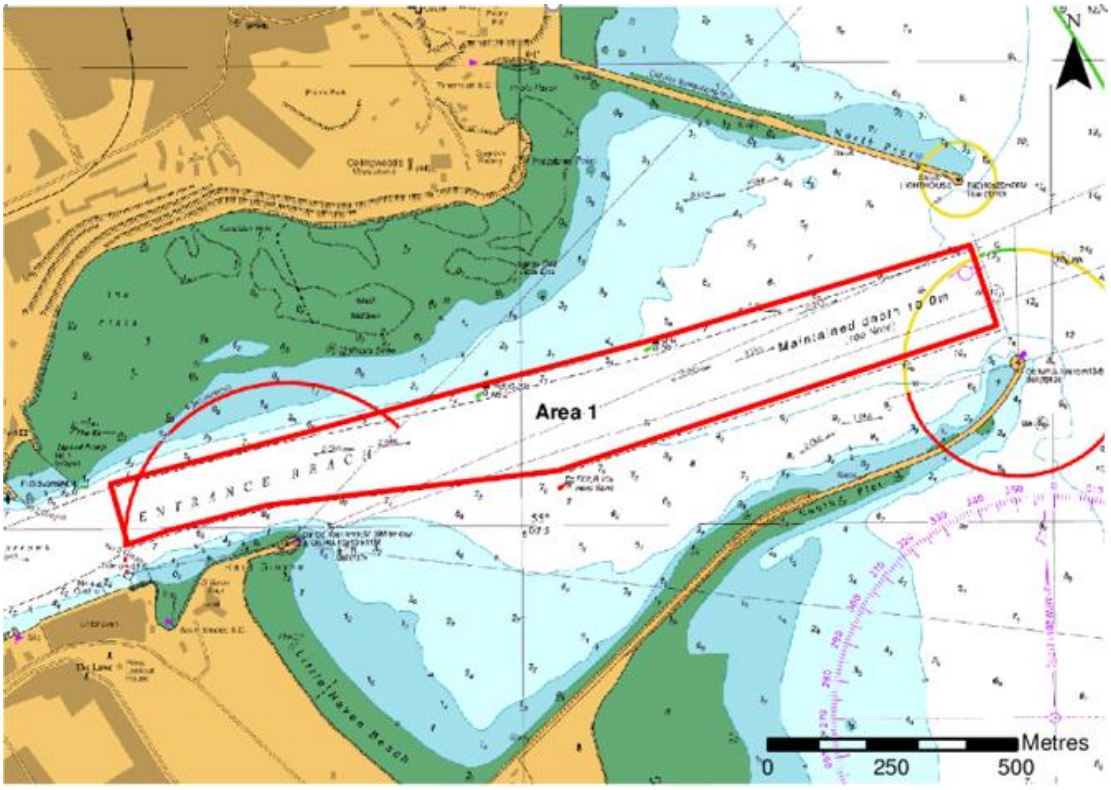
Royal Haskoning (2014). Cell 1 Sediment Transport Study
(Phase 2: Main Report)

Newcastle University (2015). Reconnaissance
Investigations on Dredging and Disposal on the River Tyne
(Phases I and II)

Appendix A

Maintenance dredge areas – data sheets

Figure A.1 **Maintenance dredging by tonnage in Area 1**



Area number		1				
Location		Harbour Channel				
Latitude		55° 00.64' N				
Longitude		001° 24.89' W				
Nature of dredge area		Harbour				
Excluded from offshore disposal?		No				
Year	**Tonnes**	**Histogram of dredged material per year**				
2000	93,226					
2001	0					
2002	54,186					
2003	0					
2004	0					
2005	128,470					
2006	103,917					
2007	35,936					
2008	25,126					
2009	41,221					
2010	14,862					
2011	29,715					
2012	12,160					
2013	141,728					
2014	60,320					
2015	38,162					
2016	30,828					
Preferred Dredging Method						
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger		
Bucket Dredger		Plough Dredger		Water Injection Dredger		
Disposal Area						
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	X	
Notes:						
Sand to be used as required for replenishment of cap at Souter CDM Site						
Potential for beneficial use in beach replenishment being investigated						

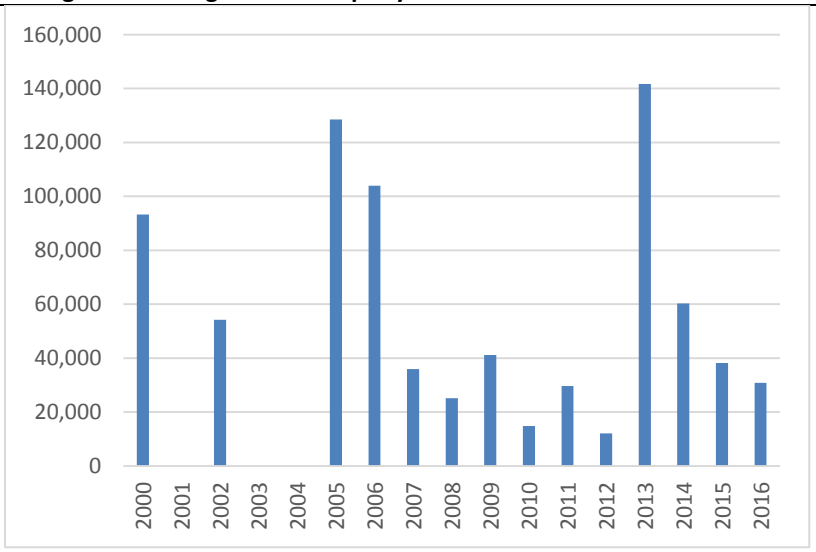
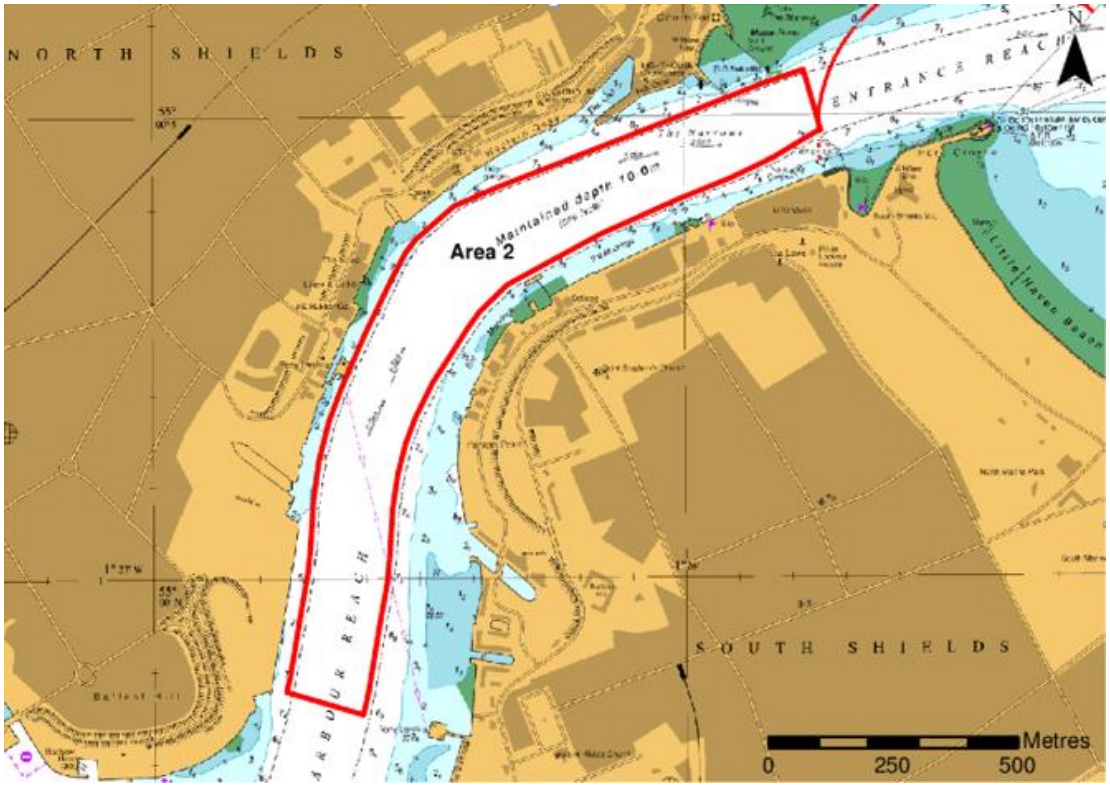
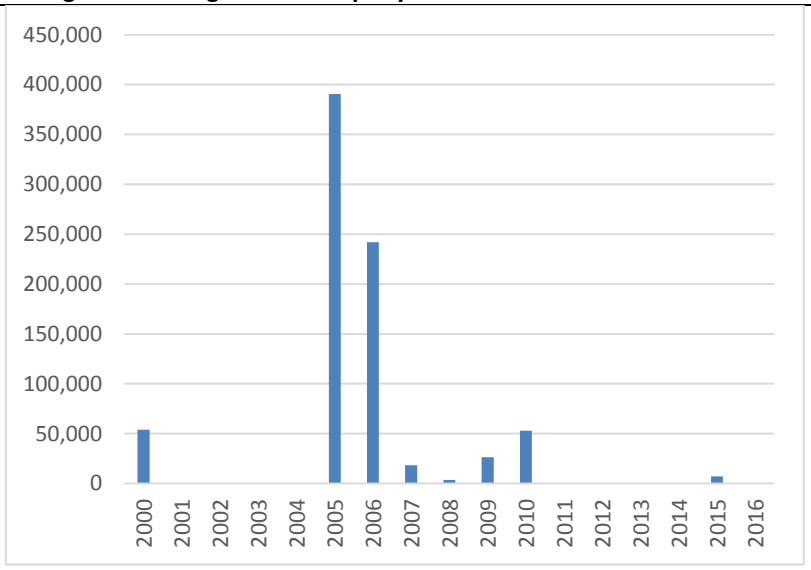


Figure A.2 **Maintenance dredging by tonnage in Area 2**

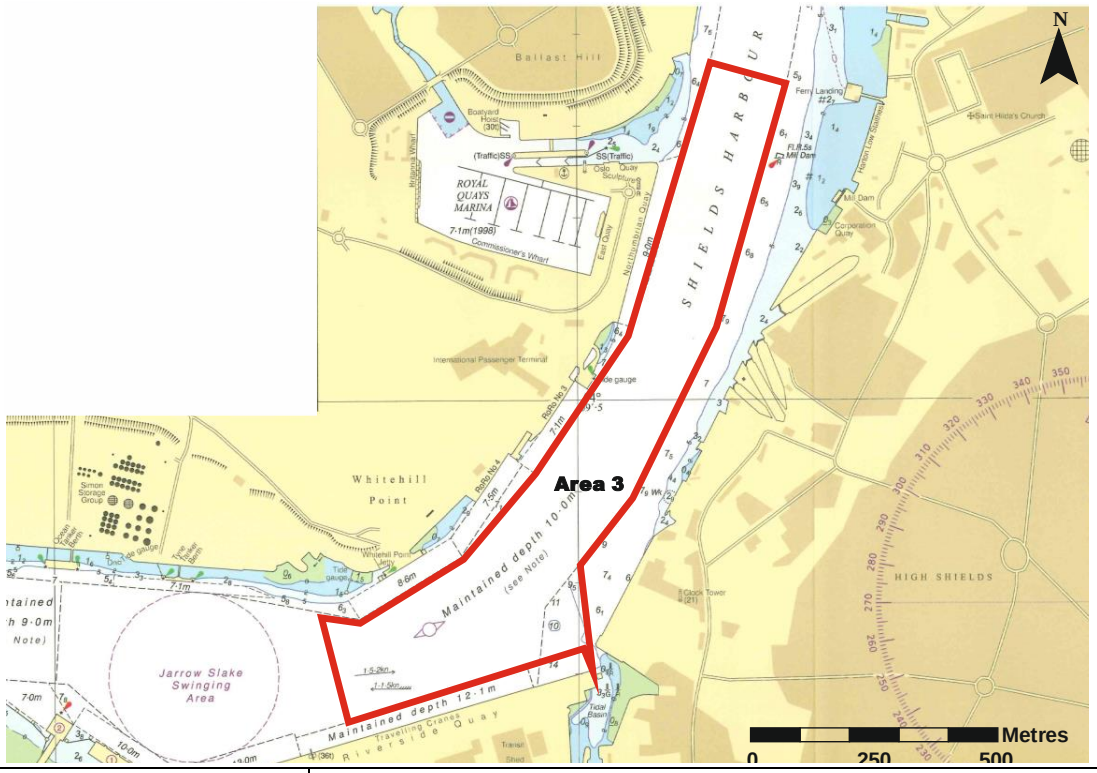


Area number		2
Location		Harbour Channel
Latitude		55° 00.23' N
Longitude		001° 26.30' W
Nature of dredge area		River – maintained at 10.0m below Chart Datum
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	54,106	
2001	0	
2002	0	
2003	0	
2004	0	
2005	390,515	
2006	241,883	
2007	18,459	
2008	3,470	
2009	26,379	
2010	53,111	
2011	0	
2012	0	
2013	0	
2014	0	
2015	7,150	
2016	0	

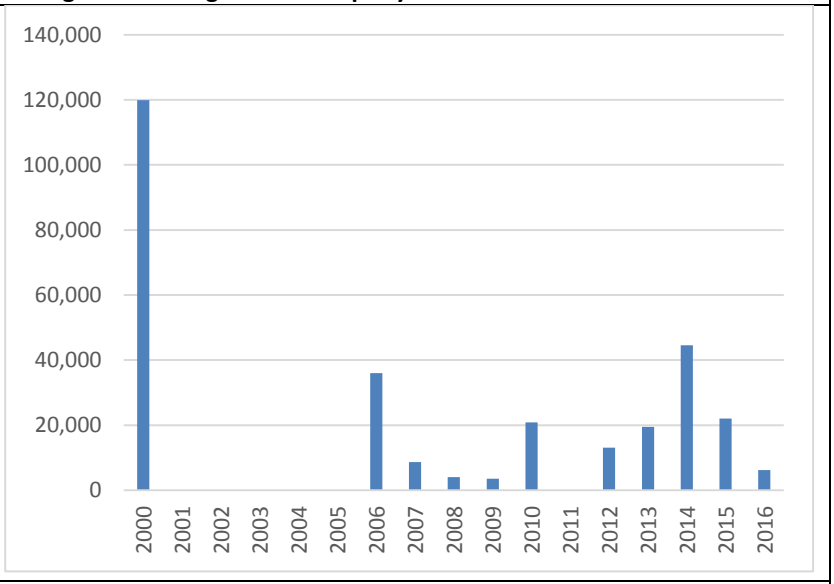


Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger		Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
Dredging restricted under FEPA Licence Condition south west corner of area due to berth contamination					
Potential for fishing debris in vicinity of the Fish Quay					

Figure A.3 **Maintenance dredging by tonnage in Area 3**

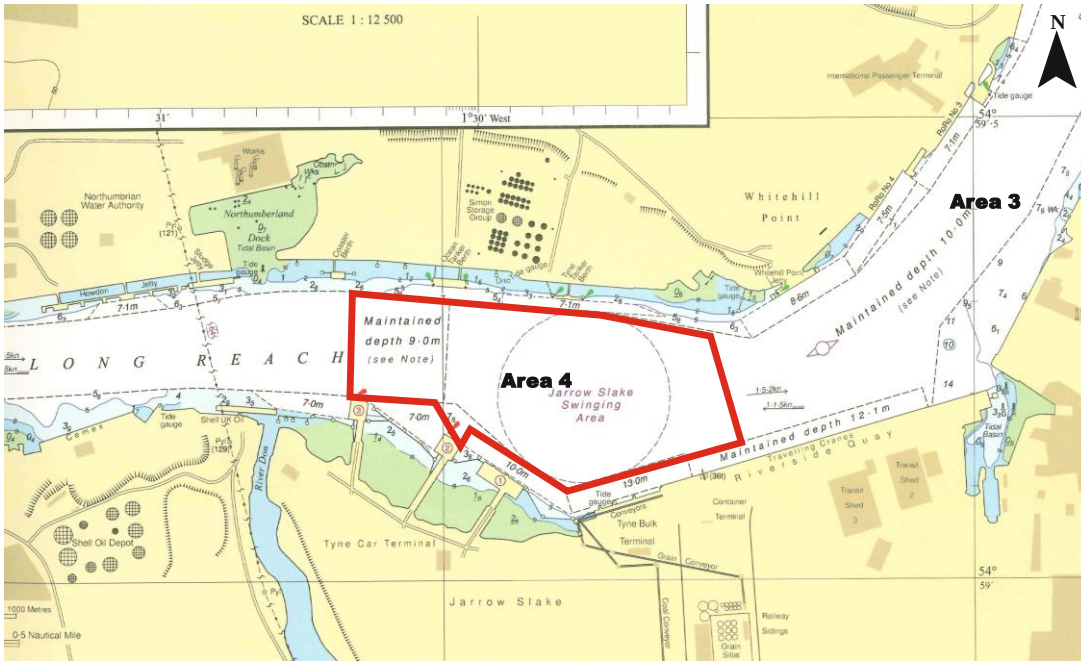


Area number		3
Location		Channel: Shields Harbour up-river Reach
Latitude		54° 59.49' N
Longitude		001° 27.02' W
Nature of dredge area		River – maintained at 10.0m below Chart Datum
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	119,900	
2001	0	
2002	0	
2003	0	
2004	0	
2005	0	
2006	35,968	
2007	8,615	
2008	4,012	
2009	3,537	
2010	20,878	
2011	0	
2012	13,077	
2013	19,486	
2014	44,599	
2015	22,032	
2016	6,163	

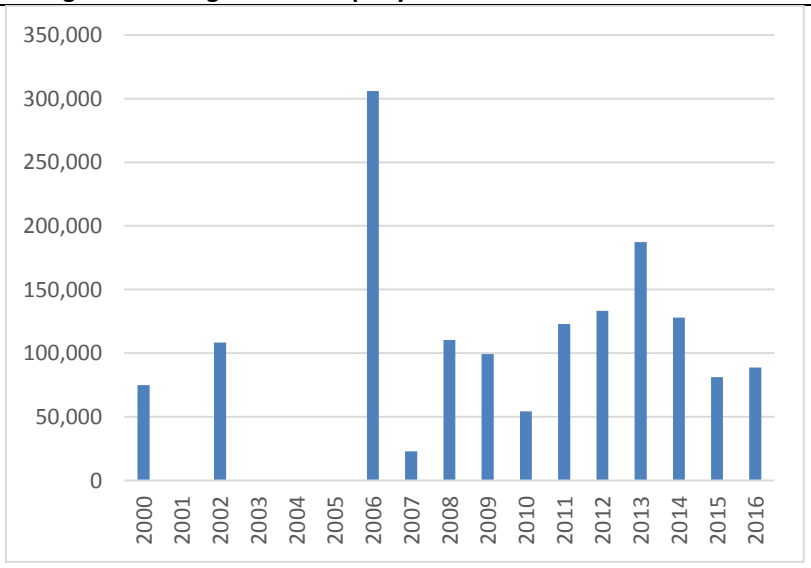


Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger		Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Figure A.4 **Maintenance dredging by tonnage in Area 4**

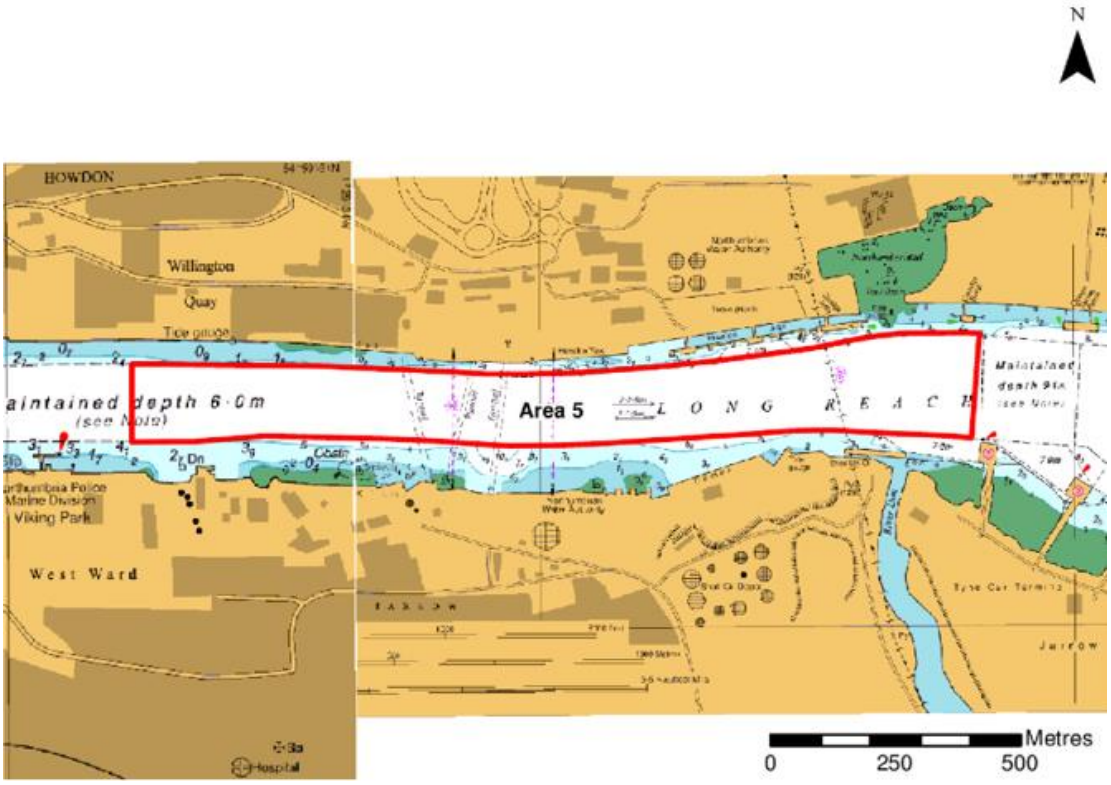


Area number		4
Location		Channel: Northumberland Dock to Jarrow Quay Corner Reach
Latitude		54° 59.21' N
Longitude		001° 27.81' W
Nature of dredge area		River – maintained at 10.0m below Chart Datum
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	74,908	
2001	0	
2002	108,303	
2003	0	
2004	0	
2005	0	
2006	305,885	
2007	23,006	
2008	110,348	
2009	99,266	
2010	54,394	
2011	122,969	
2012	133,214	
2013	187,405	
2014	128,090	
2015	81,155	
2016	88,848	

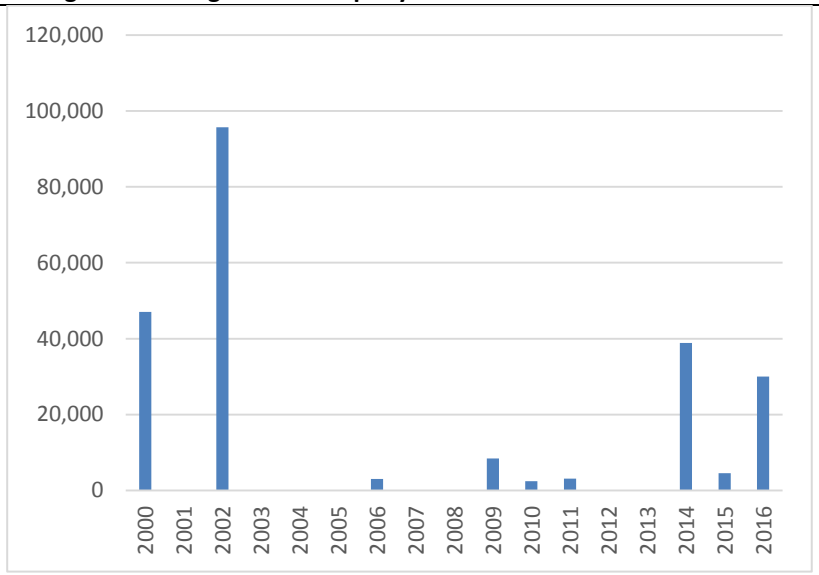


Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger		Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Figure A.5 **Maintenance dredging by tonnage in Area 5**

