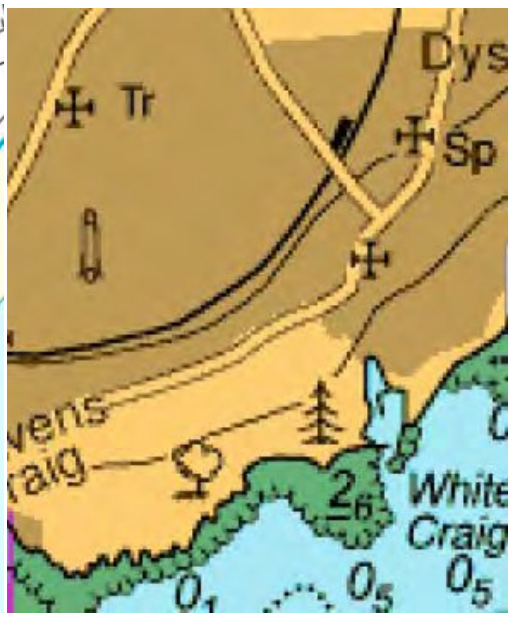
1.0 Introduction

This Best Practical Environmental Option (BPEO) assessment has been prepared to support an application being made by the Dysart Sailing Club to Marine Scotland for a licence under the Marine (Scotland) Act 2010 to undertake dredging operations in Dysart Harbour, Fife.

1.1Dysart Harbour

Dysart Harbour is located to the east of Kirkcaldy, on the north coast of the Firth of Forth, and has been in existence since the 15th Century. Whilst initially a trading port, the harbour has for many years been the home to a variety of leisure (small yacht and motor boat) and pot and rod fishing craft. The harbour itself consists of an inner and outer basin, with entry to most craft restricted to 2.5 hours either side of high tide.



1.2 Dredging Requirements

The harbour is prone to siltation, particularly the outer basin, and the purpose of the Club's application for a Marine Licence is to allow the channel leading from the harbour entrance to the inner basin to be cleared of the accumulated sediment, and to allow for repeat dredging thereafter on an annual basis, so as to maintain the depth of water required for safe access. The proposed

dredging area is shown delineated red in Figure 4 below. Neither the inner basin nor the wider outer basin will be dredged.

The dredging would involve the removal of a maximum of 1200 cubic metres of material per annum.

Works are planned to commence in April 2022, with each dredging operation taking approximately 3-5 days to complete (weather permitting).

DREDGE AREA	LAT	LON
NW	56 7.342N	3 7.456W
NE	56 7.346N	3 7.451W
SE	56 7.287N	3 7.445W
SW	56 7.295N	3 7.461W
Middle	56 7.308N	3 7.452W

2.0 Sediment Chemical Analysis

Three sediment samples were taken from the proposed dredging area in November, 2021 and sent to RPS Group Ltd (a UKAS accredited laboratory) for chemical analysis.

SAMPLE NO.	LAT	LONG
1	56 7.341N	3 7.455W
2	56 7.339N	3 7.456W
3	56 7.363N	3 7.458w

Three sediment samples were taken from the proposed dredging area in November, 2021 and sent to RPS Group Ltd (a UKAS accredited laboratory) for chemical analysis.

The table is a representation of the received re4sults which are on the required return form.