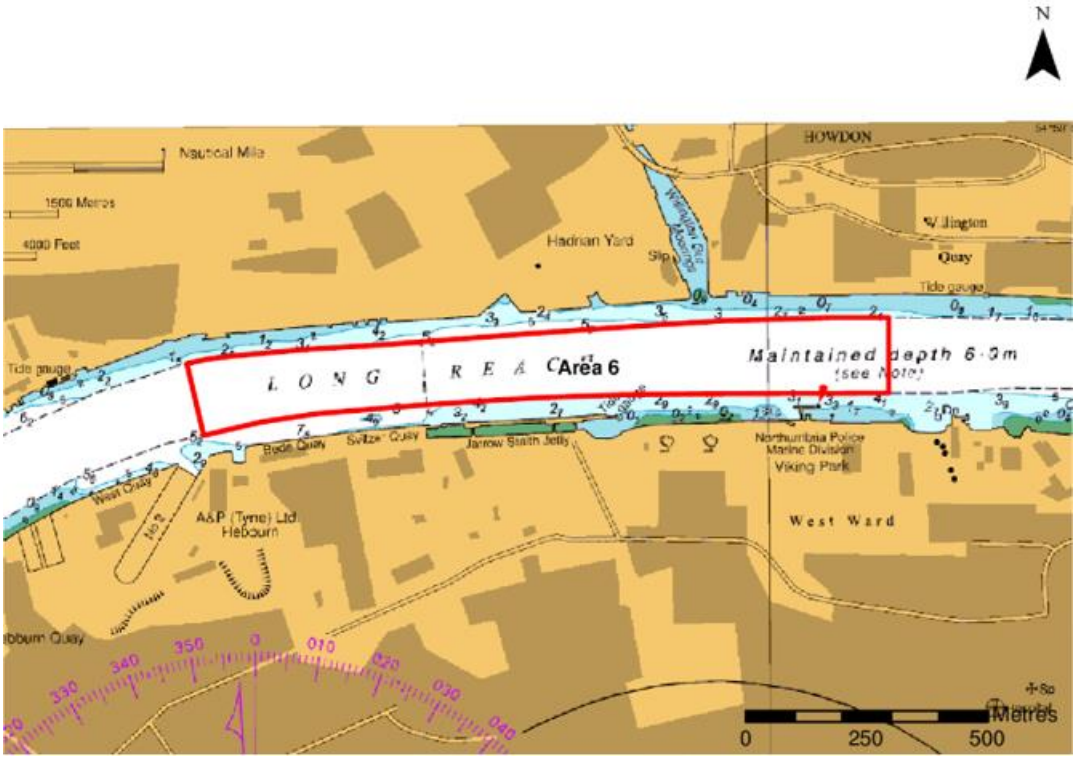


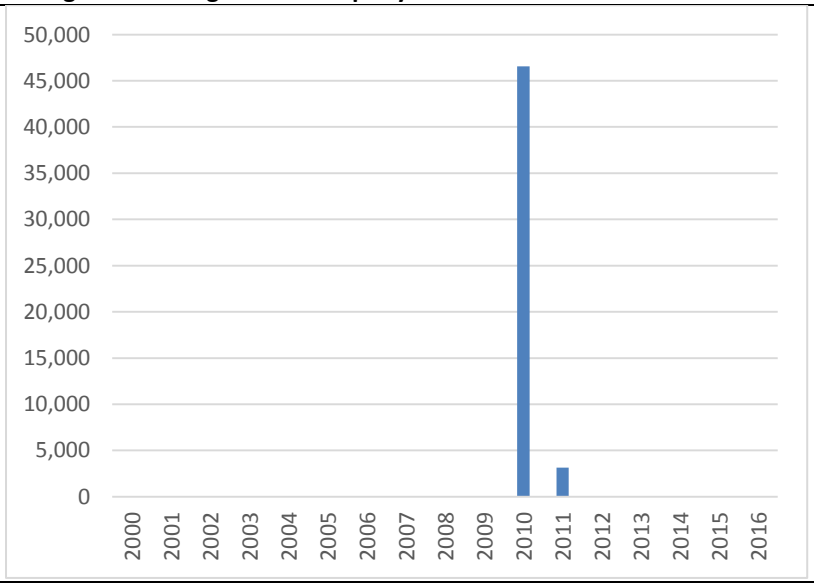
Area number		5
Location		Channel: Long Reach down river
Latitude		54° 59.25' N
Longitude		001° 28.94' W
Nature of dredge area		River – maintained at 6.0m below Chart Datum
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	47,014	
2001	0	
2002	95,700	
2003	0	
2004	0	
2005	0	
2006	3,031	
2007	0	
2008	0	
2009	8,422	
2010	2,408	
2011	3,139	
2012	0	
2013	0	
2014	38,845	
2015	4,551	
2016	30,053	



Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger		Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

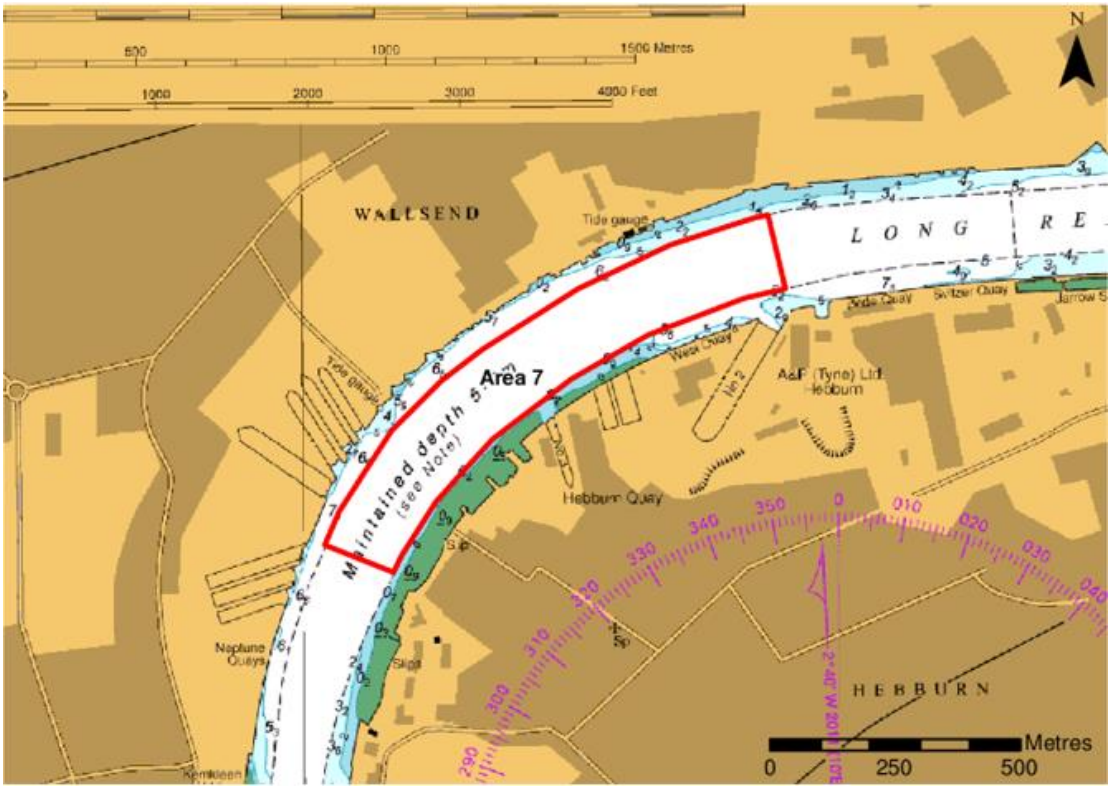
Figure A.6 **Maintenance dredging by tonnage in Area 6**



Area number		6
Location		Channel: Long Reach up-river
Latitude		54° 59.23' N
Longitude		001° 30.43' W
Nature of dredge area		River – maintained at 6.0m & 5.2m below Chart Datum
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	0	
2001	0	
2002	0	
2003	0	
2004	0	
2005	0	
2006	0	
2007	0	
2008	0	
2009	0	
2010	46,575	
2011	3,139	
2012	0	
2013	0	
2014	0	
2015	0	
2016	0	

Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger		Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

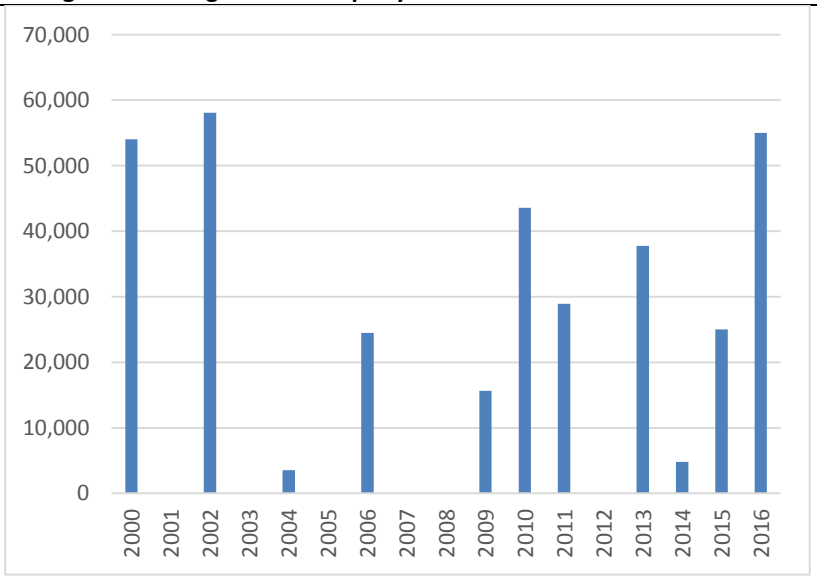
Figure A.7 **Maintenance dredging by tonnage in Area 7**



Area number	7
Location	Channel: Swan's Bend
Latitude	54° 59.06' N
Longitude	001° 31.53' W
Nature of dredge area	River – maintained at 5.2m below Chart Datum
Excluded from offshore disposal?	No

Year	**Tonnes**
2000	54,036
2001	0
2002	58,047
2003	0
2004	3,528
2005	0
2006	24,457
2007	0
2008	0
2009	15,666
2010	43,578
2011	28,913
2012	0
2013	37,762
2014	4,809
2015	25,013
2016	54,979

Histogram of dredged material per year



Preferred Dredging Method

Trailer Suction Dredger	X	Grab Dredger		Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	

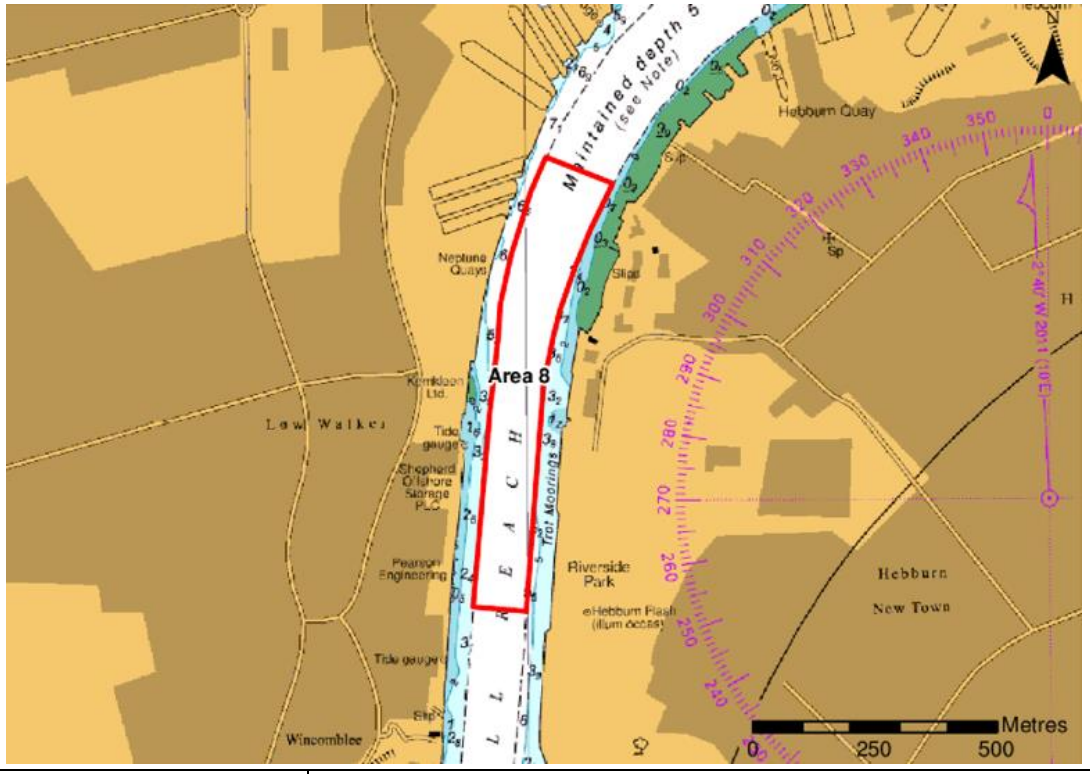
Disposal Area

North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	

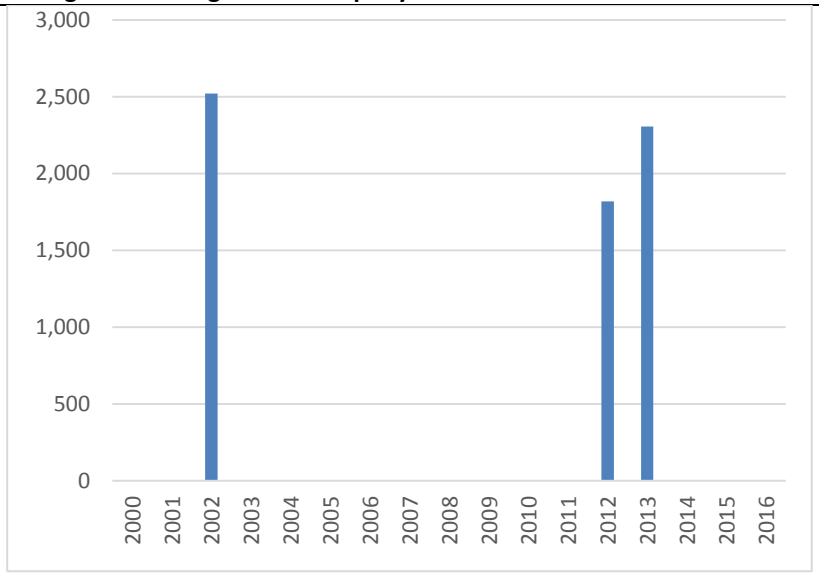
Notes:

Berths along north edge of the area are all contaminated – caution to be taken when dredging in vicinity

Figure A.8 **Maintenance dredging by tonnage in Area 8**

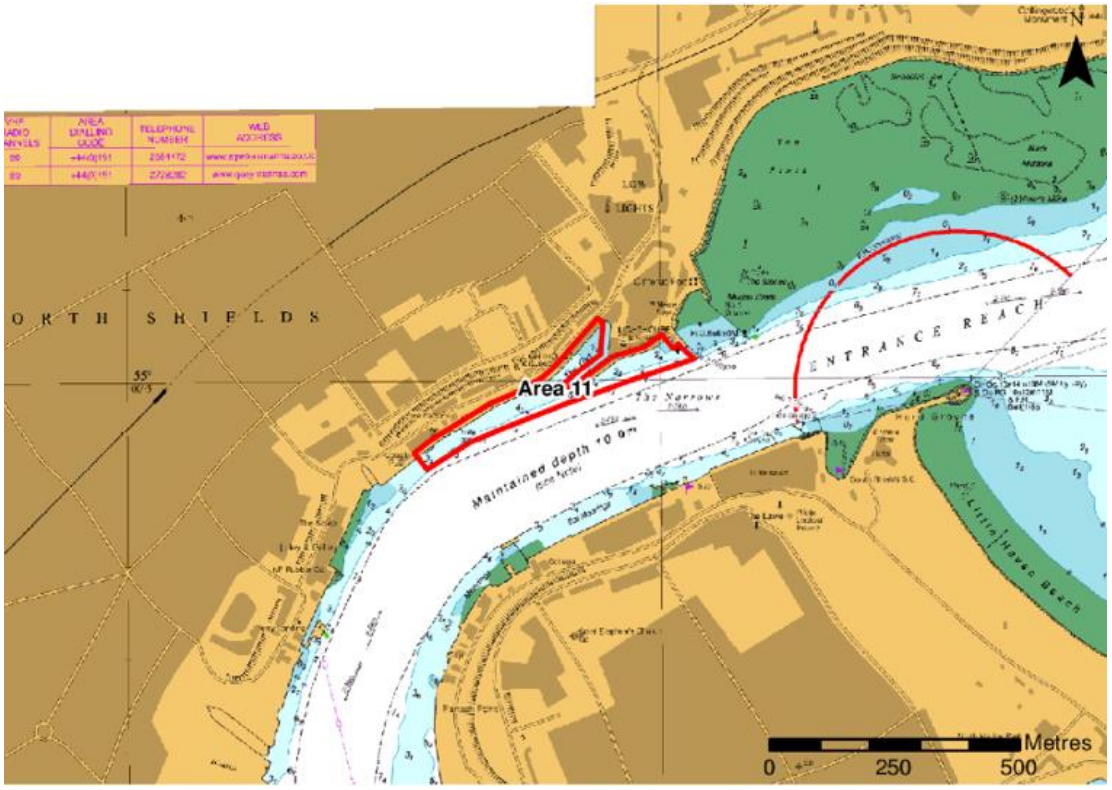


Area number		8
Location		Channel: Bill Reach down river
Latitude		54° 58.64' N
Longitude		001° 31.98' W
Nature of dredge area		River – maintained at 5.2m below Chart Datum
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	0	
2001	0	
2002	2,520	
2003	0	
2004	0	
2005	0	
2006	0	
2007	0	
2008	0	
2009	0	
2010	0	
2011	0	
2012	1,819	
2013	2,306	
2014	0	
2015	0	
2016	0	

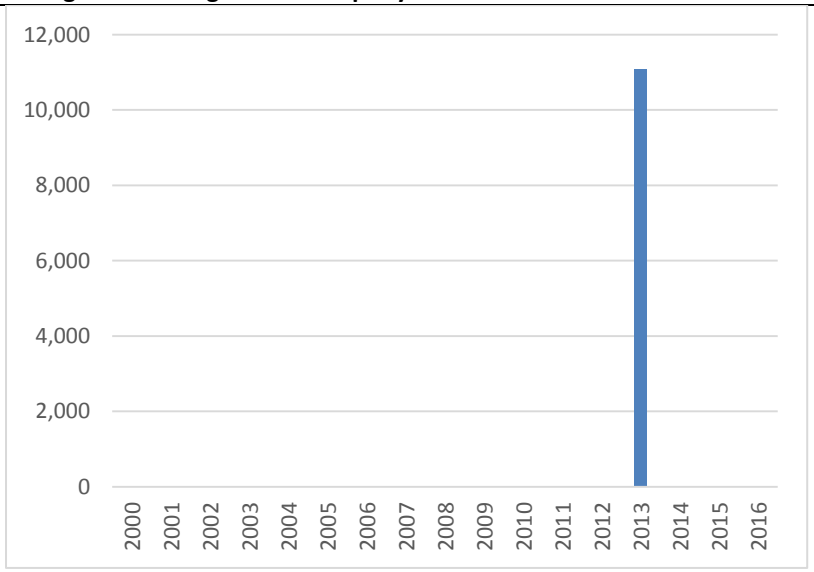


Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger		Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
Berths along west edge of the area are all contaminated – caution to be taken when dredging in vicinity					

Figure A.9 **Maintenance dredging by tonnage in Area 11**

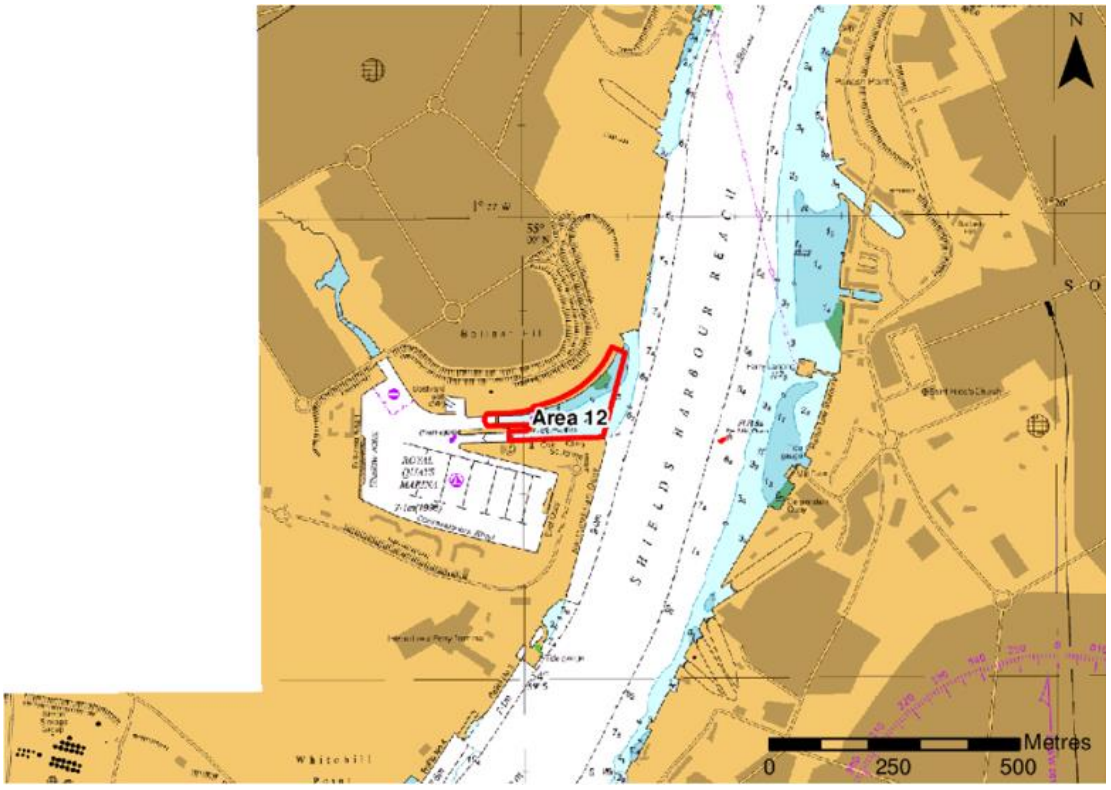


Area number		11
Location		Fish Quay
Latitude		55° 00.49' N
Longitude		001° 26.18' W
Nature of dredge area		Berth – maintained at 3.0m below Chart Datum
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	0	
2001	0	
2002	0	
2003	0	
2004	0	
2005	0	
2006	0	
2007	0	
2008	0	
2009	0	
2010	0	
2011	0	
2012	0	
2013	11,070	
2014	0	
2015	0	
2016	0	



Preferred Dredging Method					
Trailer Suction Dredger		Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
Some fishing debris encountered					

Figure A.10 **Maintenance dredging by tonnage in Area 12**



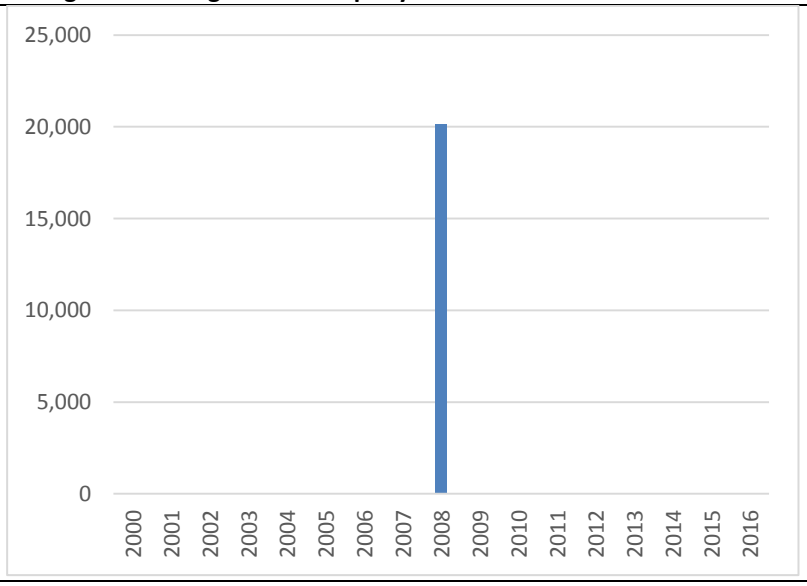
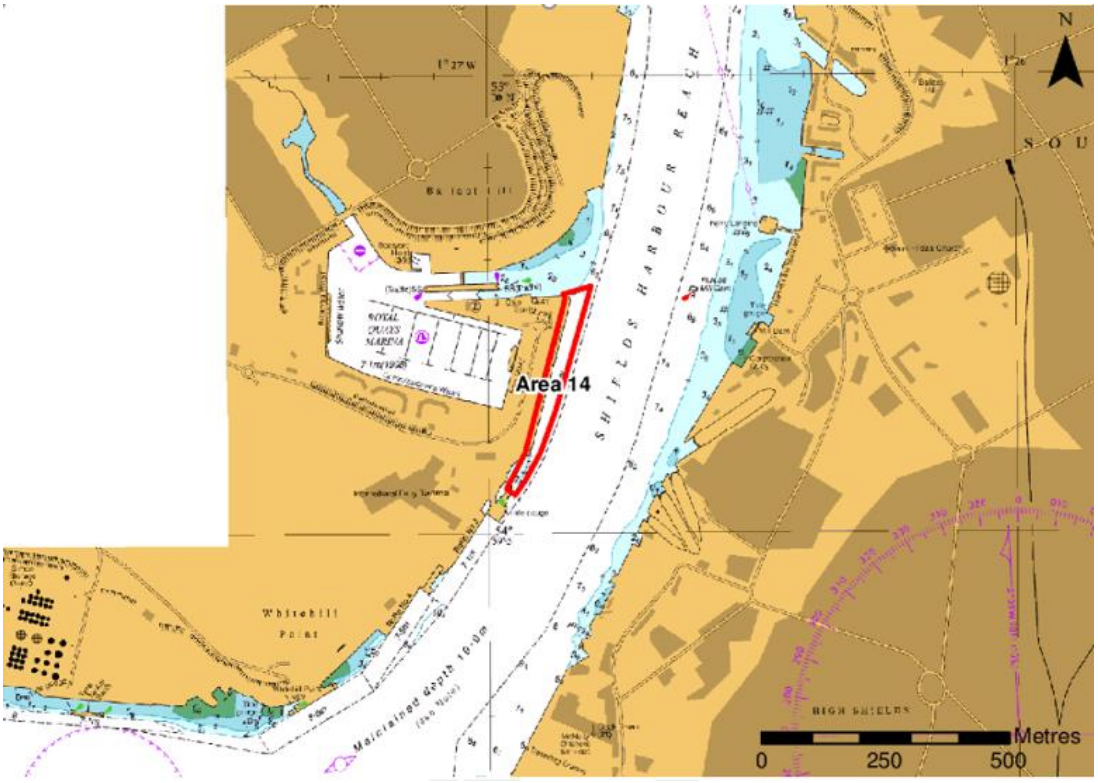
Area number		12				
Location		Royal Quays Marina and Approach				
Latitude		54° 59.80' N				
Longitude		001° 26.91' W				
Nature of dredge area		Berth – maintained at 3.5m below Chart Datum				
Excluded from offshore disposal?		No				
Year	**Tonnes**	**Histogram of dredged material per year**				
2000	0					
2001	0					
2002	0					
2003	0					
2004	0					
2005	0					
2006	0					
2007	0					
2008	20,160					
2009	0					
2010	0					
2011	0					
2012	0					
2013	0					
2014	0					
2015	0					
2016	0					
Preferred Dredging Method						
Trailer Suction Dredger		Grab Dredger	X	Backhoe Dredger		
Bucket Dredger		Plough Dredger	X	Water Injection Dredger		
Disposal Area						
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)		
Notes:						
Berths at north edge of the area are all contaminated – caution to be taken when dredging in vicinity						

Figure A.11 **Maintenance dredging by tonnage in Area 14**



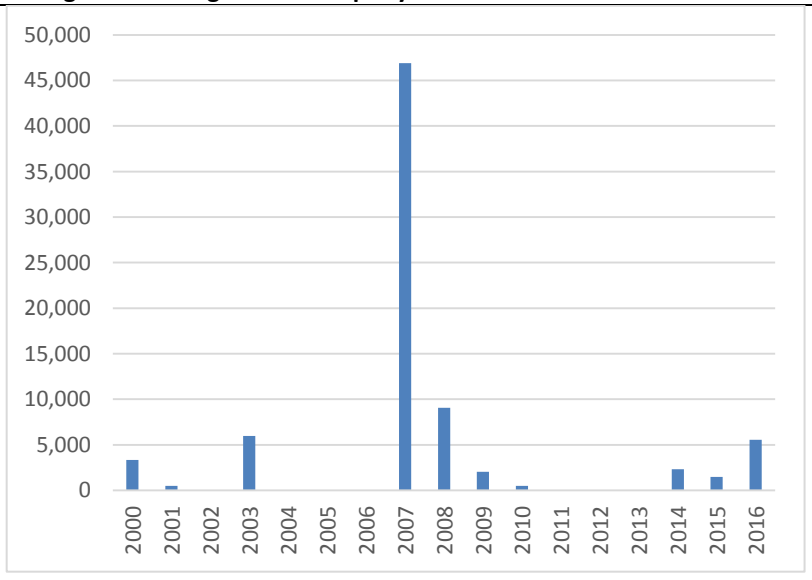
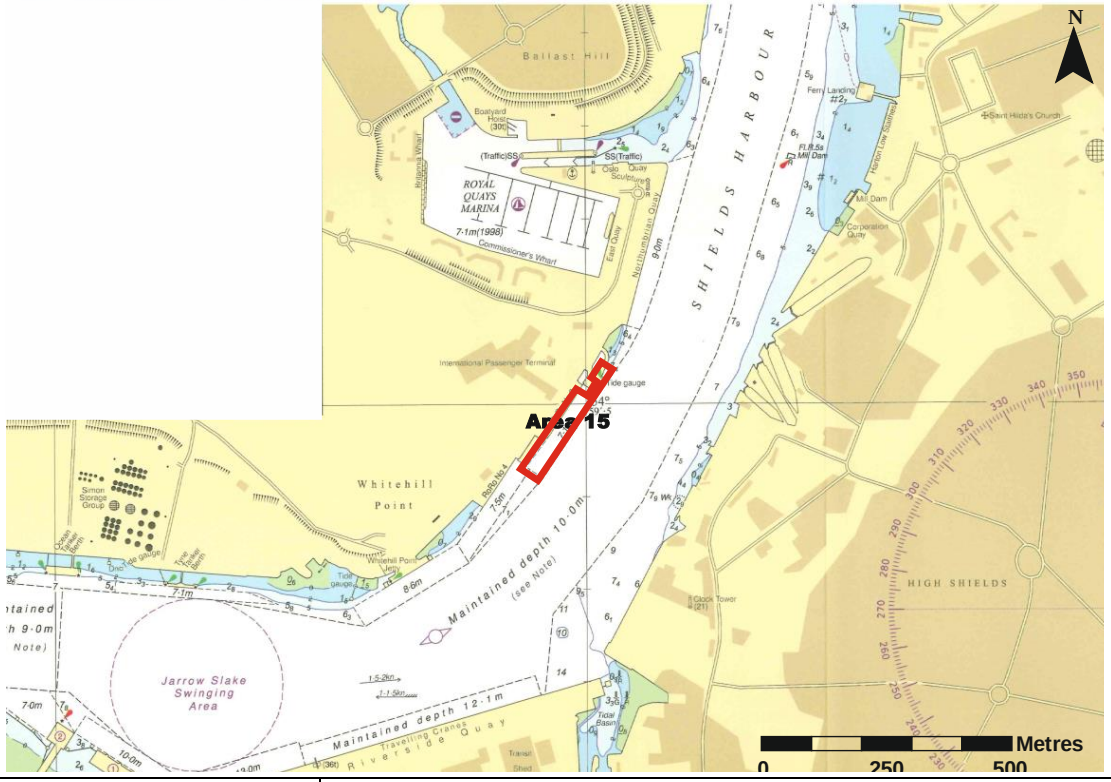
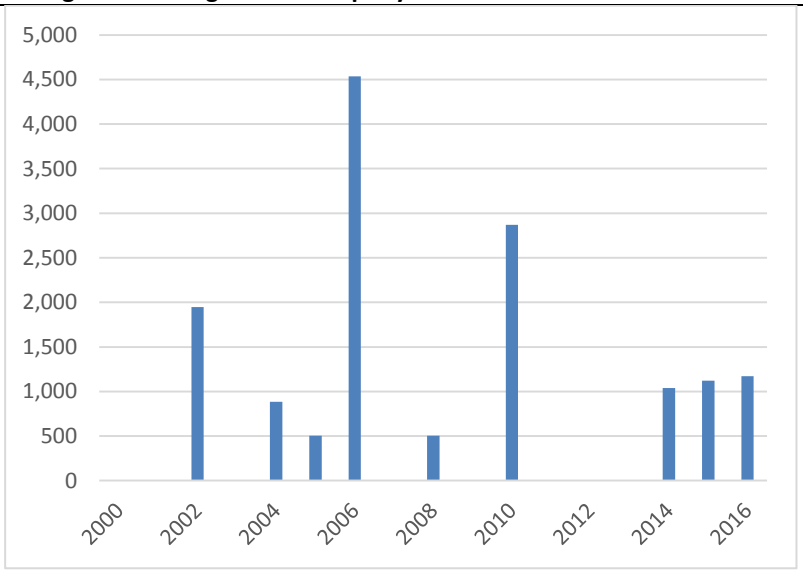
Area number		14				
Location		Northumbrian Quay				
Latitude		54° 59.66' N				
Longitude		001° 26.87' W				
Nature of dredge area		Berth – maintained at 9.0m below Chart Datum				
Excluded from offshore disposal?		No				
Year	**Tonnes**	**Histogram of dredged material per year**				
2000	3,321					
2001	504					
2002	0					
2003	5,967					
2004	0					
2005	0					
2006	0					
2007	46,897					
2008	9,056					
2009	2,044					
2010	504					
2011	0					
2012	0					
2013	0					
2014	2,306					
2015	1,483					
2016	5,564					
Preferred Dredging Method						
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger		
Bucket Dredger		Plough Dredger	X	Water Injection Dredger		
Disposal Area						
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)		
Notes:						
No significant issues						

Figure A.12 **Maintenance dredging by tonnage in Area 15**

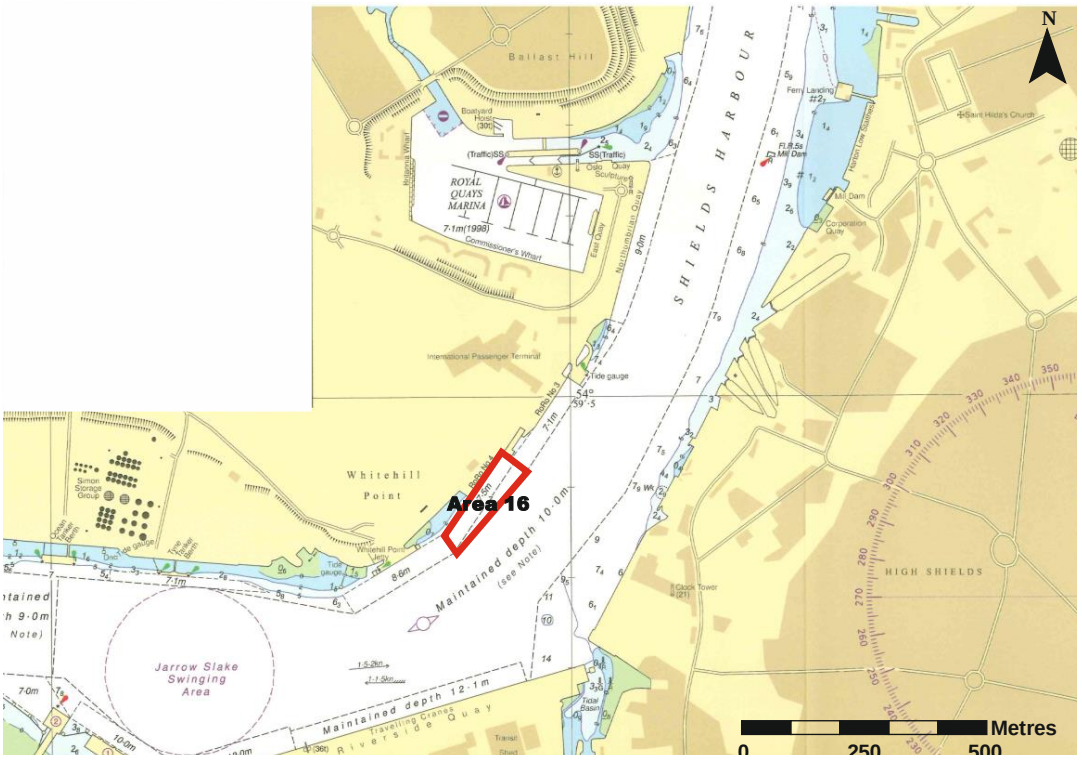


Area number		15
Location		RoRo Berth Number 3
Latitude		54° 59.48' N
Longitude		001° 27.03' W
Nature of dredge area		Berth – maintained at 7.1m below Chart Datum
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	0	
2001	0	
2002	1,946	
2003	0	
2004	883	
2005	504	
2006	4,536	
2007	0	
2008	504	
2009	0	
2010	2,871	
2011	0	
2012	0	
2013	0	
2014	1,040	
2015	1,123	
2016	1,170	

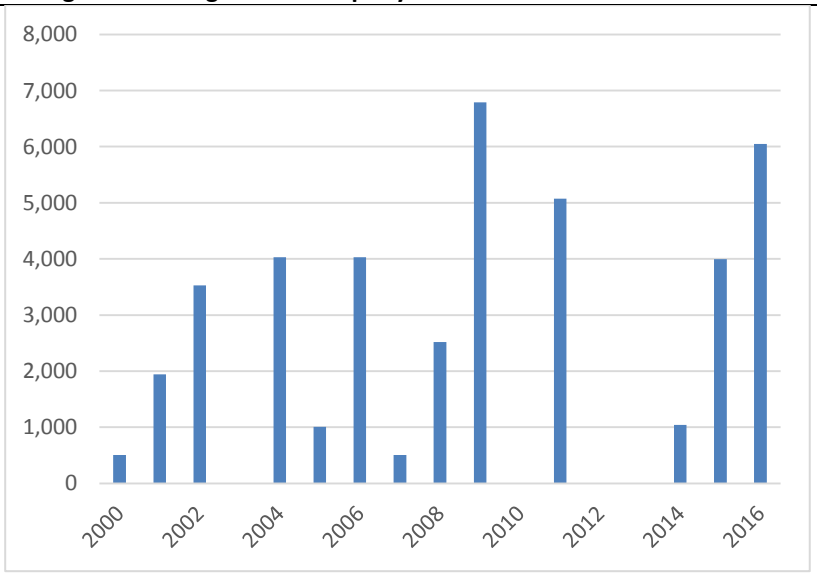


Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Figure A.13 **Maintenance dredging by tonnage in Area 16**

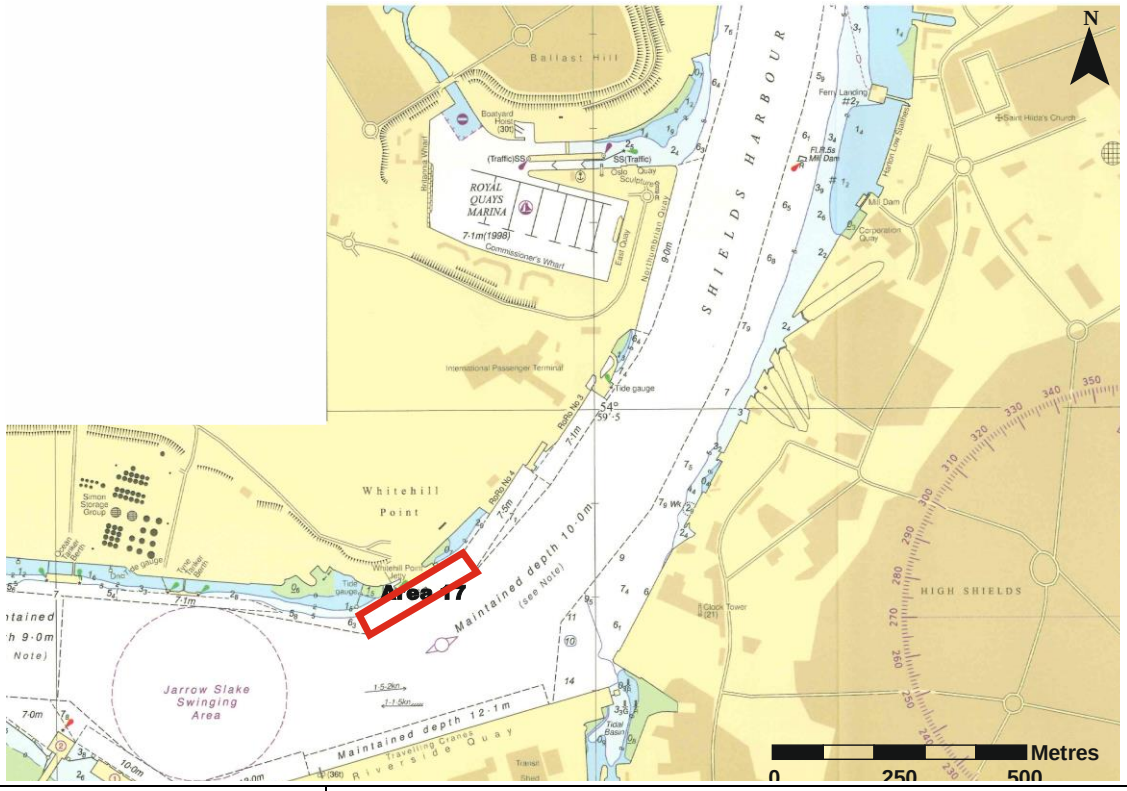


Area number		16
Location		RoRo Berth Number 4
Latitude		54° 59.39' N
Longitude		001° 27.16' W
Nature of dredge area		Berth – maintained at 7.5m below Chart Datum
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	504	
2001	1,945	
2002	3,528	
2003	0	
2004	4,032	
2005	1,008	
2006	4,032	
2007	504	
2008	2,520	
2009	6,787	
2010	0	
2011	5,075	
2012	0	
2013	0	
2014	1,040	
2015	3,998	
2016	6,050	

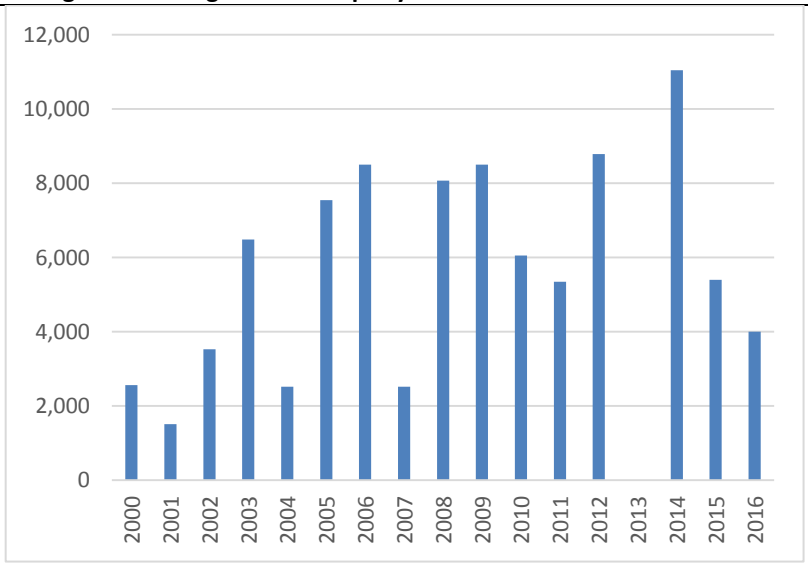


Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Figure A.14 **Maintenance dredging by tonnage in Area 17**

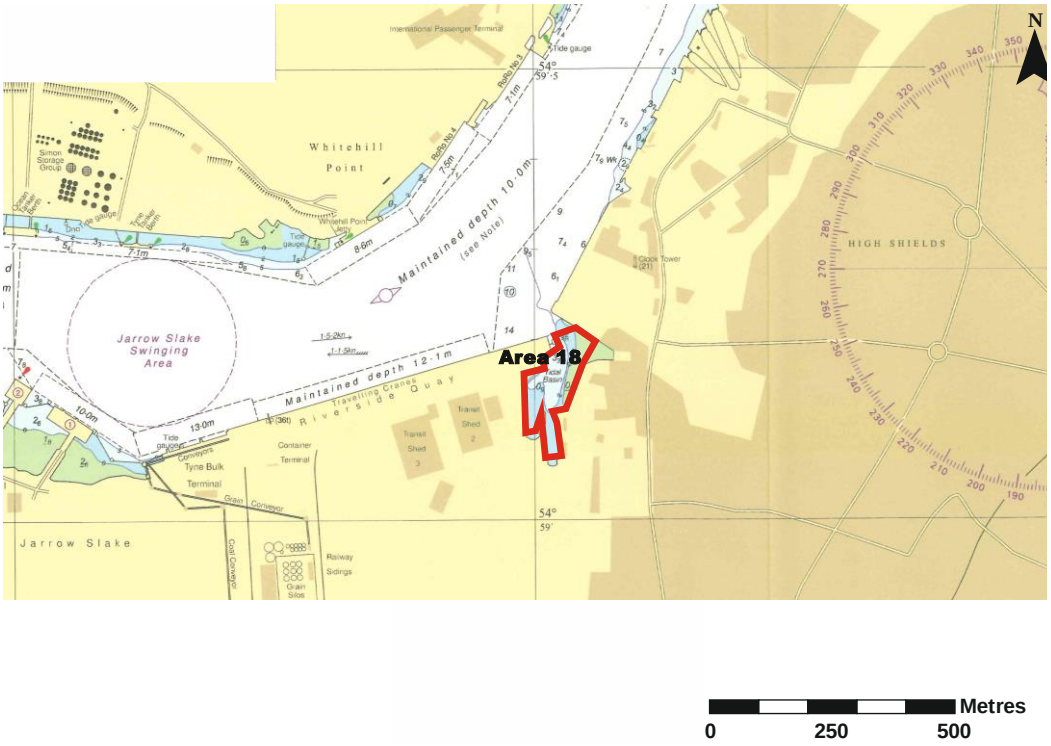


Area number		17
Location		Whitehill Point Jetty
Latitude		54° 59.31' N
Longitude		001° 27.33' W
Nature of dredge area		Berth – maintained at 8.6m below Chart Datum
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	2,561	
2001	1,512	
2002	3,528	
2003	6,481	
2004	2,520	
2005	7,545	
2006	8,497	
2007	2,520	
2008	8,064	
2009	8,498	
2010	6,048	
2011	5,340	
2012	8,783	
2013	0	
2014	11,042	
2015	5,398	
2016	4,001	

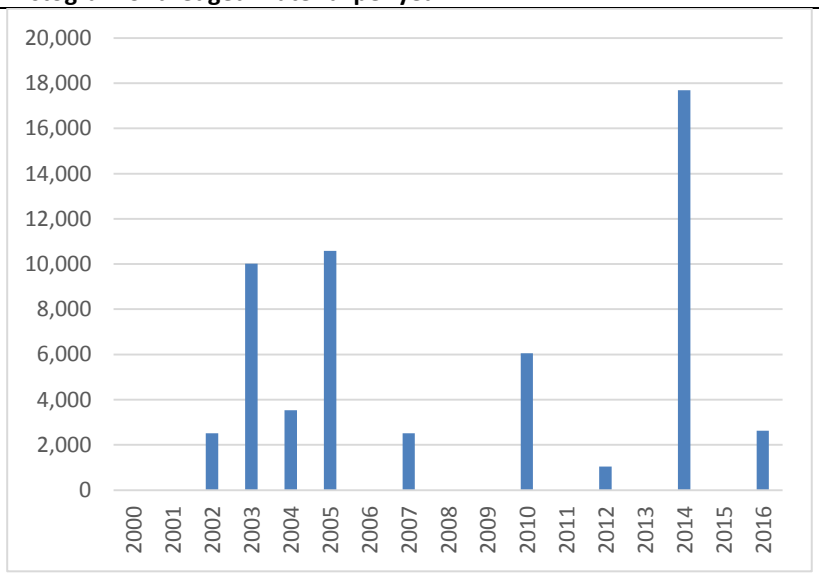


Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Figure A.15 **Maintenance dredging by tonnage in Area 18**

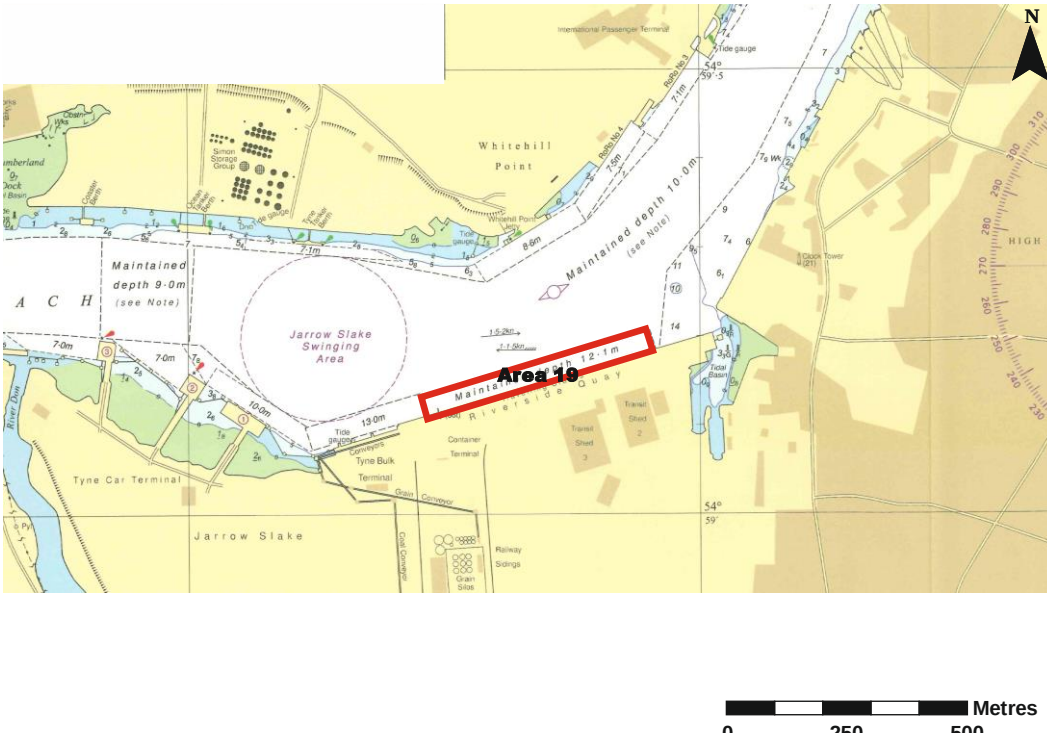


Area number		18
Location		Tyne Dock Entrance
Latitude		54° 59.17' N
Longitude		001° 26.98' W
Nature of dredge area		Berth – maintained at 2.5m below Chart Datum
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	0	
2001	0	
2002	2,520	
2003	10,009	
2004	3,528	
2005	10,584	
2006	0	
2007	2,520	
2008	0	
2009	0	
2010	6,048	
2011	0	
2012	1,040	
2013	0	
2014	17,684	
2015	0	
2016	2,620	

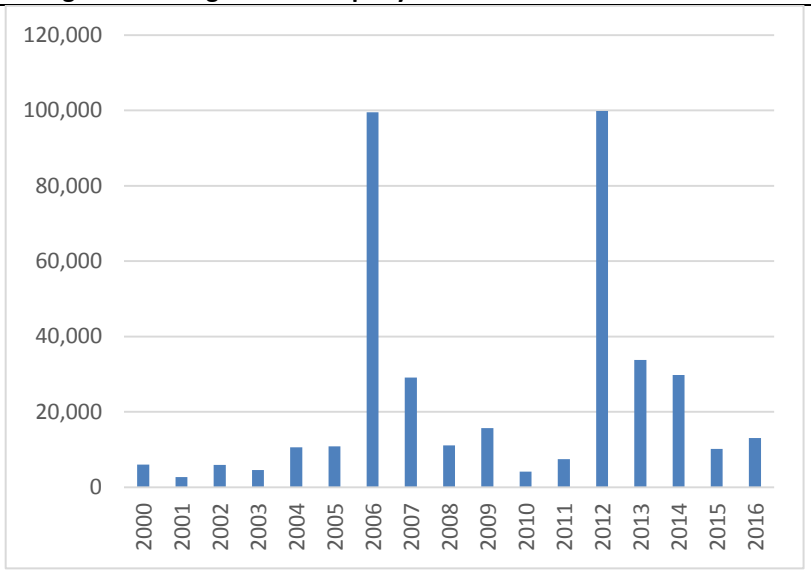


Preferred Dredging Method					
Trailer Suction Dredger		Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Figure A.16 **Maintenance dredging by tonnage in Area 19**