Sample Points

The analysis results have been examined

arsenic (HF digest)	**mg/kg AD**	**8.20**	**16.5**	**12.8**
cadmium (HF digest)	**mg/kg AD**	**< 0.10**	**0.30**	**< 0.10**
chromium (HF digest)	**mg/kg AD**	**75.1**	**101**	**89.0**
copper (HF digest)	**mg/kg AD**	**38.8**	**64.4**	**48.8**
mercury (HF digest)	**mg/kg AD**	**0.04**	**0.15**	**0.06**
nickel (HF digest)	**mg/kg AD**	**49.3**	**52.4**	**57.3**
lead (HF digest)	**mg/kg AD**	**12.3**	**34.1**	**19.7**
zinc (HF digest)	**mg/kg AD**	**57.4**	**138**	**73.7**
acenaphthene	**ug/kg**	**2.3**	**25.2**	**34.7**
acenaphthylene	**ug/kg**	**< 2.0**	**< 2.0**	**75.1**
anthracene	**ug/kg**	**13.4**	**111**	**232**
benzo(a)anthracene	ug/kg	17.5	124	229
benzo(a)pyrene	ug/kg	14.5	96.3	164
benzo(b)fluoranthene	ug/kg	18.2	124	181
benzo(g,h,i)perylene	ug/kg	30.5	185	259
benzo(k)fluoranthene	ug/kg	4.5	34.9	72.0
C1 128	ug/kg	142	613	700
C1 178	ug/kg	23.4	126	123
C2 128	ug/kg	77.5	329	349
C3 128	ug/kg	36.5	207	221
chrysene	ug/kg	13.5	94.0	181
dibutyltin (DBT)	ug/kg as cation	< 5.00	< 5.00	< 5.00
dibenzo(a,h)anthracene	ug/kg	3.6	23.4	30.1
dieldrin	mg/kg	< 0.01	< 0.01	< 0.01
fluoranthene	ug/kg	21.1	161	418
fluorene	ug/kg	9.3	75.7	128
hexachlorobenzene (HCB)	mg/kg	< 0.01	< 0.01	< 0.01
indeno(1,2,3-c,d)pyrene	ug/kg	7.0	72.7	113
naphthalene	ug/kg	81.5	426	469

Although some are above AL1 none of the results are in excess of AL2.

It may be of note that the sample contamination is greater at the harbour mouth compared to the inner area.

Given the low volume of material to be disposed of, the fact it raises relatively little contamination concern, and the strong tidal and wave action evident along this section of coastline (as evidenced by the above photograph), it is expected that the material, as for the sea disposal option, would rapidly disperse and dilute in the receiving environment and have negligible adverse environmental impact.

This is a possible disposal method and has been carried forward for further analysis.

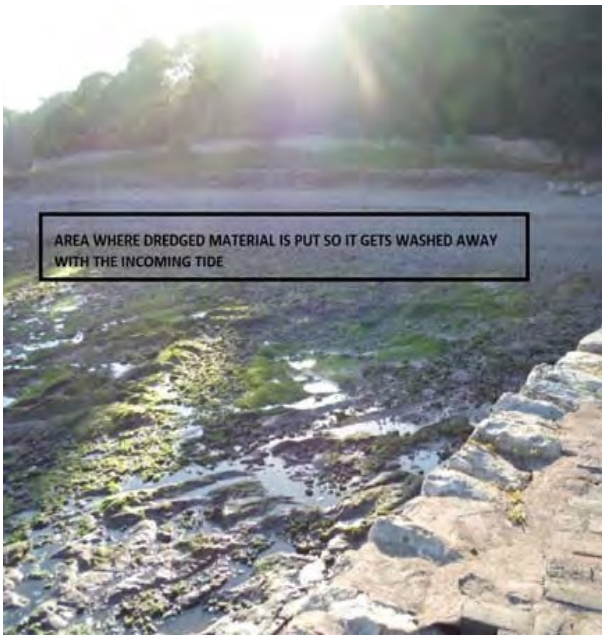
3.1Option 1 - Disposal at Sea

Dysart is a drying harbour with a restricted entrance and navigable channel that would prevent use of a large scale dredger. The accumulated sediment would therefore need to be excavated and loaded onto a shallow draft vessel (hopper barge) for disposal at a licensed disposal site.

Whilst this option would present logistical challenges, it does represent a possible disposal method and has been carried forward for further analysis.