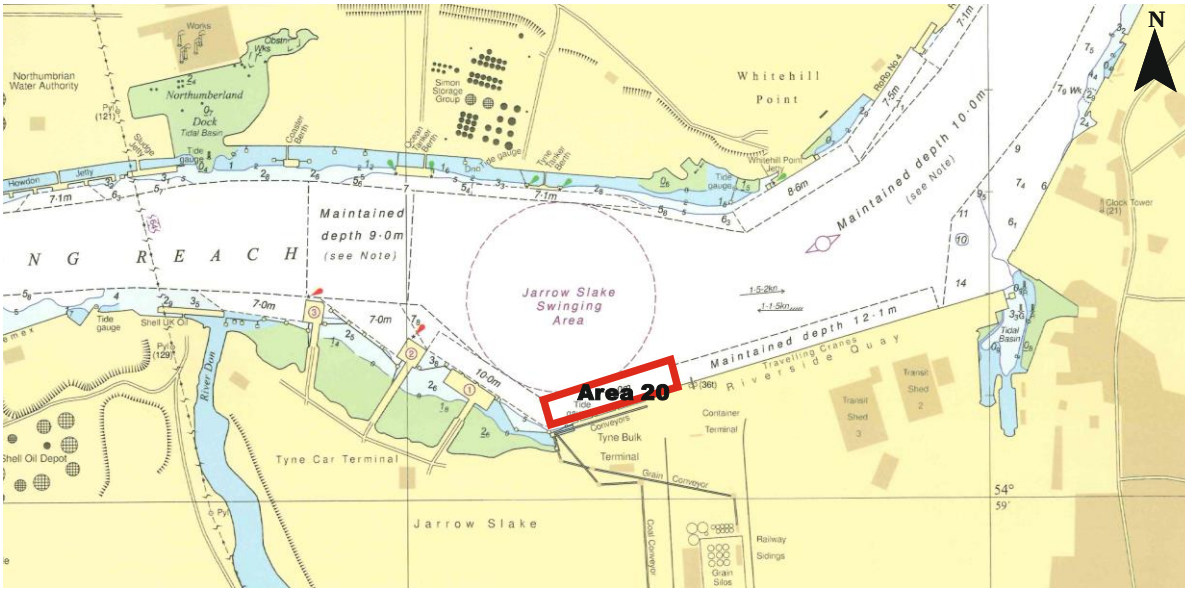


Area number		19
Location		Riverside Quay
Latitude		54° 59.16' N
Longitude		001° 27.32' W
Nature of dredge area		Berth – maintained at 12.1m below Chart Datum
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	5,980	
2001	2,666	
2002	5,896	
2003	4,519	
2004	10,554	
2005	10,800	
2006	99,485	
2007	29,101	
2008	11,125	
2009	15,709	
2010	4,124	
2011	7,461	
2012	99,849	
2013	33,773	
2014	29,797	
2015	10,117	
2016	13,034	



Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

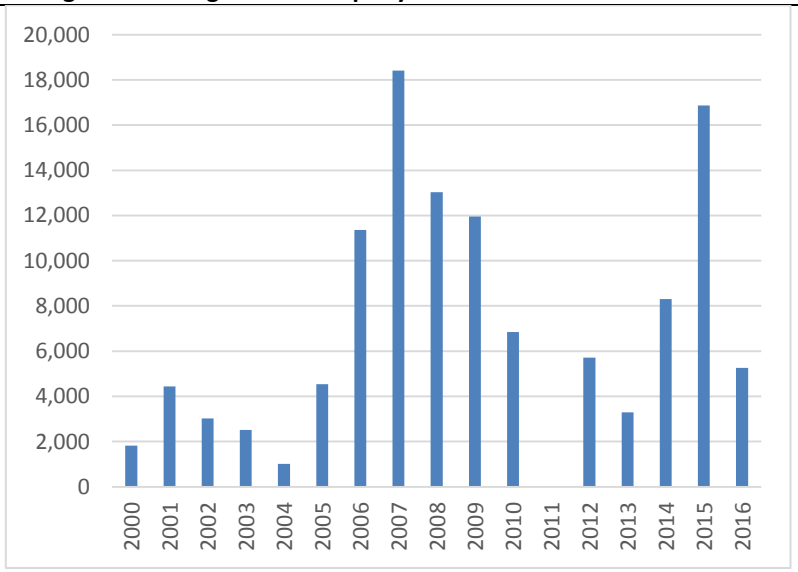
Figure A.17 **Maintenance dredging by tonnage in Area 20**



Area number	20
Location	Tyne Bulk Terminal
Latitude	54° 59.11' N
Longitude	001° 27.65' W
Nature of dredge area	Berth – maintained at 13.0m below Chart Datum
Excluded from offshore disposal?	No

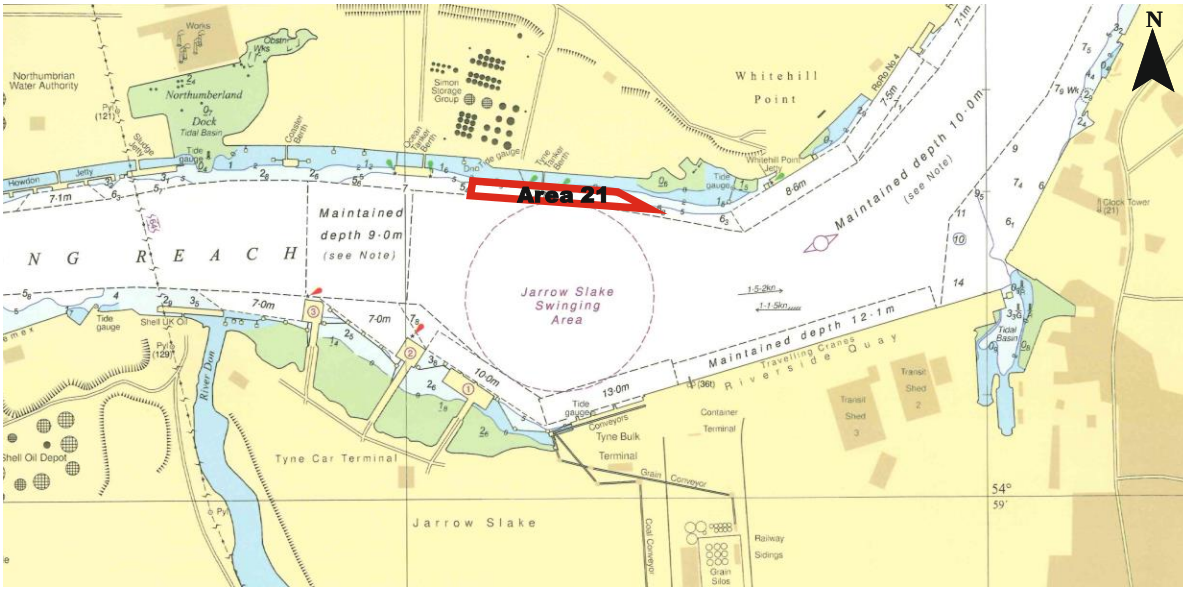
Year	**Tonnes**
2000	1,820
2001	4,438
2002	3,024
2003	2,520
2004	1,008
2005	4,536
2006	11,358
2007	18,405
2008	13,033
2009	11,954
2010	6,839
2011	0
2012	5,715
2013	3,290
2014	8,310
2015	16,870
2016	5,260

Histogram of dredged material per year

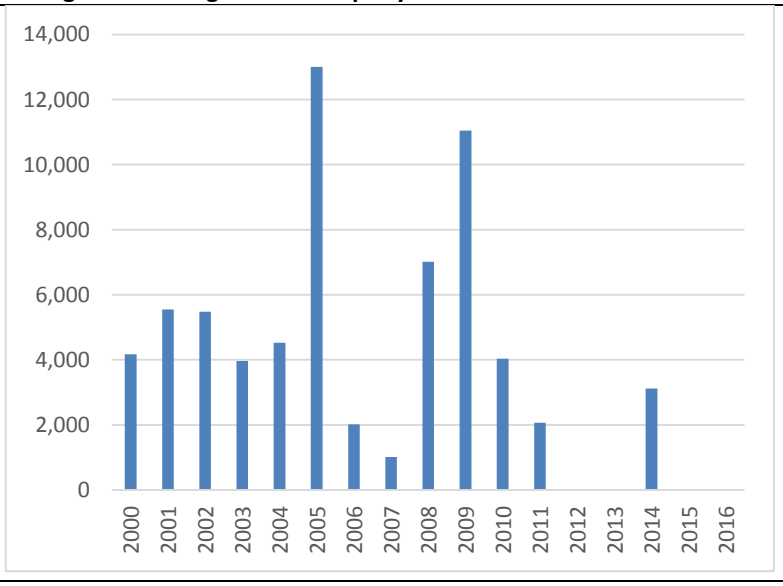


Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Figure A.18 **Maintenance dredging by tonnage in Area 21**

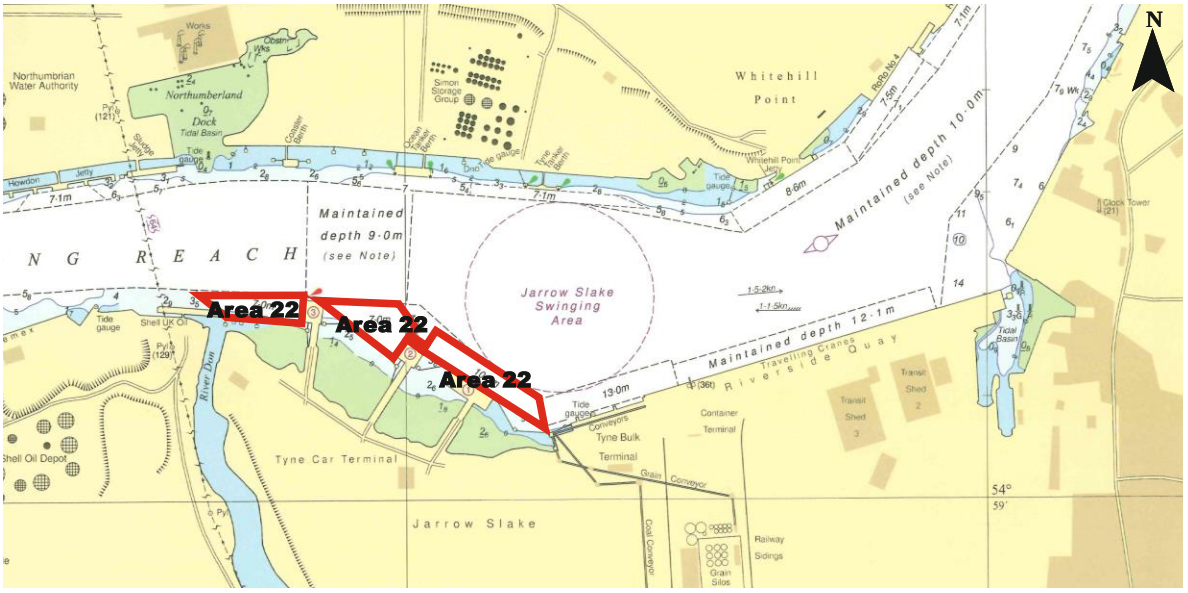


Area number		21
Location		Tyne Tanker Berth
Latitude		54° 59.30' N
Longitude		001° 27.74' W
Nature of dredge area		Berth – maintained at 7.1m below Chart Datum
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	4,168	
2001	5,544	
2002	5,474	
2003	3,961	
2004	4,521	
2005	13,006	
2006	2,016	
2007	1,008	
2008	7,013	
2009	11,044	
2010	4,032	
2011	2,063	
2012	0	
2013	0	
2014	3,120	
2015	0	
2016	0	



Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Figure A.19 **Maintenance dredging by tonnage in Area 22**



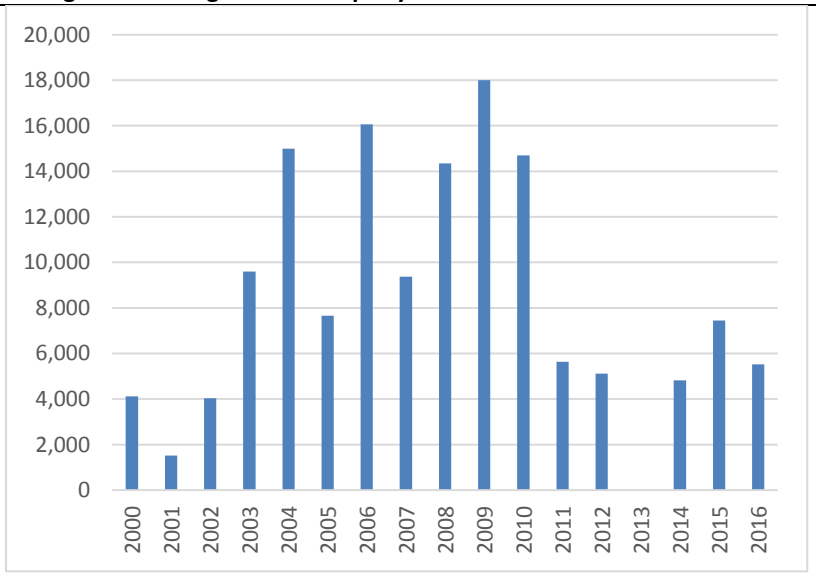
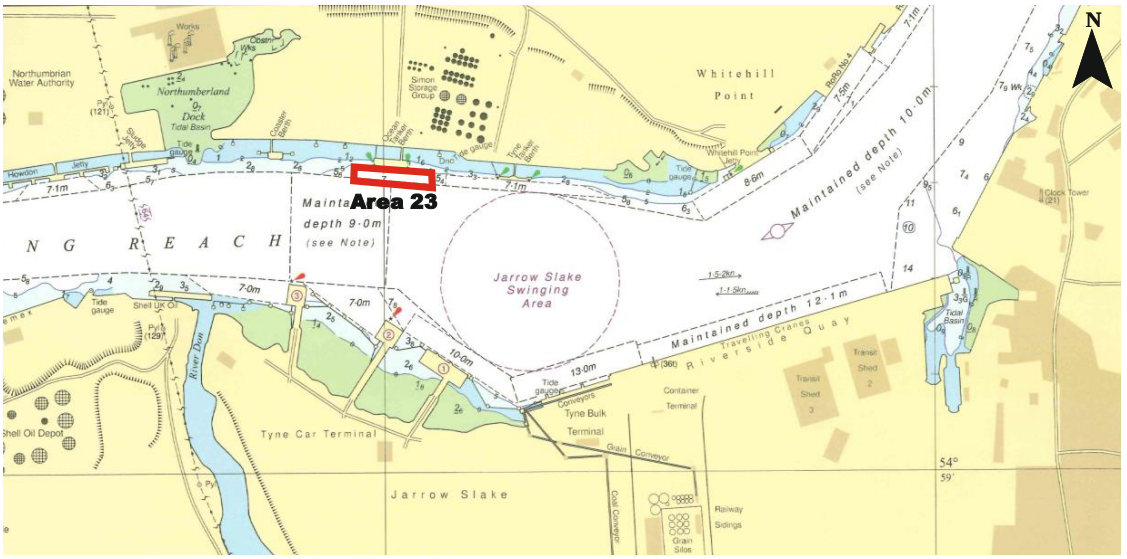
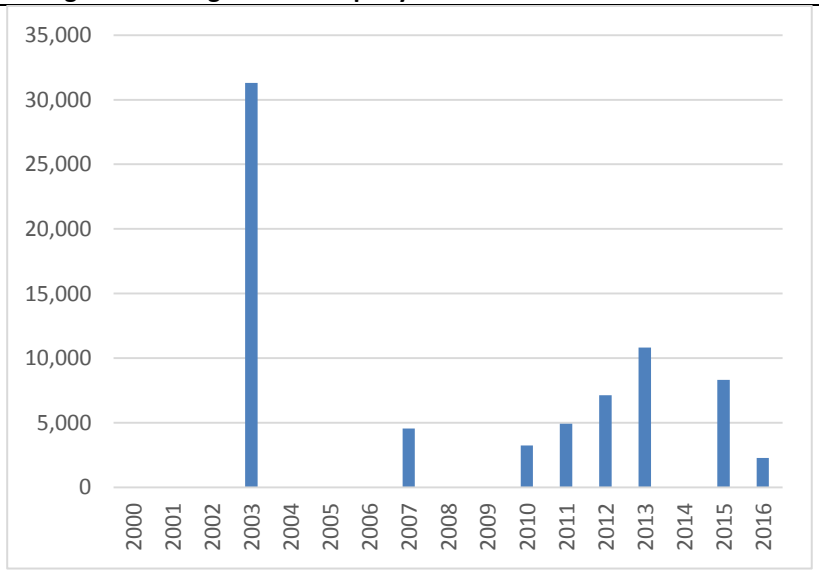
Area number		22			
Location		Tyne Car Terminal – Berths 1, 2 & 3			
Latitude		54° 59.17' N			
Longitude		001° 28.05' W			
Nature of dredge area		Berth – (Berth 1 – 10m CD; Berth 2 – 7.0m CD; Berth 3 – 7.0m CD)			
Excluded from offshore disposal?		No			
Year	**Tonnes**	**Histogram of dredged material per year**			
2000	4,113				
2001	1,512				
2002	4,032				
2003	9,600				
2004	14,995				
2005	7,654				
2006	16,058				
2007	9,378				
2008	14,341				
2009	18,003				
2010	14,692				
2011	5,637				
2012	5,109				
2013	0				
2014	4,819				
2015	7,449				
2016	5,528				
Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Figure A.20 **Maintenance dredging by tonnage in Area 23**

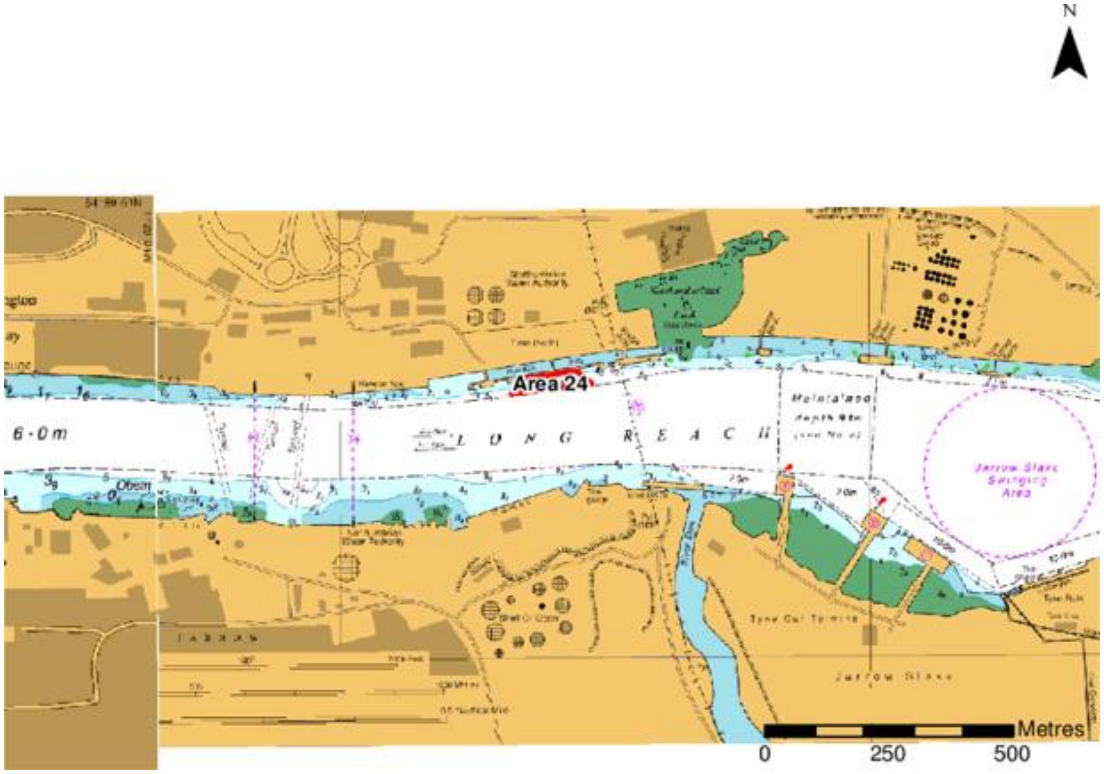


Area number		23
Location		Interterminals – Ocean Berth
Latitude		54° 59. 31' N
Longitude		001° 27.96' W
Nature of dredge area		Berth – maintained at 8.0m below Chart Datum
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	0	
2001	0	
2002	0	
2003	31,295	
2004	0	
2005	0	
2006	0	
2007	4,536	
2008	0	
2009	0	
2010	3,223	
2011	4,929	
2012	7,119	
2013	10,816	
2014	0	
2015	8,306	
2016	2,271	



Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Figure A.21 **Maintenance dredging by tonnage in Area 24**



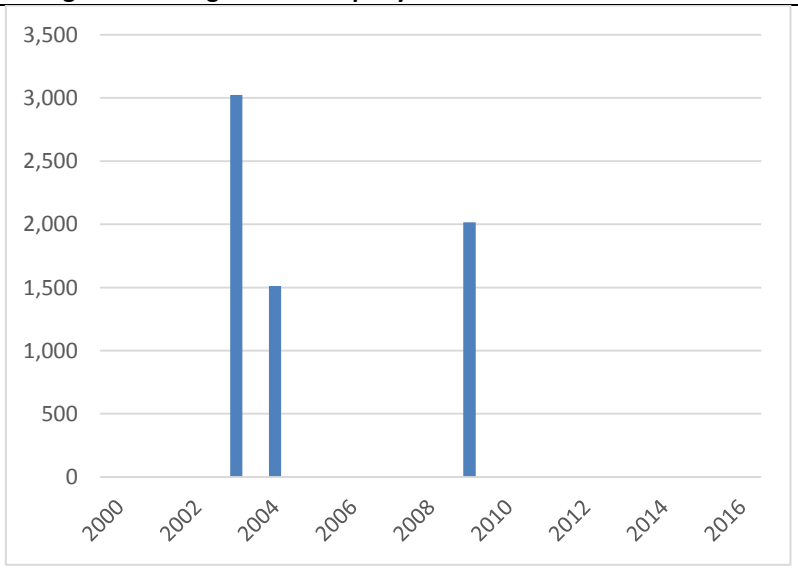
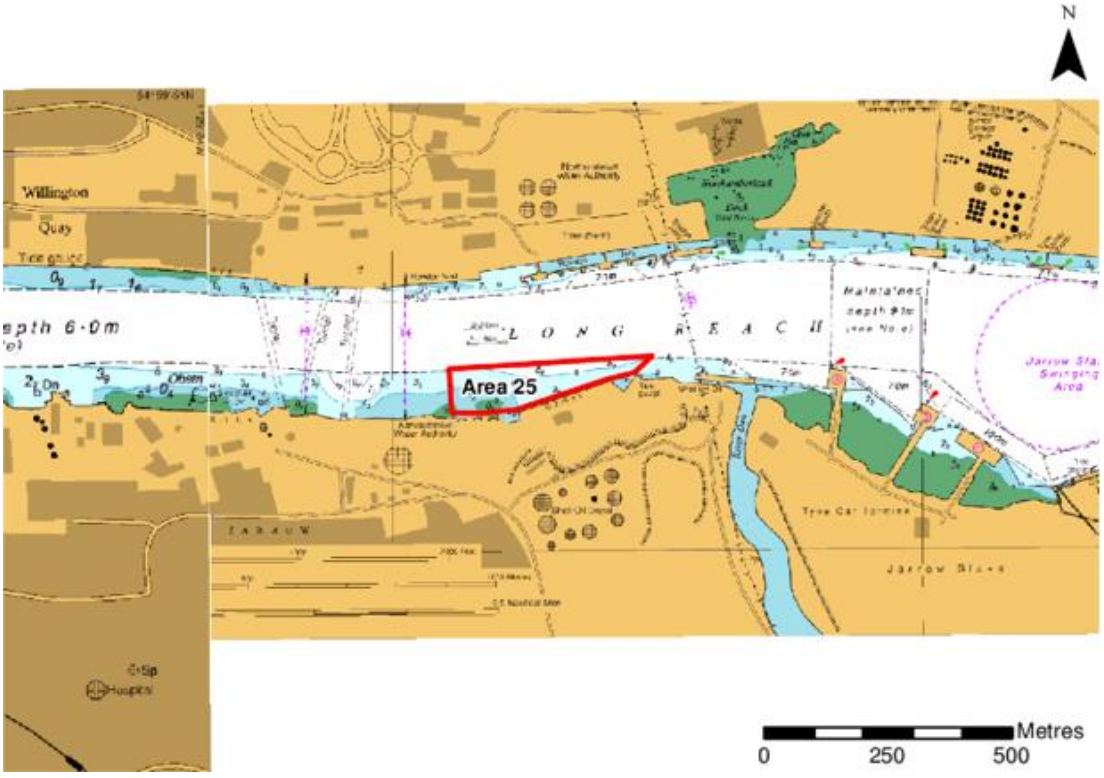
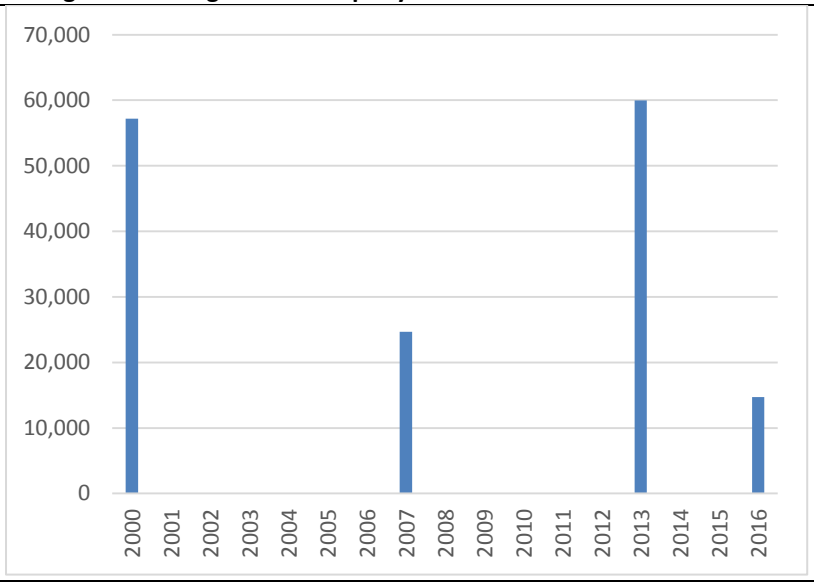
Area number		24				
Location		Howdon Jetty				
Latitude		54° 59.30' N				
Longitude		001° 28.59' W				
Nature of dredge area		Berth – maintained at 7.1m below Chart Datum				
Excluded from offshore disposal?		No				
Year	**Tonnes**	**Histogram of dredged material per year**				
2000	0					
2001	0					
2002	0					
2003	3,024					
2004	1,512					
2005	0					
2006	0					
2007	0					
2008	0					
2009	2,016					
2010	0					
2011	0					
2012	0					
2013	0					
2014	0					
2015	0					
2016	0					
Preferred Dredging Method						
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger		
Bucket Dredger		Plough Dredger	X	Water Injection Dredger		
Disposal Area						
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)		
Notes:						
No significant issues						

Figure A.22 **Maintenance dredging by tonnage in Area 25**

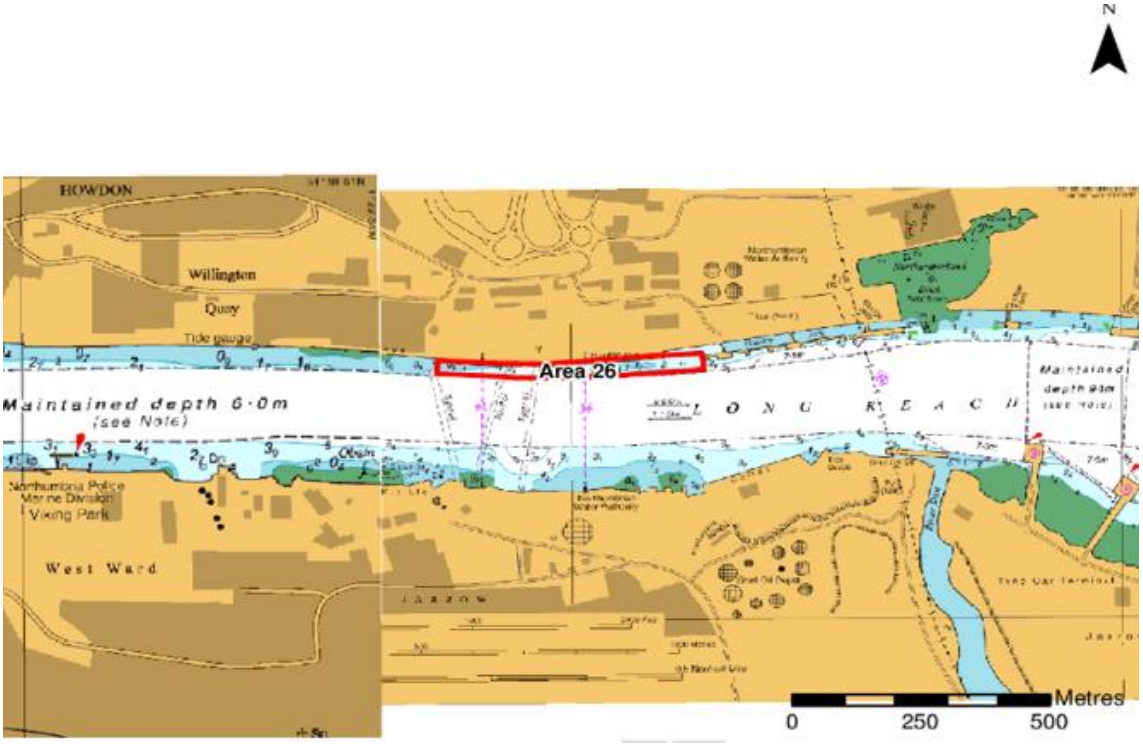


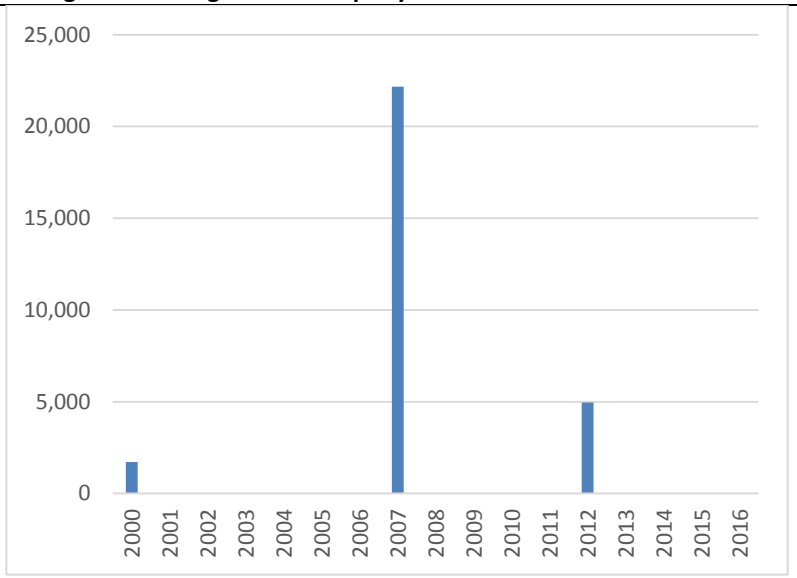
Area number		25
Location		RMC, Jarrow Quay
Latitude		54° 59.18' N
Longitude		001° 28.71' W
Nature of dredge area		Berth
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	57,216	
2001	0	
2002	0	
2003	0	
2004	0	
2005	0	
2006	0	
2007	24,691	
2008	0	
2009	0	
2010	0	
2011	0	
2012	0	
2013	59,966	
2014	0	
2015	0	
2016	14,715	



Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

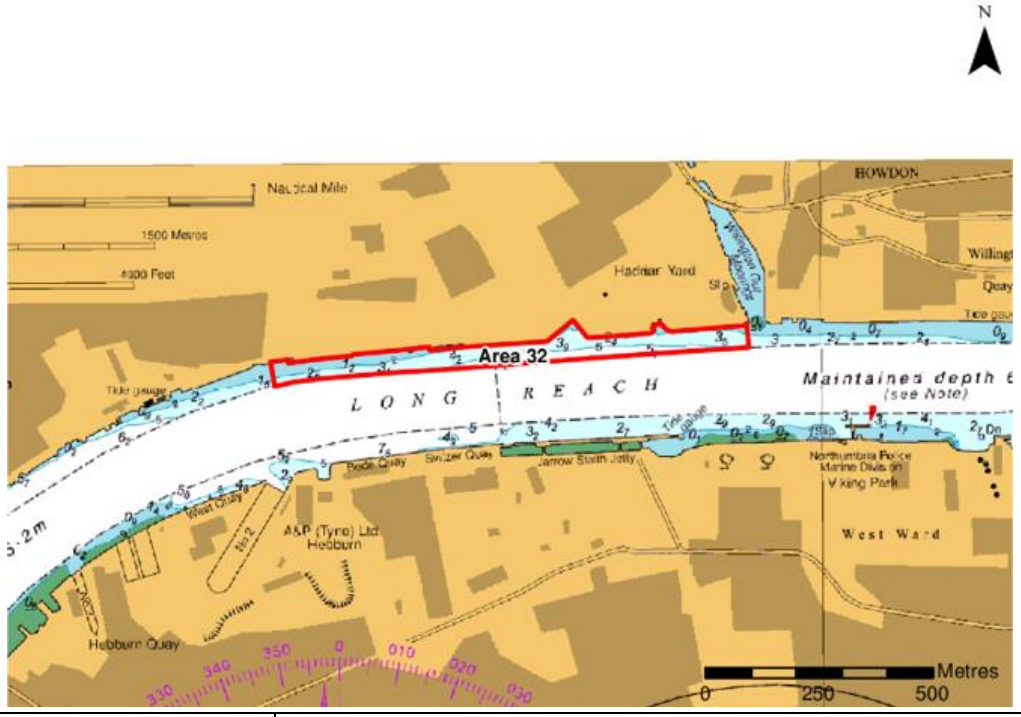
Figure A.23 **Maintenance dredging by tonnage in Area 26**



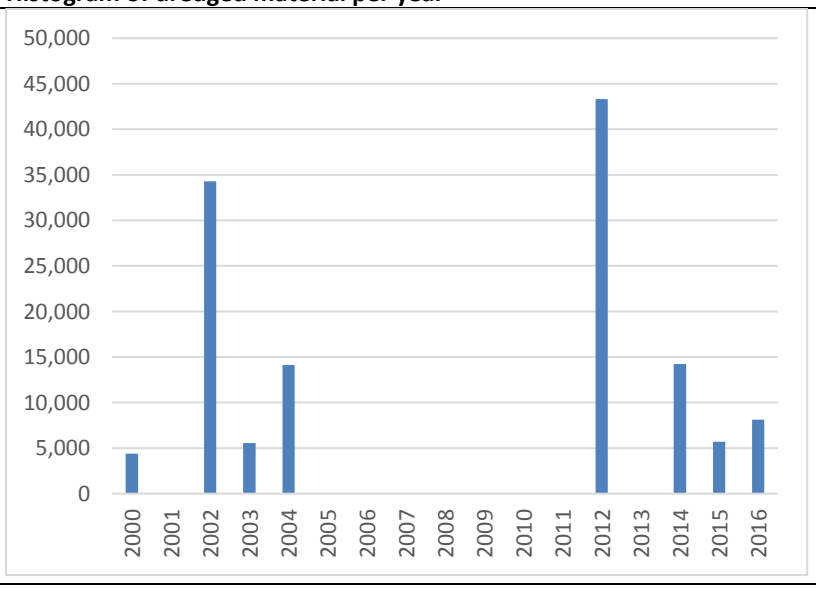
Area number		26			
Location		AMEC Howdon Yard			
Latitude		54° 59.29' N			
Longitude		001° 28.99' W			
Nature of dredge area		Berth			
Excluded from offshore disposal?		No			
Year	**Tonnes**	**Histogram of dredged material per year**			
2000	1,707				
2001	0				
2002	0				
2003	0				
2004	0				
2005	0				
2006	0				
2007	22,176				
2008	0				
2009	0				
2010	0				
2011	0				
2012	4,966				
2013	0				
2014	0				
2015	0				
2016	0				

Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	X
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
Basin now infilled. Quay to be extended east 90m. Berth will be subject of capital dredge to deepen it in the					
Future					

Figure A.24 **Maintenance dredging by tonnage in Area 32**

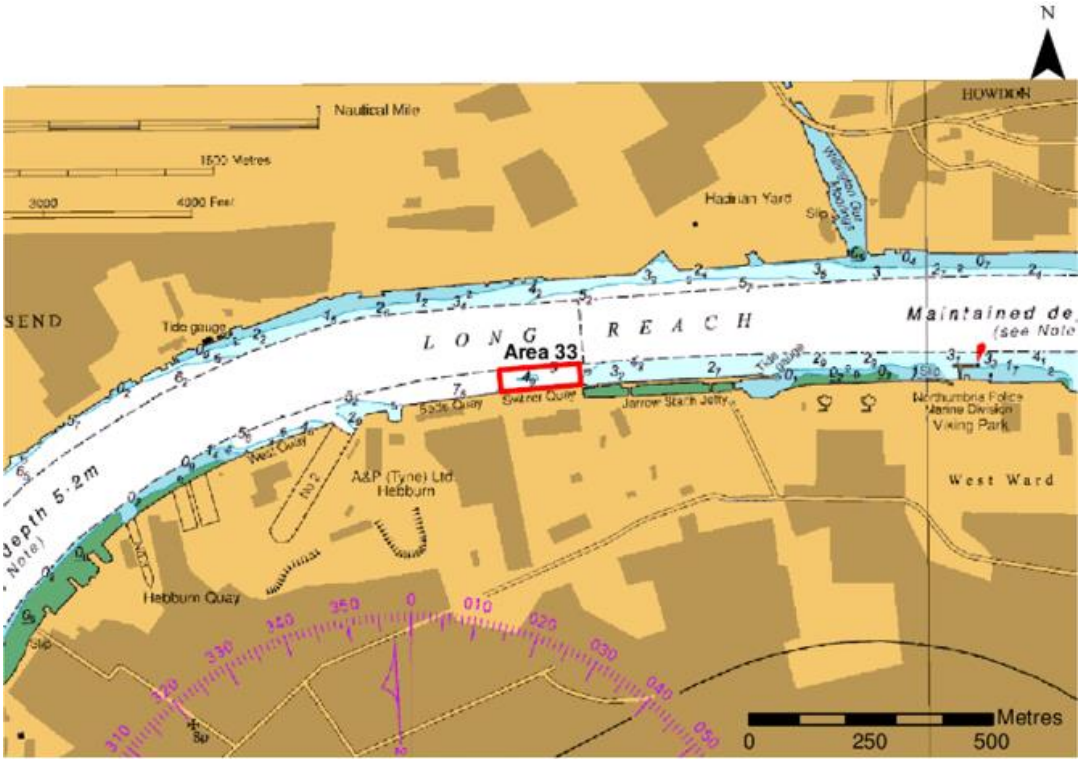


Area number		32
Location		AMEC Hadrian Yard West
Latitude		54° 59.28' N
Longitude		001° 30.63' W
Nature of dredge area		Berth
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	4,401	
2001	0	
2002	34,274	
2003	5,544	
2004	14,112	
2005	0	
2006	0	
2007	0	
2008	0	
2009	0	
2010	0	
2011	0	
2012	43,325	
2013	0	
2014	14,230	
2015	5,704	
2016	8,117	

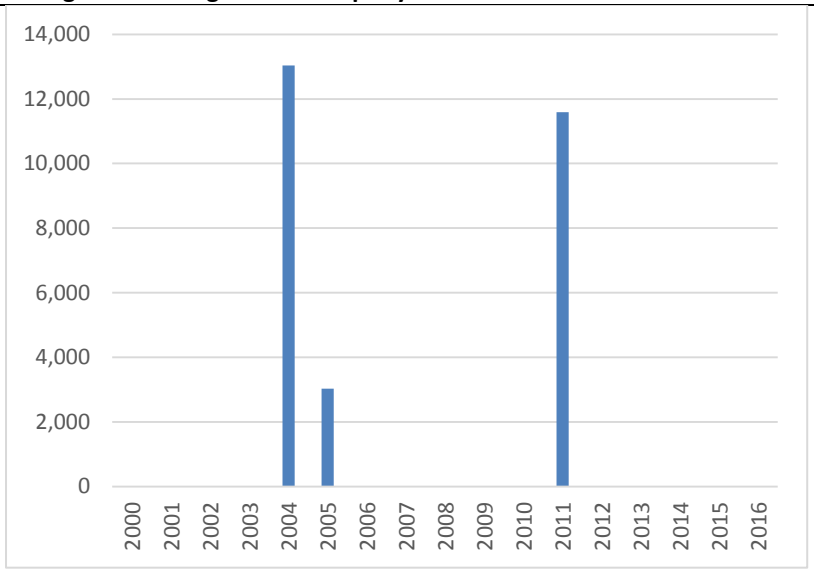


Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Figure A.25 **Maintenance dredging by tonnage in Area 33**

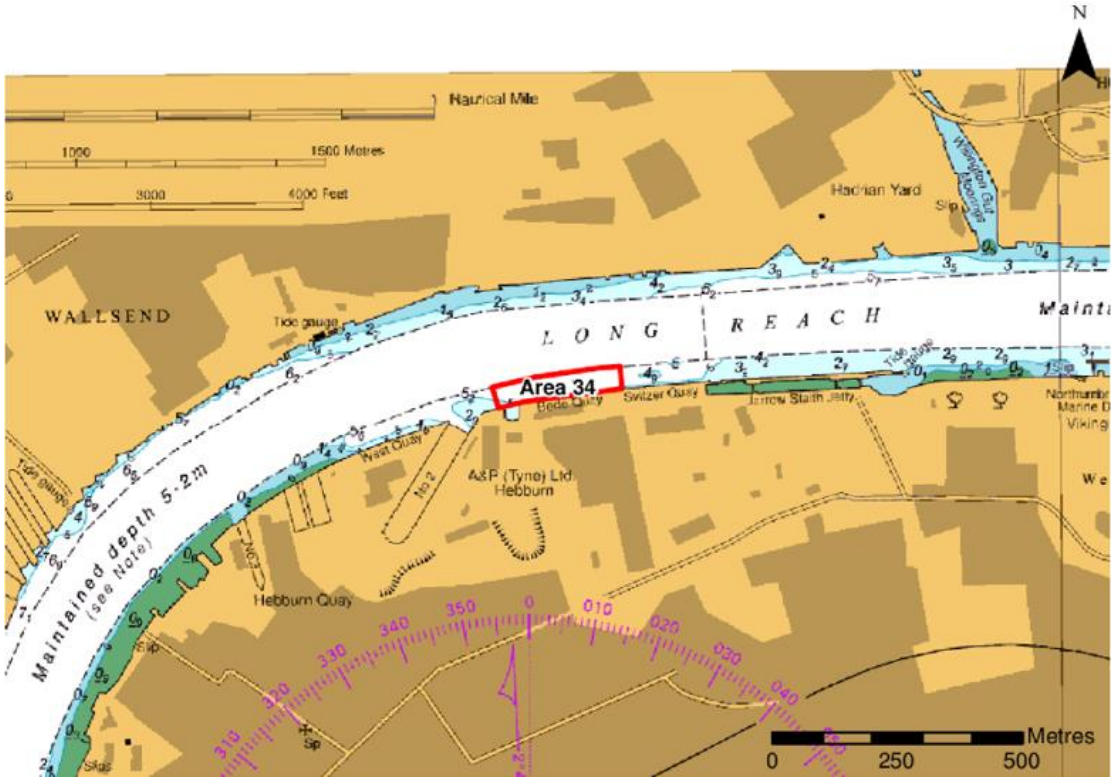


Area number		33
Location		Svitzer Quay
Latitude		54° 59.18' N
Longitude		001° 30.74' W
Nature of dredge area		Berth
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	0	
2001	0	
2002	0	
2003	0	
2004	13,034	
2005	3,024	
2006	0	
2007	0	
2008	0	
2009	0	
2010	0	
2011	11,592	
2012	0	
2013	0	
2014	0	
2015	0	
2016	0	

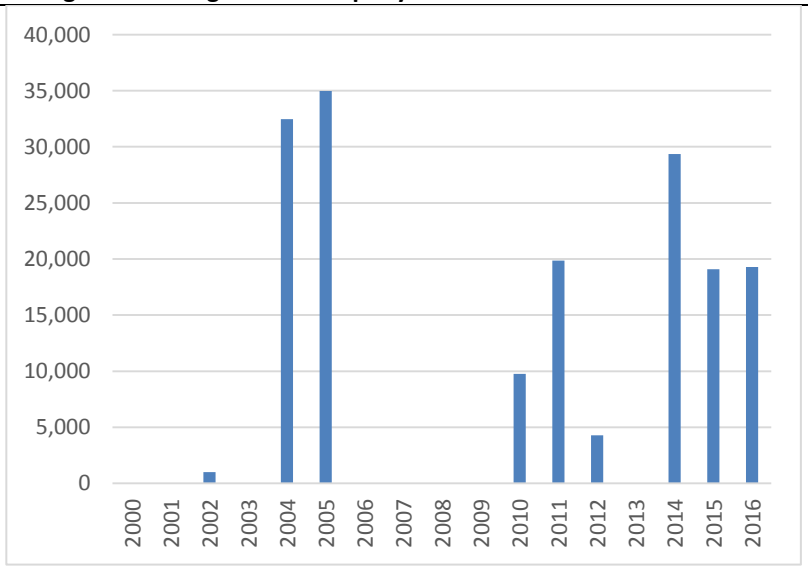


Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Figure A.26 **Maintenance dredging by tonnage in Area 34**

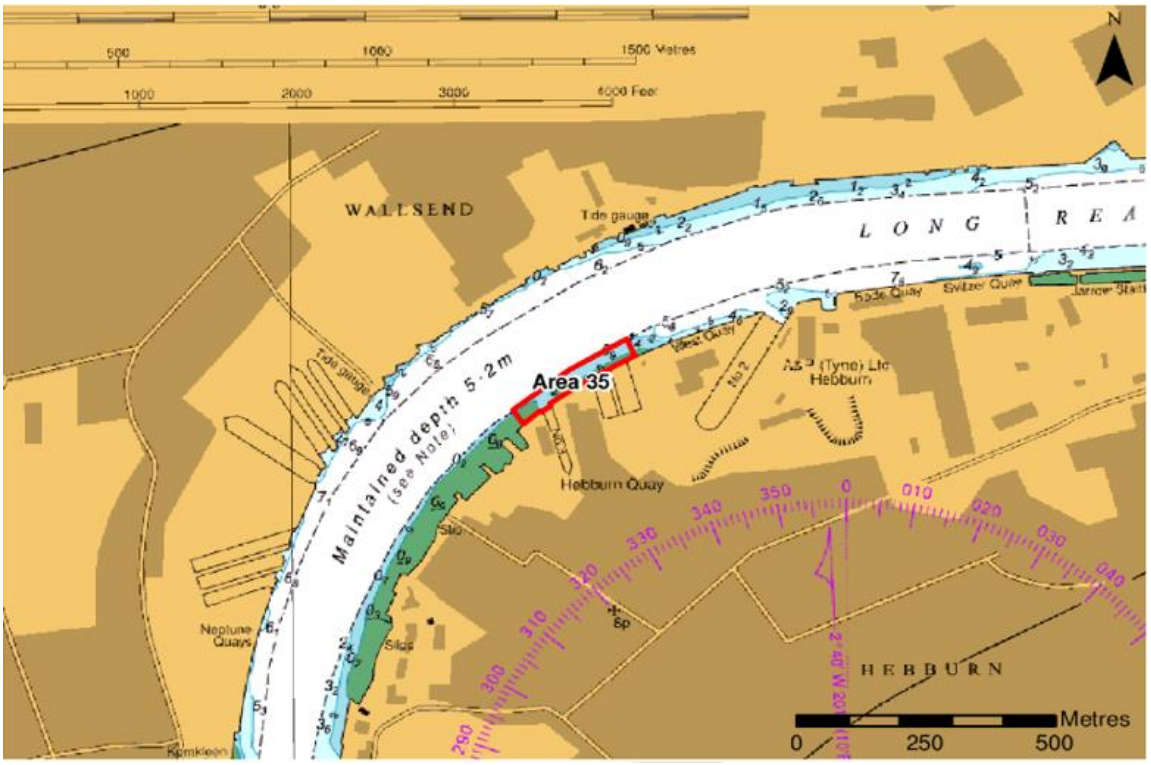


Area number		34
Location		A&P Tyne – Bede Quay
Latitude		54° 59.17' N
Longitude		001° 30.94' W
Nature of dredge area		Berth
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	0	
2001	0	
2002	1,008	
2003	0	
2004	32,470	
2005	34,981	
2006	0	
2007	0	
2008	0	
2009	0	
2010	9,752	
2011	19,861	
2012	4,271	
2013	0	
2014	29,361	
2015	19,089	
2016	19,273	

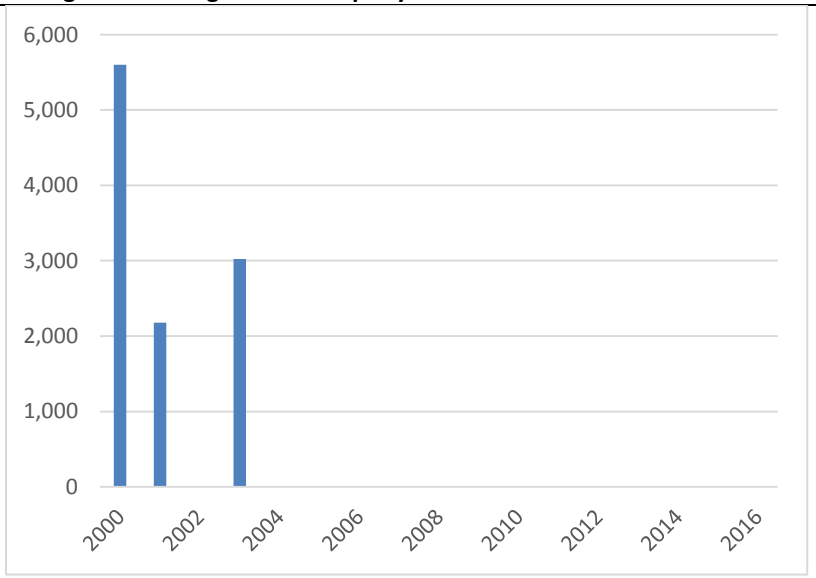


Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
Area to west of berth excluded from FEPA Licence due to contamination					

Figure A.27 **Maintenance dredging by tonnage in Area 35**

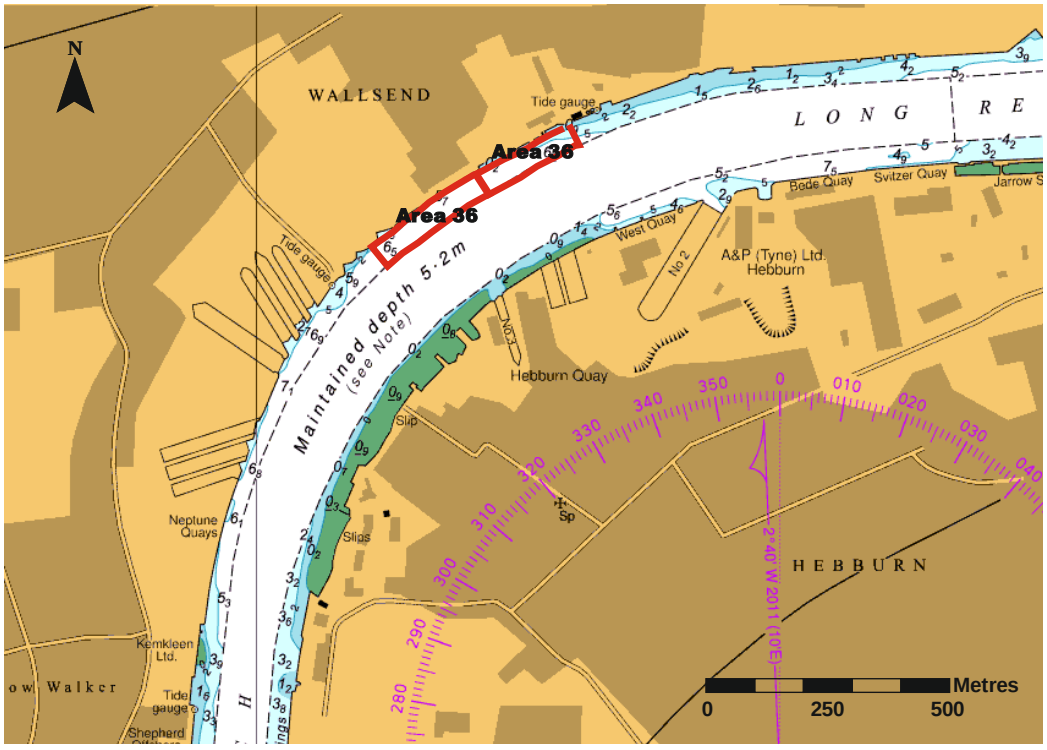


Area number		35
Location		Hawthorn-Leslie Dry Dock and Quay
Latitude		54° 59.05' N
Longitude		001° 31.48' W
Nature of dredge area		Berth
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	5,599	
2001	2,177	
2002	0	
2003	3,024	
2004	0	
2005	0	
2006	0	
2007	0	
2008	0	
2009	0	
2010	0	
2011	0	
2012	0	
2013	0	
2014	0	
2015	0	
2016	0	