3.2Option 2 - Disposal on Foreshore

This option would involve the excavation of the accumulated sediment by a local contractor utilising a 360° digger, with the arisings being loaded onto dumper trucks for disposal on the adjacent foreshore to the east of the harbour (Figure 6 / Table 5). The material would be spread over the identified area, and allowed to disperse on subsequent tides



	LAT	LONG
Disposal Area - SE Corner	56 7.298N	3 7.471W
Disposal Area - SW Corner	56 7.283N	3 7.510W
Disposal Area - NW Corner	56.7.297N	3 7.525W
Disposal Area - NE Corner	56°07.311'N	3°07.486'W

Table 5 Disposal Area Coordinates

3.3 Option 3 - Disposal at Landfill

Disposal of the dredged material at landfill would first require the material to be stockpiled on shore for dewatering. The material would then need to be reloaded into suitable trucks for onward transport.

Storage of the material within the confines for Dysart Harbour would be problematic given its small size. The one area that could potentially be utilised, located adjacent to the harbour office, is used for boat storage and is typically full during the winter / spring months. Use of this area would cause considerable disruption to the users of the harbour, and the material would be visible to members of the public using the adjoining public carpark.

This is a possible disposal method and has been carried forward for further analysis.

3.4 Option 4 - Incineration

As the dredged material is non-combustible, incineration is not possible. This option is discounted from further analysis.

3.5 Option 5 - Beneficial Use

We are not aware of any projects in the vicinity where the dredged material could be used. Given the low volumes involved, it is unlikely that those undertaking land reclamation or other similar projects would be interested in the material. It is also questionable whether the material would be suitable from a geotechnical perspective.

This option has been discounted from further analysis.

3.6 Option 6 - Do nothing

In the event that safe access into the harbour cannot be maintained, this would jeopardise the future viability of the harbour and could ultimately result in its closure. This would have a significant adverse social, economic and cultural impact on the Dysart community.

This option has been discounted from further analysis.

4.0 Strategic Considerations

The following options have been taken forward for further consideration:-

Option 1 - Disposal at Sea

Option 2 - Disposal on Foreshore

Option 3 - Disposal at Landfill

4.1 Operational considerations, including handling and transportation

Option 1 would require the dredged material to be loaded onto a hopper barge. The barge could be loaded via a land based excavator, or more typically from a pontoon / spud leg backhoe dredger. However, given the restricted nature of the harbour, this would be a difficult operation to complete - even a modest 150m^3 capacity barge would have a length in excess of 30m, and at that capacity would require 3 return trips to the offshore disposal site. The hopper barge, if not self-propelled, would also require a support vessel.

Options 3 would require the dredged material to be stored onshore for dewatering prior to onward transport. Sites for such storage at the harbour are extremely limited and this option would almost inevitably require areas used for boat and other storage to be vacated. This would cause considerable disruption to the users of the harbour.

In respect of the onward transport of the dredged material, a typical rigid bodied ipper or articulated tanker has a load capacity of 16 tonnes, and it would take approximately 75 loads to dispose of the material at landfill. With disposal sites approximately 20 miles from the harbour (Section 4.2 below), and assuming an average speed of 30mph, this would take approximately 40 minutes per trip. Taking into account loading, emptying and return trip, this gives between 3 - 4 trips per day, or between 19 to 25 days to complete operations assuming one truck is employed.

Option 2 provides the least amount of handling as the material would be deposited directly into the dumber truck, which would then transport the material to the disposal site on the west side of the pier for disposal.

Options 1 and 3 would both require additional machinery and plant operatives compared to Option 2, which inevitably introduces additional risks to the project.

From an operational and risk perspective, Option 2 is considered to be the least onerous to both the public and labour.

4.2 Suitable Sites / Facilities

Option 1

The closest offshore disposal site to Dysart Harbour is Kirkcaldy (FO047), located approximately 3km due south.

Attribute	Value
status	Open
epsgtrans	1314.00000000000
dispsitena	KIRKCALDY
disposalsi	FO047
datum	OSGB36
cent_lon	-3.12473923337
cent_lat	56.09662590937

Option 2

The foreshore immediately to the West of the harbour is considered a suitable site for the disposal of the dredged material, as the majority of recreational activity occurs to the East of the harbour, facilitated, at least in part, by the presence of a public carpark. The are no residential or other properties overlooking the proposed disposal site, and leisure use, particularly during the winter and spring months when the dredging is schedule to take place, is low.