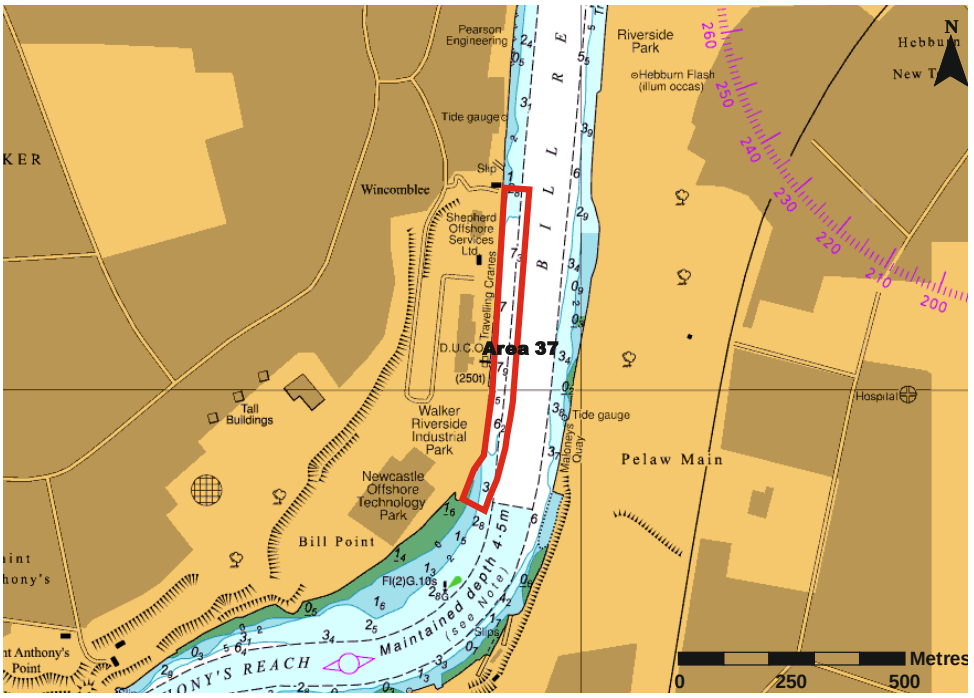
Preferred Dredging Method					
Trailer Suction Dredger		Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Figure A.2X **Maintenance dredging by tonnage in Area 36**



Area number		36			
Location		Swans Fitting Out Quay			
Latitude		54° 59.11' N			
Longitude		001° 31.66' W			
Nature of dredge area		Berth – maintained at West Berth 9.1m and East Berth 7.5m below CD			
Excluded from offshore disposal?		No			
Year	**Tonnes**	**Histogram of dredged material per year**			
2000	0				
2001	0				
2002	0				
2003	0				
2004	0				
2005	0				
2006	0				
2007	0				
2008	0				
2009	0				
2010	0				
2011	0				
2012	0				
2013	0				
2014	0				
2015	0				
2016	0				
Preferred Dredging Method					
Trailer Suction Dredger		Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Figure A.28 **Maintenance dredging by tonnage in Area 37**



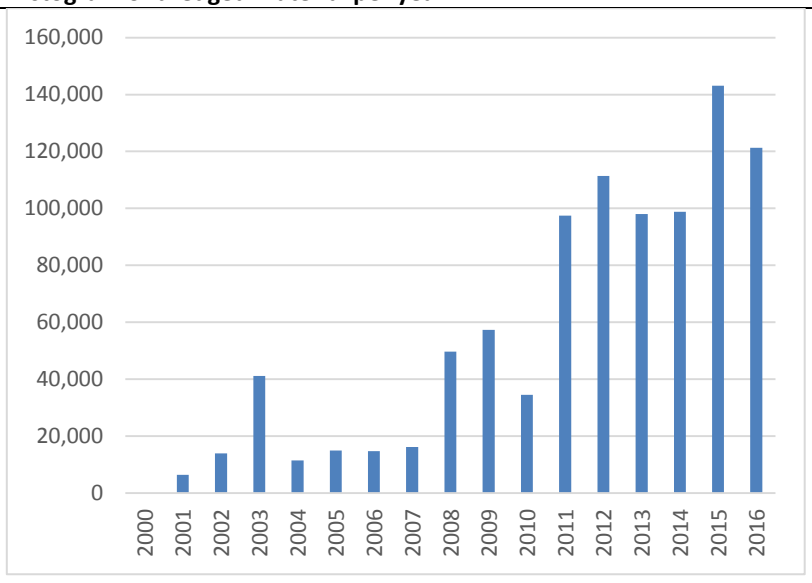
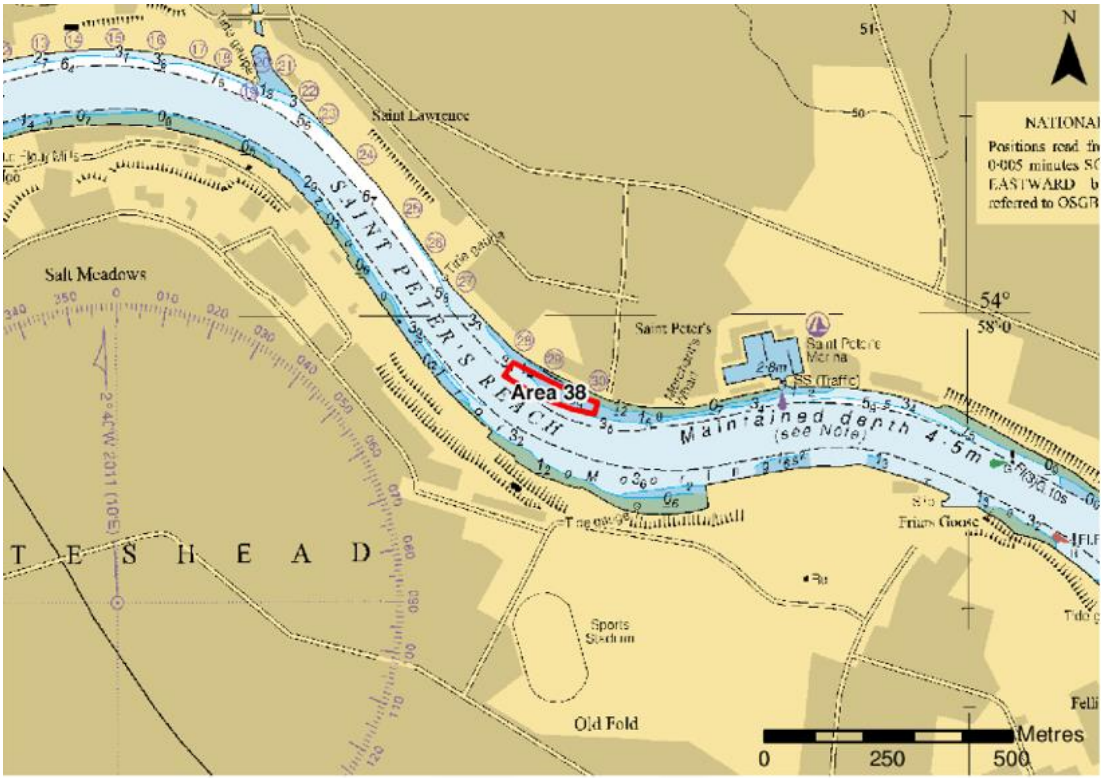
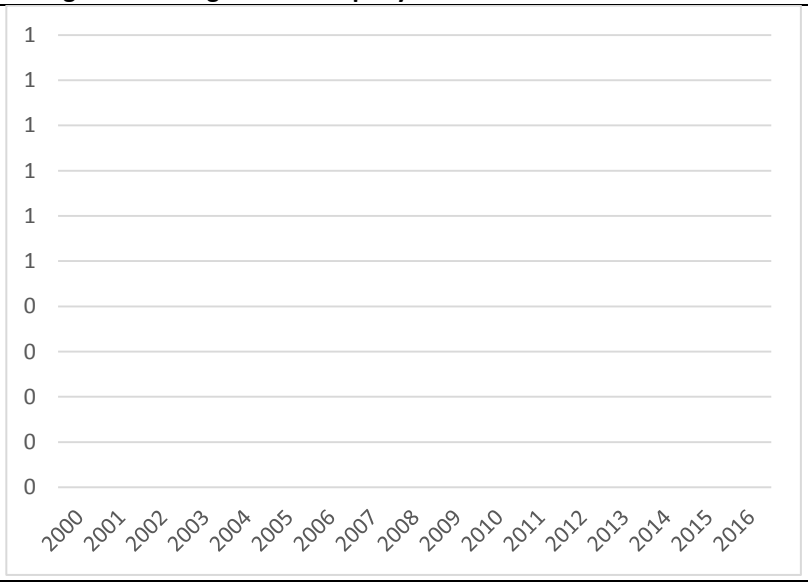
Area number		37			
Location		Walker Technology Park			
Latitude		54° 58.05' N			
Longitude		001° 32.18' W			
Nature of dredge area		Berth			
Excluded from offshore disposal?		No			
Year	**Tonnes**	**Histogram of dredged material per year**			
2000	0				
2001	6,443				
2002	13,938				
2003	41,118				
2004	11,503				
2005	14,940				
2006	14,751				
2007	16,136				
2008	49,699				
2009	57,313				
2010	34,558				
2011	97,476				
2012	111,420				
2013	98,060				
2014	98,776				
2015	143,062				
2016	121,337				
Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
Berth subject to additional sampling conditions in FEPA Licence due to ongoing potential contamination issues.					
Channel adjacent to berth excluded from FEPA Licence due to contamination.					

Figure A.29 **Maintenance dredging by tonnage in Area 38**

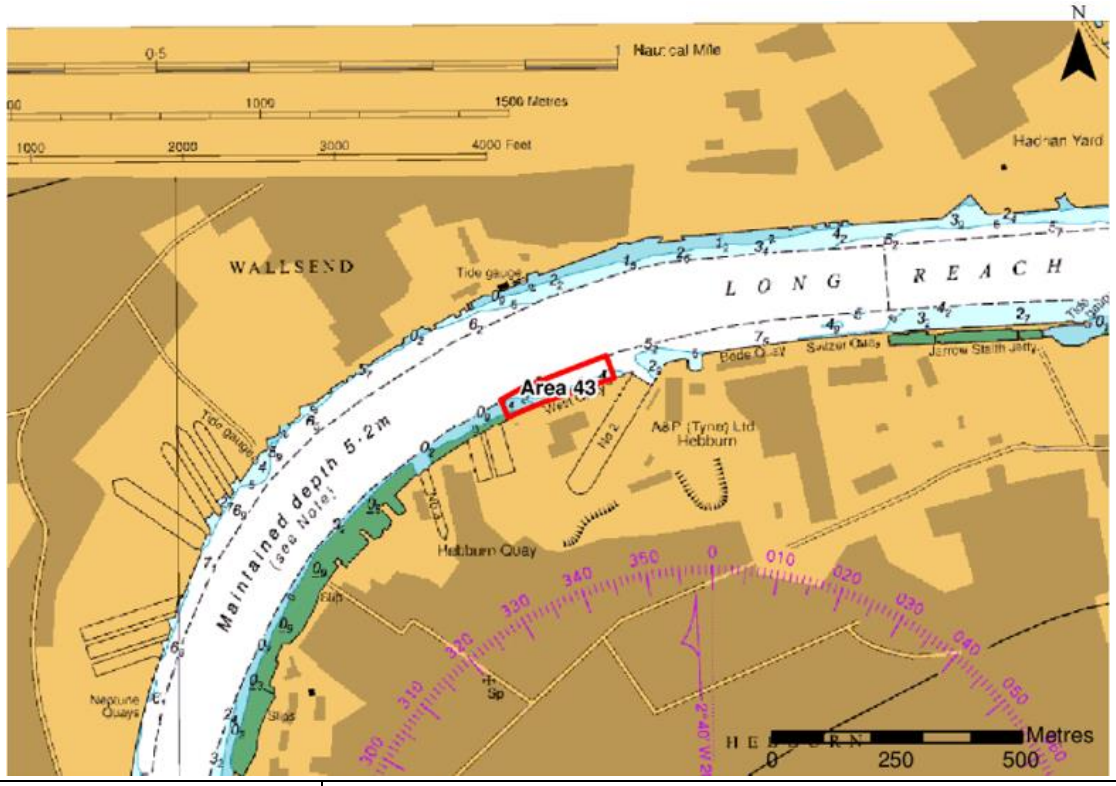


Area number		38
Location		Newcastle Quay - TAVR
Latitude		54° 57.93' N
Longitude		001° 34.75' W
Nature of dredge area		Berth Maintained at 2.5m below Chart Datum
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	0	
2001	0	
2002	0	
2003	0	
2004	0	
2005	0	
2006	0	
2007	0	
2008	0	
2009	0	
2010	0	
2011	0	
2012	0	
2013	0	
2014	0	
2015	0	
2016	0	

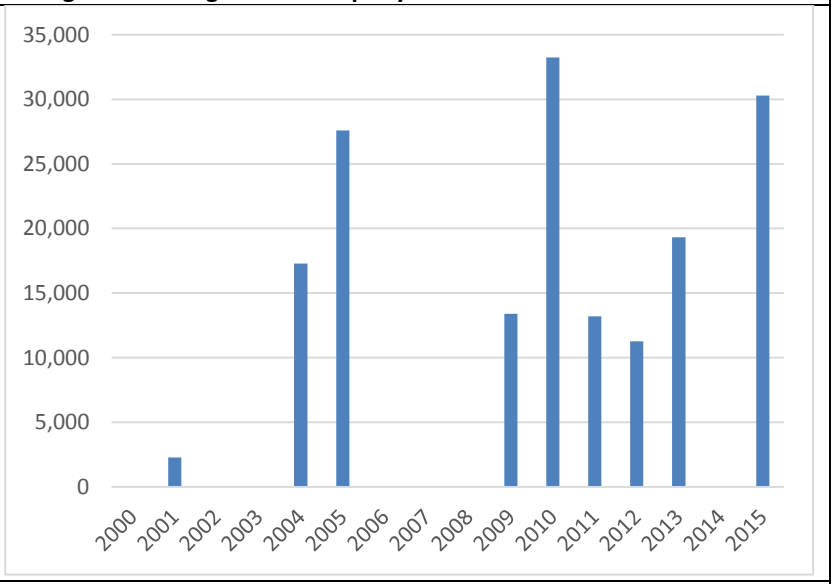


Preferred Dredging Method					
Trailer Suction Dredger		Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Figure A.30 **Maintenance dredging by tonnage in Area 43**

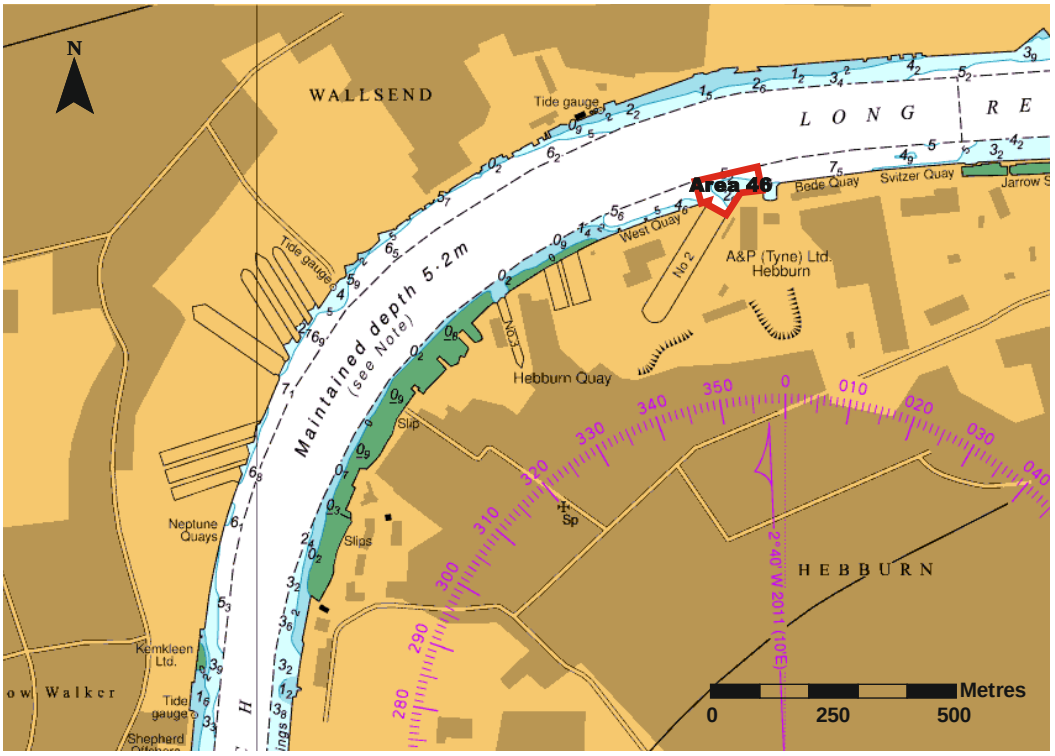


Area number		43
Location		A&P Tyne – West Quay, Hebburn
Latitude		54° 59.11' N
Longitude		001° 31.28' W
Nature of dredge area		Berth
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	0	
2001	2,285	
2002	0	
2003	0	
2004	17,292	
2005	27,592	
2006	0	
2007	0	
2008	0	
2009	13,388	
2010	33,234	
2011	13,191	
2012	11,271	
2013	19,318	
2014	0	
2015	30,299	
2000	0	



Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
Area to east of berth excluded from FEPA Licence due to contamination					

Figure A.31 **Maintenance dredging by tonnage in Area 46**



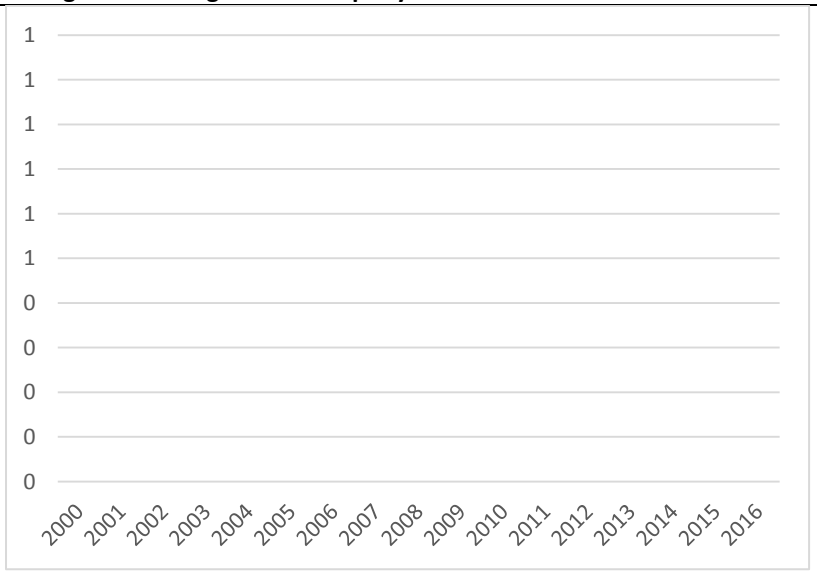
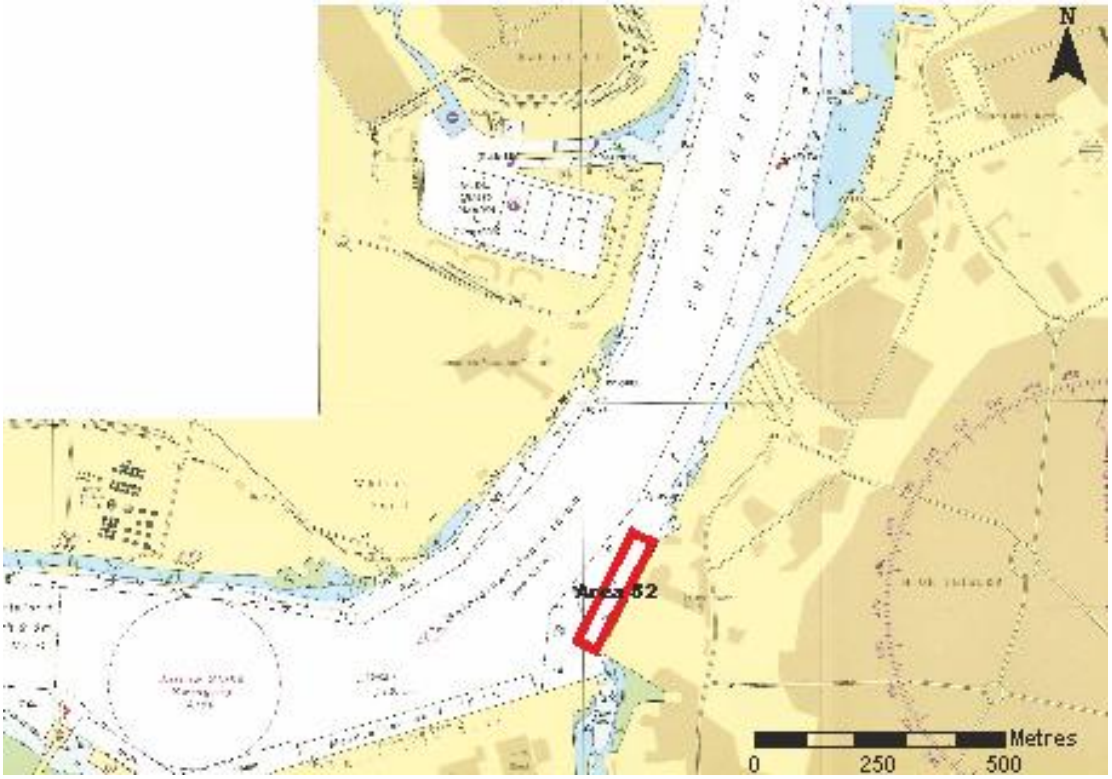
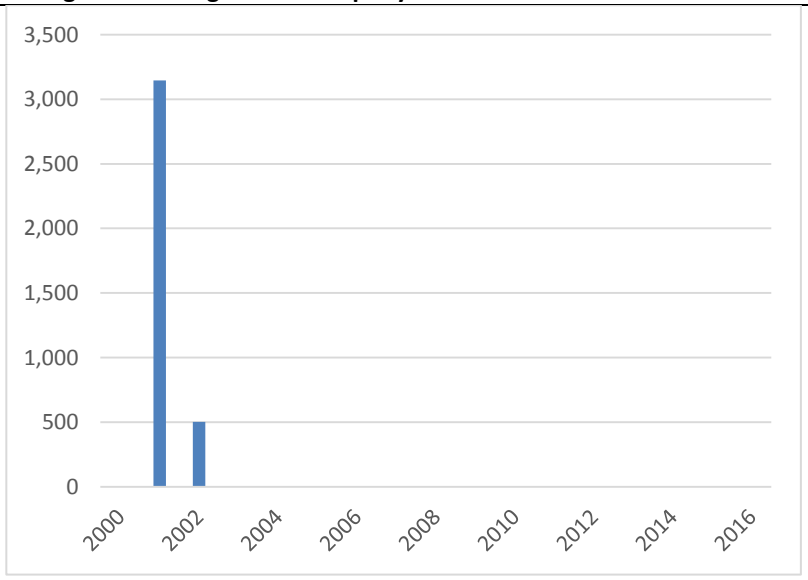
Area number		46			
Location		A&P Tyne - No.2 Dry Dock Entrance			
Latitude		54° 59.14' N			
Longitude		001° 31.11' W			
Nature of dredge area		Drydock approach			
Excluded from offshore disposal?		No			
Year	**Tonnes**	**Histogram of dredged material per year**			
2000	0				
2001	0				
2002	0				
2003	0				
2004	0				
2005	0				
2006	0				
2007	0				
2008	0				
2009	0				
2010	0				
2011	0				
2012	0				
2013	0				
2014	0				
2015	0				
2016	0				
Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					

Figure A.32 **Maintenance dredging by tonnage in Area 52**

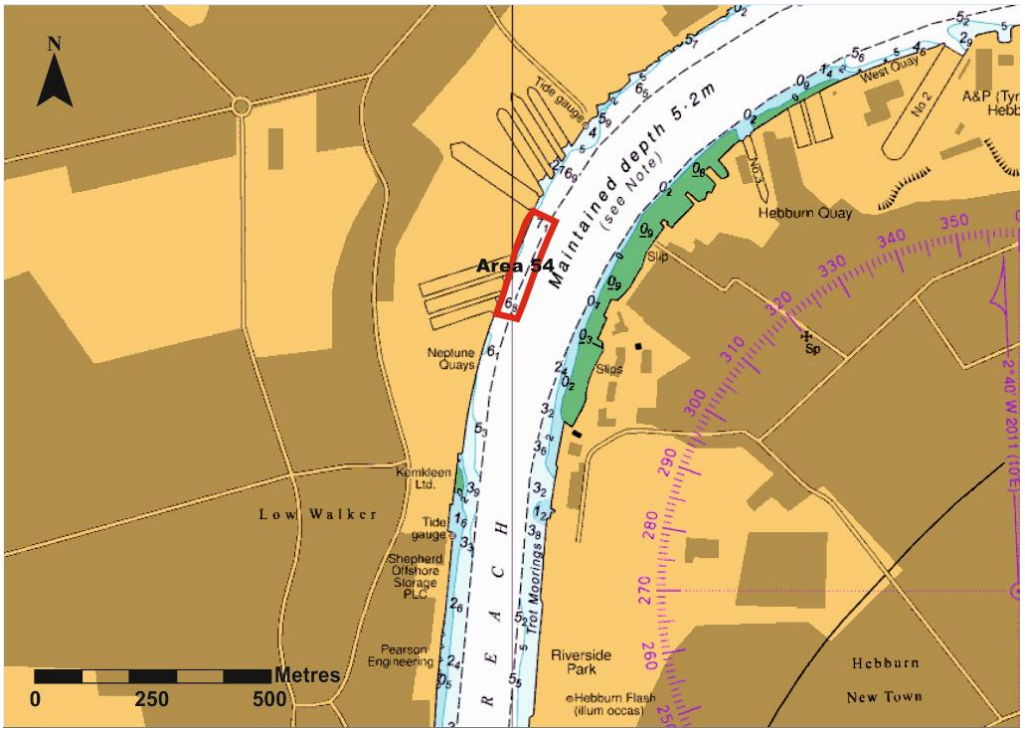


Area number		52
Location		McNulty Offshore Quays
Latitude		54° 59.30' N
Longitude		001° 26.92' W
Nature of dredge area		Berth
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	0	
2001	3,145	
2002	504	
2003	0	
2004	0	
2005	0	
2006	0	
2007	0	
2008	0	
2009	0	
2010	0	
2011	0	
2012	0	
2013	0	
2014	0	
2015	0	
2016	0	

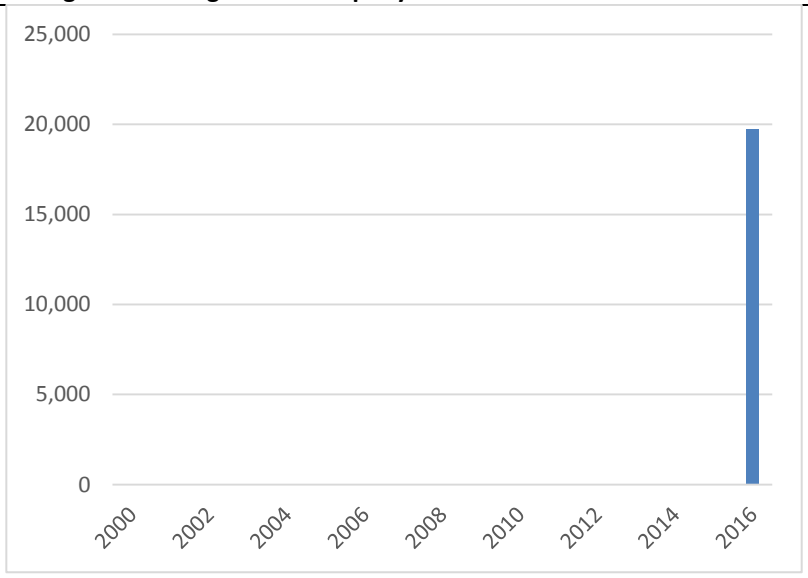


Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Figure A.33 **Maintenance dredging by tonnage in Area 54**

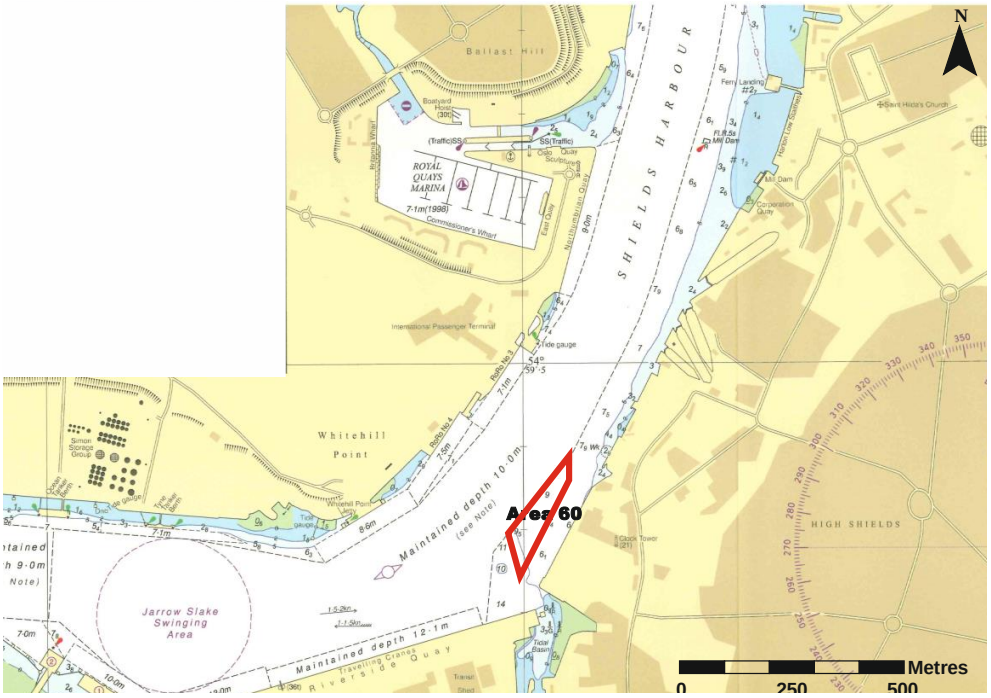


Area number		54
Location		Neptune Quays
Latitude		54° 58.87' N
Longitude		001° 31.98' W
Nature of dredge area		Berth – maintained at 8.5m below Chart Datum
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	0	
2001	0	
2002	0	
2003	0	
2004	0	
2005	0	
2006	0	
2007	0	
2008	0	
2009	0	
2010	0	
2011	0	
2012	0	
2013	0	
2014	0	
2015	0	
2016	19,737	

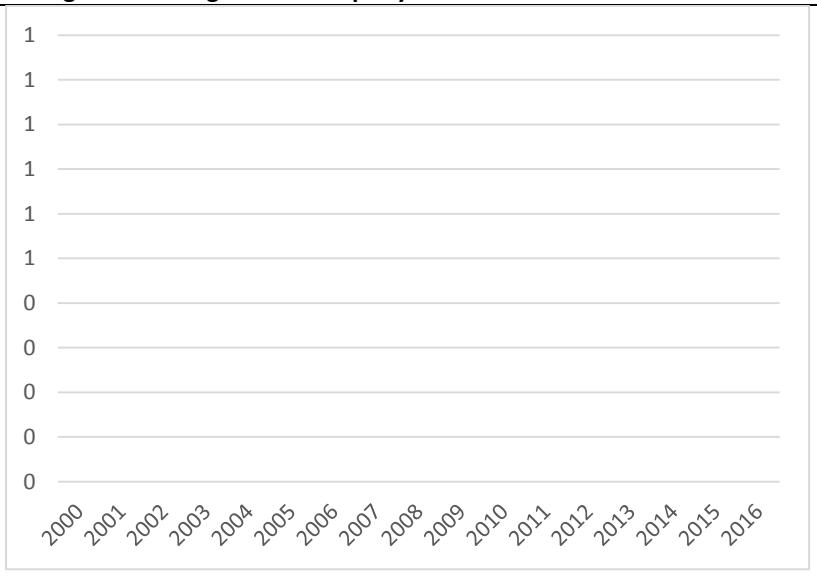


Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Figure A.34 **Maintenance dredging by tonnage in Area 60**

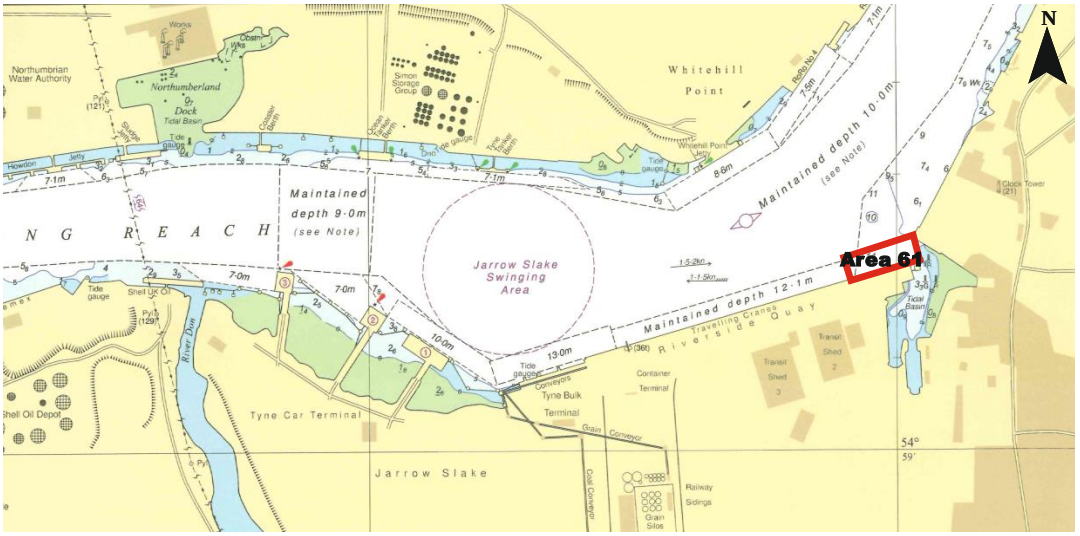


Area number		60
Location		McNulty Quay Approach
Latitude		54° 59.30' N
Longitude		001° 26.97' W
Nature of dredge area		Berth approach
Excluded from offshore disposal?		No
Year	**Tonnes**	**Histogram of dredged material per year**
2000	0	
2001	0	
2002	0	
2003	0	
2004	0	
2005	0	
2006	0	
2007	0	
2008	0	
2009	0	
2010	0	
2011	0	
2012	0	
2013	0	
2014	0	
2015	0	
2016	0	



Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Figure A.35 **Maintenance dredging by tonnage in Area 61**



Area number		61			
Location		Riverside Quay East End			
Latitude		54° 59.21' N			
Longitude		001° 27.02' W			
Nature of dredge area		Berth – maintained at 13.0m below Chart Datum			
Excluded from offshore disposal?		No			
Year	**Tonnes**	**Histogram of dredged material per year**			
2000	0				
2001	0				
2002	0				
2003	0				
2004	0				
2005	0				
2006	0				
2007	0				
2008	0				
2009	0				
2010	0				
2011	0				
2012	0				
2013	0				
2014	0				
2015	0				
2016	0				
Preferred Dredging Method					
Trailer Suction Dredger	X	Grab Dredger	X	Backhoe Dredger	
Bucket Dredger		Plough Dredger	X	Water Injection Dredger	
Disposal Area					
North Tyne (TY070)	X	Souter Point (Outer)(TY080)	X	Other (see Notes)	
Notes:					
No significant issues					

Appendix B
Sediment quality data

Polychlorinated Byphenyls mg/kg (ppm) dry weight

Location	TS (%)	CB#101	CB#105	CB#110	CB#118	CB#128	CB#138	CB#141	CB#149	CB#151	CB#153	CB#156	CB#158	CB#170	CB#18	CB#180	CB#183	CB#187	CB#194	CB#28	CB#31	CB#44	CB#47	CB#49	CB#52	CB#66	SUM	TOT25CBS	TOTICES7
Area 1 Harbour Channel	71.5	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0008	0.0008	0.0003
Area 2 Shields Harbour (down river)	68.7	0.0007	0.0000	0.0006	0.0006	0.0002	0.0008	0.0000	0.0005	0.0000	0.0004	0.0000	0.0000	0.0000	0.0003	0.0003	0.0000	0.0000	0.0000	0.0002	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0048	0.0048	0.0030
Area 3 Shields Harbour (up river)	65.2	0.0049	0.0013	0.0043	0.0035	0.0009	0.0058	0.0014	0.0050	0.0018	0.0060	0.0006	0.0005	0.0017	0.0006	0.0041	0.0011	0.0022	0.0008	0.0011	0.0010	0.0012	0.0005	0.0011	0.0024	0.0000	0.0538	0.0538	0.0278
Area 5 Channel:Long reach-down	47.6	0.0015	0.0007	0.0016	0.0014	0.0005	0.0018	0.0004	0.0012	0.0038	0.0017	0.0005	0.0004	0.0006	0.0005	0.0010	0.0003	0.0005	0.0003	0.0010	0.0010	0.0006	0.0002	0.0007	0.0009	0.0009	0.0241	0.0206	0.0093
Area 6 Channel:Long reach up																													
Area 14 Northumbrian Quay	47.5	0.0011	0.0006	0.0011	0.0010	0.0004	0.0011	0.0004	0.0008	0.0003	0.0011	0.0004	0.0004	0.0005	0.0003	0.0007	0.0002	0.0004	0.0003	0.0007	0.0008	0.0005	0.0002	0.0005	0.0007	0.0007	0.0152	0.0151	0.0064
Area 15 Ro-ro berth 3 surf																													
Area 16 Ro-ro berth 4 surf																													
Area 17 Whitehill point jetty surf																													
Area 18 Tyne Dock entrance																													
Area 19 Riverside quay surf																													
Area 20 Tyne bulk terminal surf																													
Area 21 Tyne Tanker berth	41.47	0.0011	0.0006	0.0013	0.0011	0.0004	0.0014	0.0002	0.0010	0.0003	0.0012	0.0000	0.0000	0.0004	0.0004	0.0007	0.0003	0.0004	0.0002	0.0009	0.0010	0.0005	0.0002	0.0007	0.0007	0.0007	0.0155	0.0155	0.0071
Area 22 Tyne car terminal surf																													
Area 23 Ocean berths surf																													
Area 24 Howdon jetty	35.97	0.0016	0.0007	0.0015	0.0013	0.0005	0.0016	0.0004	0.0011	0.0004	0.0016	0.0005	0.0004	0.0006	0.0004	0.0011	0.0003	0.0006	0.0003	0.0011	0.0013	0.0007	0.0000	0.0007	0.0010	0.0010	0.0207	0.0207	0.0093
Area 25 RMC, Jarrow Quay																													
Area 26 AMEC Howdon Yard surf																													
Area 32 AMEC Hadrian Yard west																													
Area 33 Devlin's Quay																													
Area 34 A&P Tyne Bede Quay	38.04	0.0022	0.0008	0.0022	0.0021	0.0004	0.0023	0.0003	0.0015	0.0005	0.0021	0.0002	0.0000	0.0006	0.0007	0.0014	0.0003	0.0007	0.0003	0.0016	0.0015	0.0008	0.0000	0.0010	0.0019	0.0013	0.0266	0.0266	0.0136
Area 37 Walker Technology Park																													
Area 43 A&P Tyne West Quay Hebburn	39.4	0.0016	0.0008	0.0020	0.0015	0.0004	0.0019	0.0003	0.0015	0.0005	0.0017	0.0002	0.0002	0.0006	0.0007	0.0011	0.0004	0.0008	0.0004	0.0016	0.0016	0.0008	0.0004	0.0012	0.0019	0.0012	0.0252	0.0252	0.0113
Area 52 Mc Nulty Offshore Quays																													
AL1 (ppm dry)		0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
AL2 (ppm dry)		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
PEL		0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189

Exceedance of AL1

Metals/Tins mg/kg (ppm) dry wt

Location	TS%	AS	CD	CR	CU	HG	NI	PB	ZN	DBT	TBT
Area 1 Harbour channel	71.57	10	0.03	12	8.6	0.05	9	20	39	<LOD	0.013
Area 2 Channel :Shields Harbour-down	68.70	13	0.09	16	14	0.12	13	35	61	0.006	0.024
Area 3 Channel:Shields Harbour-up	65.28	15	0.32	43	125	1.30	26	106	418	0.028	0.204
Area 5 Channel:Long reach-down	47.60	19	1.40	44	55	0.45	32	191	400	0.035	0.426
Area 6 Channel:Long reach up	45.75	20	2.30	53	77	0.67	35	264	601	0.049	0.527
Area 14 Northumbrian Quay	47.49	25	0.64	46	43	0.29	35	115	211	0.002	0.06
Area 15 Ro-ro berth 3 surf	36.68	28	0.40	52	48	0.37	38	192	355	0.018	0.060
Area 16 Ro-ro berth 4 surf	30.85	30	0.16	52	46	0.30	38	185	313	< LOD	0.027
Area 17 Whitehill point jetty surf	34.25	25	0.00	33	29	0.26	31	116	195	< LOD	0.030
Area 18 Tyne Dock entrance	46.82	24	0.85	42	45	0.53	31	122	271	0.001	0.100
Area 19 Riverside quay surf	38.16	30	0.09	41	43	0.44	35	153	266	< LOD	0.035
Area 20 Tyne bulk terminal surf	57.46	16	0.00	30	24	0.13	22	77	152	0.009	0.184
Area 21 Tyne Tanker berth	41.47	21	0.68	45	39	0.29	37	103	210	0.018	0.057
Area 22 Tyne car terminal surf	37.17	26	0.00	40	38	0.30	32	137	242	< LOD	0.040
Area 23 Ocean berths surf	39.04	27	0.39	46	46	0.32	39	183	346	0.015	0.053
Area 24 Howdon jetty	35.97	24	1.60	48	75	0.89	35	172	451	0.034	0.065
Area 25 RMC, Jarrow Quay	39.81	22	1.00	44	65	0.37	37	131	340	0.001	0.062
Area 26 AMEC howdon yard surf	36.48	31	1.50	53	69	0.49	45	276	526	0.023	0.090
Area 32 AMEC Hadrian Yard west	36.16	28	2.40	56	70	0.61	39	230	642	0.089	0.123
Area 33 Devlin's Quay	34.81	26	2.10	49	67	0.70	38	201	556	0.045	0.162
Area 34 A&P Tyne Bede Quay	38.04	34	2.00	56	63	0.48	37	233	485	0.002	0.148
Area 37 Walker Technology Park	43.58	26	3.20	54	65	0.58	39	352	652	<LOD	0.171
Area 43 A&P Tyne West Quay Hebburn	39.44	23	1.80	46	60	0.41	33	193	483	0.034	0.152
Area 52 Mc Nulty Offshore Quays	37.46	32	1.81	83	93	0.71	50	201	440	0.047	0.077
AL1 (ppm dry)		**20**	**0.4**	**40**	**40**	**0.3**	**20**	**50**	**130**	**0.1**	**0.1**
AL2 (ppm dry)		**100**	**5.0**	**400**	**400**	**3.00**	**200**	**500**	**800**	**1**	**1**
PEL		**41.6**	**4.2**	**160**	**108**	**0.7**	**-**	**112**	**271**	**-**	**-**

Exceedance of AL1

River Tyne Berths Q3 2013 Metals and Tins Sampling Results

						mg/kg (ppm) Dry weight										
Sample Plan Ref	Sample No.	Location		Area	TS%	AS	CD	CR	CU	HG	NI	PB	ZN	DBT	TBT	Comments
	1	Harbour Channel, Site A, 0,		1	60.9	20.15	0.11	26.37	19.12	0.16	19.38	63.25	73.32	<LOD	<LOD	
	3	Harbour Channel, Site C, 0m		1	54.9	25.9	0.3	28.54	25.21	0.21	24.7	75.93	104.07	<LOD	0.013	
	5	Shields Harbour Reach Downriver, Site A, 0m		2	48.4	13.44	0.15	14.31	12.1	0.1	12.34	46.44	67.1	<LOD	0.00084	
	6+7+8	Shields Harbour Reach Downriver, Site B, C, D, 0m		2	61.6	17.97	0.35	23.05	24.88	0.22	19.73	92.41	130.78	<LOD	0.002103	
	9+11+12	Shields Harbour Reach Upriver Site A, C, D, 0m		3	48.3	24.19	0.69	41.63	36.51	0.28	31.84	160.64	190.98	<LOD	0.005714	
	10	Shields Harbour Reach Upriver Site B, 0m		3	61.8	31.86	1.36	30.6	207.6	1.03	32.16	279.34	593.99	<LOD	<LOD	
	13+14+15+16	Northumberland Dock to Jarrow Quay Site A, B, C, D, 0m		4	42.8	23.29	0.76	38.91	37.66	0.32	30.28	156.72	272.54	<LOD	0.014971	
	17	Northumberland Dock to Jarrow Quay Site E, 0m		4	39.7	30.07	0.72	50.8	43.56	0.35	37.67	153.23	208.94	<LOD	0.006699	
	18+19+20	Northumberland Dock to Jarrow Quay Site F, G, H, 0m		4	40.0	26.4	0.93	43.99	43.4	0.31	34.25	168.54	266.07	<LOD	0.023394	
	21	Northumberland Dock to Jarrow Quay Site I, 0m		4	68.0	21.17	1.64	60.17	103.36	0.87	38.32	154.1	250.7	0.039	0.107498	
	22+23+24	Northumberland Dock to Jarrow Quay Site J, K, L, 0m		4	42.9	31.01	1.22	53.1	52.76	0.37	40.3	213.59	325.9	<LOD	0.026744	
	25	Long Reach Downriver, Site A, 0m		5	46.3	23.63	1.17	54.01	75.17	0.45	37.7	162.65	294.69	0.0336	0.253945	
	26	Long Reach Downriver, Site B, 0m		5	42.1	37.21	1.41	70.67	61.82	0.54	49.94	230.42	297.23	<LOD	0.026361	
	27+28	Long Reach Upriver Site A, B, 0m		6	46.0	29.63	1.63	52.74	57.37	0.38	40.91	229.52	454.22	<LOD	0.04699	
	29+31+32+33	Swans Bend Site A, C, D, E, 0m		7	45.4	21.32	2.43	39.29	59.59	0.34	36.28	306.68	601.13	<LOD	0.10193	
	30	Swans Bend Site B, 0m		7	44.2	29.15	2.55	60.07	94.56	0.46	51.48	293.23	646.92	0.0314	0.17651	
	34	Bill Reach downriver, Site A, 0m		8	55.6	17.66	1.67	35.96	52.67	0.32	31.17	210.78	479.71	0.011	0.048	
	35	Bill Reach downriver, Site B, 0m		8	41.4	17.06	2.82	35.32	57.97	0.38	33.93	319.11	833.31	0.021	0.252439	Area removed from license
	36+37+38	Fish Quay, Site A, B, C, 0m		9	53.7	23.23	0.29	38.86	29.85	0.2	27.57	86.03	145.41	<LOD	0.019011	
MLA2013/00131	39	Northumbrian quay, 0m		10	46.3	25.93	0.38	36.6	34.61	0.26	28.91	120.61	183.15	<LOD	0.069435	
	40	Ro-Ro Berth No 3, 0m		11	68.5	12.27	0.21	31.54	33.36	0.07	39.74	48.81	116.4	<LOD	0.010319	
	41+42	Ro-Ro Berth No 4, Site A, B, 0m		12	42.8	24.96	0.71	35.49	35.76	0.26	28.62	171.55	264.47	<LOD	0.017986	
	43+44	Whitehill Point Jetty, Site A, B, 0m		13	37.9	26.56	0.85	36.21	38.04	0.28	30.14	183.83	318.54	<LOD	0.032	
	45+46	Tyne Dock entrance, Site A, B, 0, 2m		14	40.7	31.25	0.69	44.08	46.65	0.32	34.5	162.96	244.9	<LOD	0.024425	
	47+48	Riverside Quay Site A, B, 0m		15	42.7	21.26	0.81	36.54	38.43	0.26	31.66	153.37	340.2	0.0613	0.029495	
	49	Riverside Quay Site C, 0m		15	44.0	22.45	0.66	35.29	34.86	0.29	27.78	125.91	260.56	<LOD	0.026246	
	50	Tyne Bulk Terminal, Site A, 0m		16	45.9	22.99	0.7	33.82	33.87	0.28	27.42	143.76	247.08	<LOD	0.024	
	51+52	Tyne Bulk Terminal, Site B,C, 0m		16	38.9	25.92	0.85	37.24	40.12	0.35	30.47	177.12	347.95	<LOD	0.028	
	53+54	Tyne Tanker Berth Site A, B, 0m		17	35.0	31.23	0.88	47.55	45.8	0.35	35.38	179.46	321.54	<LOD	0.032	
	55+56	Tyne Car Terminal Berth 1, Site A, B, 0m		18	43.8	32.79	1.11	53.01	49.72	0.4	39.11	228.93	316.13	<LOD	0.032	
	57	Tyne Car Terminal Berth 2, 0m		19	43.9	23.43	0.68	34.17	35.55	0.22	27.12	153.34	288.06	<LOD	0.021	
	58	Tyne Car Terminal Berth 3, 0m		20	40.0	22.69	1.12	41.42	45.3	0.31	30.16	173.13	365.17	0.009	0.055	
	59	Howdon Jetty Site A, 0m		21	41.4	21.73	0.92	38.46	40.06	0.31	30.15	158.65	327.97	<LOD	0.03	
	60	Howdon Yard, Site A, 0m		22	54.7	14.93	1.38	37.89	79.29	0.45	29.23	222.17	430.28	0.015	0.091	
	61	Howdon Yard, Stie B, 0m		22	40.4	28.01	1.28	48.84	49.03	0.35	37.51	198.25	439.96	<LOD	0.034	
	62	Svitzer Yard, 0m		23	49.9	26.18	2.65	44.09	155.17	0.39	33.86	217.25	1125.9	0.024	0.165	Area removed from license
	63	Newcastle Quay TAVR, 0m		24	43.2	13.17	1.94	25.98	39.97	0.39	20.77	283.3	724.98	0.016	0.058	
	64+65	McNulty Quay, Site A, B, 0m		25	38.1	24.34	0.62	37.16	35.03	0.31	28.75	139.83	230.67	<LOD	0.021	
	66+67	McNulty Approach, Site A, B, 0m		26	39.7	26.56	0.6	42.32	38.7	0.37	31.61	143.81	234.41	<LOD	0.021	
MLA2013/00253	1	Walker Technology Park (Area 37)		37	47.7	26.28	1.41	46.21	46.55	0.29	33.86	193.92	385.49	0.0022	0.041353	
	2	Walker Technology Park (Area 37)		37	53.5	20.56	1.35	35.02	41.61	0.32	27.97	179.38	384.66	0.0027	0.046752	
	3	Walker Technology Park (Area 37)		37	39.1	35.54	1.74	60.39	63.52	0.44	43.24	247.75	470.85	0.0053	0.052889	
	4	Walker Technology Park (Area 37)		37	46.1	28.39	1.94	54.01	69.63	0.4	38.62	268.34	561.02	0.0057	0.069862	
	1+2+3	Area 34-A&P Tyne-Bede Quay Site A+B+ C, 0m		34	42.9	29.13	2.14	52.54	74.03	0.37	39.45	279.33	541.35	0.0144	0.073481	
	4+5	Area 35-A&P Tyne-No7 Dry Dock Entrance and Quay Site		35	50.3	21.96	1.81	40	64.25	0.29	30.81	244.55	473.57	0.01	0.070789	
	6+7+8	Area 43-A&P Tyne-West Quay Site F+G+H,0m		43	37.1	29.53	2.45	53.74	73.56	0.46	41.59	299.4	615.24	0.0125	0.080234	
MLA2013/00255	9	Area 46-A&P Tyne- No6 Dry Dock Entrance Site I, 0m		46	34.7	30.25	2.65	59.25	94.93	0.43	44.09	309.11	650.42	0.0112	0.136138	
	10	Area 46-A&P Tyne- No6 Dry Dock Entrance Site J, 0m		46	38.2	26.17	2.5	54.04	241.37	0.39	40.46	283.07	713.94	0.0227	0.097856	
	11	Area 46-A&P Tyne- No6 Dry Dock Entrance Site K, 0m		46	45.9	26.49	1.97	55.49	110.88	0.3	42.42	242.04	609.68	0.0461	0.629561	
	12	Area 46-A&P Tyne- No6 Dry Dock Entrance Site L, 0m		46	38.2	20.85	3.11	40.21	74.61	0.35	36.99	320.3	705.72	0.0142	0.119877	
MLA2013/00291	1	Simon Storage Ocean berth, Area 23, River Tyne A, 0m		23	37.3	31.36	1.36	47.74	64.93	0.46	37.96	223.48	374.75	0.0087	0.041624	
	2	Simon Storage Ocean berth, Area 23, River Tyne B, 0m		23	37.6	32.5	1.81	54.06	76.25	0.7	41.4	255.89	455.76	0.0109	0.041654	
	3	Simon Storage Ocean berth, Area 23, River Tyne C, 0m		23	36.7	25.38	1.41	42.16	59.78	0.38	32.54	208.1	357.85	0.0135	0.048071	
MLA2013/00293	1	CEMEX Berth (Area 25)		25	39.5	27.65	1.26	48.72	59.98	0.39	36.69	192.47	375.22	0.0061	0.049929	
	2	CEMEX Berth (Area 25)		25	39.4	31.21	1.52	48.26	63.47	0.39	38.89	212.03	443.95	0.0008	0.050407	
	3	CEMEX Berth (Area 25)		25	48.4	29.21	1.44	53.27	67.54	0.37	40.1	206.94	397.28	0.0246	0.140636	
	4	CEMEX Berth (Area 25)		25	40.7	26.2	1.33	47.44	65.31	0.31	36.51	205.67	475.18	0.0054	0.040829	
	5	CEMEX Berth (Area 25)		25	42.5	29.71	1.53	50.91	63.92	0.4	40.4	220.97	428.85	0.0056	0.05127	
MLA2013/00273	1	Offshore Group Newcastle (Area 32)		32	47.7	26.28	1.41	46.21	46.55	0.29	33.86	193.92	385.49	0.0022	0.041353	
	2	Offshore Group Newcastle (Area 32)		32	53.5	20.56	1.35	35.02	41.61	0.32	27.97	179.38	384.66	0.0027	0.046752	
	3	Offshore Group Newcastle (Area 32)		32	39.1	35.54	1.74	60.39	63.52	0.44	43.24	247.75	470.85	0.0053	0.052889	
	4	Offshore Group Newcastle (Area 32)		32	46.1	28.39	1.94	54.01	69.63	0.4	38.62	268.34	561.02	0.0057	0.069862	
Total	95		Average		46.7	25.52	1.33	43.79	60.35	0.36	34.20	197.92	396.58	0.02	0.07	
					AL1 (ppm dry)	20	0.4	40	40	0.3	20	50	130	0.1	0.1	
					AL2 (ppm dry)	100	5.0	400	400	3.00	200	500	800	1	1	

RiverTyne 2016 Metals and Tins Sampling Results

Sample Plan r	Sample No	Dredge Area	Total Solids	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn	DBT	TBT	Comments
	1	Harbour Channel Site A Sample 1	72.5	12.26	0.13	14.02	6.42	0.05	9.81	32.64	59.03	<0.001	<0.001	
	2	Harbour Channel Site B Sample 2	77.42	8.73	0.15	11.94	4.34	<0.033	7.43	23.84	45.92	<0.001	<0.001	
	3	Harbour Channel Site C Sample 3	65.32	13.8	0.26	19.64	12.39	0.05	13.65	45.76	76.75	<0.001	<0.001	
	4	Harbour Channel Site D Sample 4	75.04	15.99	0.27	17.19	8.8	0.05	11.53	54.29	82.36	<0.001	<0.001	
	5	Shieldr Harbour Reach Daunriver Site A	48.94	15.06	0.41	26.01	13.65	0.08	15.26	69.44	111.66	<0.001	<0.001	
	6	Shieldr Harbour Reach Daunriver Site B Sample 6	60.14	14.12	0.44	25.47	15.33	0.08	15.95	74.64	111.42	<0.001	0.038	
	7	Shieldr Harbour Reach Daunriver Site C Sample 7	74.62	10.56	0.11	6.93	2.51	<0.033	6.46	20.89	28.19	<0.001	0.001	
	8	Shieldr Harbour Reach Daunriver Site D Sample 8	39.54	27.26	0.89	45.46	27.64	0.2	28.52	126.09	220.47	<0.002	0.028	
	27	Lang Reach Upriver Site A Sample 27	51.38	23.34	2.91	64.45	101.2	0.88	38.99	220.86	618.66	0.051	0.468	
	28	Lang Reach Upriver Site B Sample 28	56.8	13.89	1.36	36.88	28.3	0.19	24.91	179.63	371.2	0.013	0.036	
	29	Suanr Bend Site A Sample 29	46.57	15.35	2.95	55.14	49.37	0.26	39.19	345.7	691	0.016	0.03	
	30	Suanr Bend Site B Sample 30	52.72	14.93	1.76	42.18	33	0.18	27.45	226.7	484.56	0.013	0.051	
	33	Suanr Bend Site E Sample 33	47.98	15.7	2.93	43.49	43.65	0.29	32.14	354.58	760.73	0.041	0.038	
	39	Northumbrian Quay Sample 39	43.95	24.32	0.85	48.89	32.33	0.29	31.32	154.91	238.64	<0.001	0.025	
	50	Tyne Bulk Terminal Site A Sample 50	46.44	24.28	1.45	42.97	33.59	0.27	28.14	174.29	343.43	<0.001	0.043	
	51	Tyne Bulk Terminal Site B Sample 51	43.37	25.24	1.36	45.88	35.85	0.26	30.53	175.45	331.66	<0.001	0.029	
	52	Tyne Bulk Terminal Site C Sample 52	43.77	24.8	1.55	43.86	37.63	0.34	30.75	199.33	379.1	0.015	0.037	
	57	Tyne Car Terminal Berth 2 Sample 57	40.97	25.59	1.23	58.39	38.61	0.31	37.95	201.96	326.62	<0.002	0.022	
	58	Tyne Car Terminal Berth 3 Sample 58	44.82	25.56	1.64	52.86	39.74	0.33	32.96	208.07	408.15	0.012	0.028	
	59	Haudon Jetty Site A Sample 59	45.21	20.60	1.22	45.02	50.83	0.27	34.49	179.42	428.02	0.021	0.043	Sample failed initially for zinc but passed on re-sampling
	60	Haudon Yard Site A Sample 60	53.37	16.59	1.31	40.28	44.06	0.27	25.29	159.1	356.09	0.015	0.034	
SAM2016/0032	61	Haudon Yard Site B Sample 61	55.84	15.77	1.19	36.12	34.44	0.22	24.85	162.4	335.1	0.012	0.03	
	62	Switzer Yard Sample 62	42.69	18.67	3.1	50.53	47.44	0.29	38.83	372.39	794.44	0.019	0.047	
	63	Newcastle Quay TAVR Sample 63	33.14	14.08	2.55	33.15	34.05	0.31	25.27	309.14	699.35	0.016	0.044	
	9+10	Shieldr Harbour Reach Upriver Site A & B Sample 9 & 10	50.66	20.62	0.6	46.92	25.7	0.3	27.16	108.94	173.21	<0.001	0.025	
	11+12	Shieldr Harbour Reach Upriver Site C & D Sample 11 & 12	51.56	22.61	1.17	48.47	31.09	0.2	28.7	146.71	288.59	<0.001	0.022	
	13+14	Northumberland Dock to Jarrau Quay Site A & B ample 13 & 14	42.78	26.34	1.94	67.99	43.49	0.39	42.51	262	505.55	0.016	0.034	
	15+16	Northumberland Dock to Jarrau Quay Site C & D ample 15 & 16	44.02	23.54	1.62	61.59	40.87	0.31	37.41	210.83	418.76	<0.002	0.03	
	17+18	Northumberland Dock to Jarrau Quay Site E & F ample 17 & 18	42.29	21.65	1.23	48.33	32.08	0.25	30.92	172.66	329.04	<0.001	0.27	
	19+20	Northumberland Dock to Jarrau Quay Site G & H ample 19 & 20	44.1	23.22	1.71	54.66	40.48	0.28	34.37	209.16	438.04	0.015	0.034	
	21+22	Northumberland Dock to Jarrau Quay Site I & J ample 21 & 22	44.9	21.51	1.13	46.69	30.63	0.22	29.22	158.54	308.1	<0.001	0.028	
	23+24	Northumberland Dock to Jarrau Quay Site K & L ample 23 & 24	47.18	19.94	1.19	52.06	32.33	0.22	31.77	159.37	323.1	<0.001	0.024	
	25+26	Lang Reach Daunriver Site A & B Sample 25 & 26	53.74	18.18	1.63	49.88	36.85	0.22	32.82	204.54	452.91	0.026	0.034	
	31+32	Suanr Bend Site C & D Sample 31 & 32	57.09	11.81	1.82	33.19	42.39	0.16	24.54	229.36	528.64	0.027	0.046	
	34+35	Bill Reach Daunriver Site A & B Sample 34 & 35	51.88	14.45	1.93	43.5	35.1	0.26	29.02	249.11	566.21	0.056	0.039	
	36+37+38	Fish Quay site A, B & C Sample 36, 37 & 38	51.21	23.31	0.51	44.6	27.85	0.2	27.05	89.8	151.35	<0.001	0.022	
	40+41+42	Ro Ro Berth No 3, No 4 Site A & No 4 Site B Sample 40, 41 & 42	42.85	24.03	1.16	64.52	41.71	0.29	39.05	167.6	354.34	<0.001	0.0234	
	43+44	Whitehill Point Jetty Site A & B Sample 43 & 44	42.06	21.21	1.08	53.22	37.55	0.26	31.5	158.4	324.39	<0.002	0.0225	
	45+46	Tyne Dock Entrance Site A & B Sample 45 & 46	42.65	19.79	1.14	55.16	42.15	0.26	32.56	151.02	347.33	0.0132	0.0397	
	47+48+49	Riverside Quay Site A, B & C Sample 47, 48 & 49	46.58	23.33	1.24	54.9	44.26	0.38	32.48	171.06	360.58	0.0098	0.0311	
	53+54	Tyne Tanker Berth A & B Sample 53 & 54	40.79	22.67	1.43	66.86	41.41	0.28	37.8	189.71	410.96	<0.002	0.023	
	55+16	Tyne Car Terminal Berth 1 Site A & B Sample 55 & 56	43.31	24.22	1.32	63.29	44.58	0.27	37.13	175.34	388.96	0.0093	0.0209	
	64+65	Mc Nulty Quay Site A & B Sample 64 & 65	42.74	20.42	1.19	60.09	37.33	0.27	34.63	162.88	355.55	<0.001	0.0206	
	66+67	Mc Nulty Approach Site A & B Sample 66 & 67	47.58	16.55	1.26	61.37	36.86	0.23	37.82	167.22	393.94	<0.001	0.2095	
	1	Walker Technology Park (Area 37)	35.96	16.61	3.02	37.17	48.71	0.32	30.81	325.93	826.06			Area removed from licence
	2	Walker Technology Park (Area 37)	48.29	12.6	1.74	29.37	36.72	0.21	24.34	215.47	533.14			
SAM2016/0023	3	Walker Technology Park (Area 37)	47.62	13.82	1.96	35.54	39.81	0.29	28.78	258.46	611.65			
	4	Walker Technology Park (Area 37)	49.03	14.22	1.92	34.78	37.47	0.24	27.73	243.18	595.55			
	5	Walker Technology Park (Area 37)	39.63	18.08	2.72	40.73	49.06	0.36	33.02	311.71	792.4			
	7	Walker Technology Park (Area 37)	43.47	14.01	2.54	33.6	43.13	0.29	28.74	288.08	736.79			
	9	Walker Technology Park (Area 37)	55.32	6.82	1.26	21.85	24.88	0.18	23.38	205.81	439.89			
	1	Neptune Quays (Area 53)	43.10	16.5	0.17	51.6	34.3	0.29	30.2	219	442	0.03	0.2	April 2017 Results
SAM2016/00085	2	Neptune Quays (Area 53)	57.40	12.3	0.86	39.2	28.3	0.14	22.8	111	280	0.02	0.07	
	3	Neptune Quays (Area 53)	50.00	14.7	1.03	49.4	31.9	0.22	27.8	145	328	0.02	0.06	
	4	Neptune Quays (Area 53)	50.00	16.7	1.55	56.6	100	0.34	31.4	168	478	0.04	0.37	
	1	Area 34-A&P Tyne-Bede Quay	40.22	22.15	1.65	40.76	43.47	0.31	31.64	209.55	502.24	0.022	0.055	Sample failed initially for zinc but passed on re-sampling
	2	Area 34-A&P Tyne-Bede Quay	40.86	19.41	1.53	34.17	40.7	0.29	28.07	199.68	469.23			
	3	Area 34-A&P Tyne-Bede Quay	36.32	20.62	1.71	37.4	44.21	0.36	30.69	207.96	508.86			
	4	Area 34-A&P Tyne-Bede Quay	38.01	21.7	1.67	41.76	42.54	0.41	32.24	213.71	501.49			
	5	Area 34-A&P Tyne-Bede Quay	42.36	21.86	1.71	48.58	43.83	0.33	33.95	207.49	500.89			
	6	Area 34-A&P Tyne-Bede Quay	43.35	20.69	1.61	46.11	44.69	0.29	32.85	205.67	494.4			
SAM2016/00044	4+5	Area 35-A&P Tyne-No7 Dry Dock Entrance and Quay Site D+E, 0m	50.19	13.79	1.86	43.61	36.62	0.22	30.26	232.88	515.8	0.014	0.053	
	6+7+8	Area 43-A&P Tyne-Wort Quay Site F+G+H, 0m	42.02	18.37	2.86	52.53	52.55	0.33	37.39	339.99	718.57	0.019	0.06	
	9	Area 46-A&P Tyne-No6 Dry Dock Entrance Site I, 0m	31.71	21.82	2.49	46.95	61.48	0.4	33.77	281.46	646.56	0.02	0.054	Sample failed initially for zinc but passed on re-sampling
	10	Area 46-A&P Tyne-No6 Dry Dock Entrance Site J, 0m	48.08	13.22	2.32	57.63	65.62	0.22	39.86	311.07	625.08	0.016	0.038	
	11	Area 46-A&P Tyne-No6 Dry Dock Entrance Site K, 0m	47.57	15.05	2.44	51.82	45.97	0.33	35.65	309.86	661.67	0.014	0.042	
	12	Area 46-A&P Tyne-No6 Dry Dock Entrance Site L, 0m	51.16	16.66	2.63	57.42	51.11	0.31	38.87	341.37	736.75	0.013	0.04	
SAM2016/00057	1+2+3	Siman Storage Ocean Berth (Area 23)	38.34	23.44	1.62	59.2	44.68	0.3	36.05	210.47	453.24	0.01	0.028	
SAM2016/00078	1	CEMEX Berth (Area 25)	29.52	34.55	0.84	75.33	42.84	0.35	46.51	172.82	299.73	<LOD	0.028	
	2	CEMEX Berth (Area 25)	31.32	34.33	0.94	79.29	43.71	0.4	47.37	176.96	318.18	<LOD	0.019	
	3	CEMEX Berth (Area 25)	34.29	30.32	0.85	64.26	40.05	0.33	41.01	159.71	281.11	<LOD	0.022	
SAM2016/0023	1	Smulders Projects Ltd (Area 32)	47.00	19.91	1.59	48.86	40.93	0.3	32.37	202.92	478.12			
	2	Smulders Projects Ltd (Area 32)	45.46	22.38	1.69	51.15	47.48	0.34	35.04	212.71	481.89			
	3	Smulders Projects Ltd (Area 32)	39.78	24.46	2.13	50.6	51.8	0.39	36.79	271.87	598.06			
	4	Smulders Projects Ltd (Area 32)	39.72	25.64	1.55	57.97	45.2	0.32	38.75	198.2	450.27			
Total	102			18.80	1.53	45.01	38.85	0.27	30.05	198.11	432.34	0.02	0.06	
			AL1 (ppm dry)	20	0.4	40	40	0.3	20	50	130	0.1	0.1	
			AL2 (ppm dry)	100	5.0	400	400	3.00	200	500	800	1	1	

Polycyclic Aromatic Hydrocarbons

mg/kg (ppm) dry weight

Location	ACENAPH	ACENAPT	ANTHRAC	BAA	BAP	BBF	BENZGHI	BEP	BKF	C1N	C1PHEN	C2N	C3N	CHRYSEN	DBENZAH	FLUORAN	FLUOREN	INDPYR	NAPTH	PERYLEN	PHENANT	PYRENE	THC
Area 1 Harbour Channel	0.029	0.245	0.328	0.349	0.339	0.411	0.266	0.342	0.099	1.739	3.369	4.560	11.107	0.285	0.062	0.440	0.318	0.110	0.318	0.039	1.216	0.466	2498.000
Area 2 Shields Harbour (down river)	0.048	0.347	0.704	0.685	0.676	0.856	0.408	0.517	0.268	2.311	4.466	5.876	13.865	0.504	0.069	1.501	0.585	0.209	0.477	0.134	2.402	1.122	3020.000
Area 3 Shields Harbour (up river)	0.039	0.133	0.393	0.468	0.512	0.716	0.240	0.394	0.254	3.645	2.235	5.714	8.702	0.436	0.062	0.971	0.265	0.195	1.064	0.108	1.122	0.915	1455.000
Area 5 Channel:Long reach-down	0.032	0.332	0.608	0.638	0.563	1.345	0.358	0.620	0.339	4.716	4.631	8.175	12.505	0.515	0.103	1.684	0.640	0.236	1.240	0.193	2.382	1.380	
Area 6 Channel:Long reach up																							
Area 14 Northumbrian Quay	0.026	0.339	0.620	0.546	0.555	1.158	0.319	0.580	0.417	4.720	5.347	9.073	14.573	0.432	0.078	1.299	0.613	0.211	1.040	0.163	2.434	1.105	
Area 15 Ro-ro berth 3 surf																							3013.000
Area 16 Ro-ro berth 4 surf																							2681.000
Area 17 Whitehill point jetty surf																							3072.000
Area 18 Tyne Dock entrance																							
Area 19 Riverside quay surf																							2758.000
Area 20 Tyne bulk terminal surf																							5280.000
Area 21 Tyne Tanker berth	0.024	0.197	0.566	0.680	0.770	0.933	0.465	0.600	0.300	3.503	3.152	5.827	10.154	0.611	0.110	1.093	0.346	0.321	0.850	0.148	1.639	0.972	3413.000
Area 22 Tyne car terminal surf																							2935.000
Area 23 Ocean berths surf																							3159.000
Area 24 Howdon jetty	0.028	0.297	0.708	0.938	0.648	1.532	0.405	0.656	0.556	3.064	4.245	5.726	9.795	0.771	0.112	2.759	0.522	0.269	0.809	0.206	2.587	2.139	
Area 25 RMC, Jarrow Quay																							
Area 26 AMEC howdon yard surf																							3738.000
Area 32 AMEC Hadrian Yard west																							2931.000
Area 33 Devlin's Quay																							3300.000
Area 34 A&P Tyne Bede Quay	0.035	0.393	0.695	1.036	0.957	1.883	0.578	0.881	0.628	3.797	4.323	6.444	10.736	0.790	0.156	2.314	0.646	0.476	1.316	0.288	2.395	1.789	2373.000
Area 37 Walker Technology Park	0.030	0.400	0.560	1.130	1.110	1.800	0.580	0.950	0.660	2.700	2.740	4.540	7.230	1.060	0.200	2.270	0.630	0.490	1.080	0.330	2.030	1.700	1804.000
Area 43 A&P Tyne West Quay Hebburn	0.046	0.350	0.584	1.037	1.086	1.577	0.637	0.877	0.584	3.924	3.971	6.402	11.393	0.923	0.165	2.310	0.629	0.457	1.189	0.316	2.376	1.862	3466.000
Area 52 Mc Nulty Offshore Quays																							
AL 1 (ppm dry)	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.01**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**100**
TEL	**0.00671**		**0.0469**	**0.0748**	**0.0888**									**0.108**	**0.00622**	**0.113**	**0.0212**		**0.0346**		**0.0867**	**0.153**	
PEL	**0.0889**		**0.245**	**0.693**	**0.763**									**0.846**	**0.135**	**1.494**	**0.144**		**0.391**		**0.544**	**1.398**	

Exceedance of AL1

Exceedance of PEL as AL2 not available

Appendix C Summary of River Tyne Licensed Areas Since 1995

Area No	Location																														
	Licensee	378/95/0	378/96/1	302/0/98/0	302/0/98/1	302/0/98/2	307/19/99/0	307/19/99/1	307/19/00/0	307/19/00/1	307/19/00/2	307/19/00/3	307/19/01/0	307/19/01/1	313/52/01/0	313/52/01/1	313/52/02/0	313/52/02/1	316/31/03/0 (A & P Tyne)	318/04/02/2	318/04/03/0	321/85/03/0	326/10/05/0	337/36/07/01	346/12/10/0	346/12/11/0	L/20/11/00/28/13	L/20/11/00/28/14	L/20/11/00/28/17	L/20/13/00/28/01	L/20/13/00/28/03	L/20/13/00/28/05
	Date	1/8/95	22/4/96	03/03/96-02/03/99	29/10/98-02/03/99	04/11/98-02/03/99	4/11/99-05/04/00	15/11/99-05/04/00	4/5/2000-5/8/2000	28/7/2000-5/8/2000	06/9/00-5/8/01	06/12/00-5/8/01	17/7/01-5/8/01	26/8/01-25/8/02	15/10/01-25/8/02	23/04/01-25/8/02	10/07/01-25/8/02	20/01/03-05/04/03	22/10/02-25/03/03	25/03/03 -25/04/03	26/03/03-25/11/04	05/04/05-25/03/07	13/12/07-25/8/08	15/11/10-31/12/12	31/3/11-31/12/12	1/11/11-31/12/12	1/12/12-30/3/13	17/5/13-30/6/13	17/8/13-31/12/22	16/6/14-31/12/22	14/11/17-31/12/22
1	Harbour Channel																														
2	Channel - Shields Harbour driver Reach																														
3	Channel - Shields Harbour u/river Reach																														
4	Channel - Northumberland Dock To Jarrow Quay Corner Reach																														
5	Channel - Long Reach driver																														
6	Channel - Long Reach u/river																														
7	Channel - Swan's Bend																														
8	Channel - Bill Reach driver																														
9	Bill Reach u/river																														
10	Bill Point																														
11	Fish Quay																														
12	Royal Quays Marina Entrance & Approach																														
13	Hardon Stathe & Mill Dam																														
14	Northumbrian Quay																														
15	RoRo Berth No. 3																														
16	RoRo Berth No. 4																														
17	Whitehill Point Jetty																														
18	Tyne Dock Entrance																														
19	Riverside Quay																														
20	Tyne Bulk Terminal																														
21	Tyne Tanker Berth																														
22a	Tyne Car Terminal Berth 1																														
22b	Tyne Car Terminal Berth 2																														
22c	Tyne Car Terminal Berth 3																														
23a	Coaster Berth																														
23b	Ocean Berth																														
24	Howdon Jetty																														
25	Cemex, Jarrow Quay																														
26	Howdon Yard Quay																														
27	AMEC Hadrian East																														
28	Rohm & Haas																														
29	Jusswood Quay																														
30	Willington Gut																														
31	Jarrow Slakh																														
32	OGN Hadrian Yard West																														
33	Switzer Quay																														
34	A&P Tyne – Bede Quay																														
35	A&P Tyne - Dry Dock Entrance & Quay (Hawthorne Leslie)																														
36	Swan Hunter (Tyneside) Ltd. – East Fitting Out Quay																														
37	Walker Technology Park																														
38	Newcastle Quay – TAVR																														
39	Newcastle Quay 27-28 Berths																														
40	Ouseburn Entrance																														
41	Lafarge Redland (Steetley)																														
42	Newcastle Quay 5 – 9 Berths																														
43	A&P Tyne – West Quay, Hebburn																														
44	A&P Tyne Smiths Dock																														
45	Newcastle Quay – 22- 26 Berths																														
46	A&P Tyne No 2 D/D Entrance																														
47	Newcastle Quay – St Peter's Marina																														
48	HMS Calliope																														
49	Newcastle Quay – 12-19 Berths																														
50	Millenium Bridge																														
51	Middle Docks – Brammore Investments																														
52	McNulty Offshore																														
53	Neptune Yard																														
54	A&P Tyne Wallsend Dry Docks																														
55	Swan Hunter Slipway Ends																														
56	Tyne Dock																														
57	Felling Reach																														
58	St Peter's Reach																														
59	Newcastle Quayside Channel																														
60	McNulty Approach																														
61	Riverside Quay Extension																														