Consultations have been undertaken with SEPA, who have confirmed that there are no bathing waters beaches within 2km of the proposed operations (Appendix 1).

Option 3

The closest landfill sites are located at Dunfermline (Lochhead Landfill) and Cupar (Lower Melville Wood Landfill), both of which are approximately 20 miles from Dysart Harbour.

4.3Public / Local Acceptability

Option 1 is not likely to cause public concern, as the Kirkcaldy offshore waste disposal site is currently open for use, and has been used for similar purposes in the past.

Option 2 is also not likely to cause wider public concern, though there may be a localised and temporary (matter of days) visual impact on users of the coastal path along this stretch of coastline. However, any potential impacts are mitigated, to a large extent, by:-

I. operations taking place during the winter / spring months, when recreational use of the area is at its lowest;

II. by avoiding the more popular / accessible stretch of coastline to the East of the harbour;

III. the material being spread as thinly as possible across the disposal site, thereby maximising the potential for dispersion; and

IV. any rubbish being removed and disposed of at a licensed onshore site.

The disposal site is also partially screened to recreational users of Ravenscraig Park by an amenity woodland area along the southern and eastern sides of the park.

The least favourable option is likely to be Option 3, as this will increase traffic, congestion and noise within Dysart, particularly on the narrow roads leading to the harbour, and raises the risk of complaints being raised by local residents. This options also increases the risk to the users of the harbour, other vehicles using the public road network, and pedestrians.

4.4Legislative Implications

All three options require a Marine Licence from Marine Scotland under the Marine (Scotland) Act 2010. A disposal consent would also be required from The Crown Estate for Option 1.

In respect of the landfill option, Option 3, the dredged material would be considered a controlled waste under the Environmental Protection Act 1990 for the purpose of transport.

5.0 Environmental Considerations

5.1Sample Analysis and General Ecological Implications

A part sediment chemical analysis has been presented in Section 2. The full sample results are attached. Contaminant levels below Action Level 1 (AL1) are considered to be close to background levels and pose no risk to the environment, whereas contaminant levels above Action Level (AL2) are not normally considered suitable for sea disposal without further testing and detailed impact assessments being undertaken.

For Dysart Harbour, contaminant concentrations (Figure 5, Section 2) were found to be below AL2. Chromium, Copper and Nickel,were above AL1 but below AL2. Zinc at sample 3 was above Al1 but again below Al2. Some PAH samples were agin found to be similar with raised contaminate levels, but again although above AQI1 they were all below Al2.

Taking into account the modest volume of material to be dredged, and the dilution and dispersion effects of sea disposal, it is considered that Options 1 and 2 would have negligible adverse ecological impact.

Disposal at landfill, Option 3, would again have negligible adverse ecological impact, as the landfill site will have measures in place to minimise pollution of the surrounding environment.

5.2Designated Sites

The Firth of Forth is subject to a number of designations, including:-

- Firth of Forth SSSI (Site code: 8163)
- Firth of Forth SPA (UK9004411)
- Outer Firth of Forth and St Andrew's Bay Complex proposed SPA (UK9020316)
- Firth of Forth RAMSAR (Site code: 8424)

Given that the dredging operations will be restricted to the limits of the harbour and that only a modest volume of material will need to be disposed of at sea – either at an offshore disposal site (Option 1) or on the foreshore (Option 2) - it is considered that the dredging and disposal operations are not likely to have a significant effect on the conservation objectives of the designated sites.

SNH has been consulted as part of the BPEO assessment, and their response is included at Appendix 2. Site maps for each designation have been included at Appendices 3 - 6[2].

5.3Interference with Other Activities

The Firth of Forth is subject to high levels of commercial and recreational activity, and any additional vehicular and vessel activity caused by the dredging and disposal operations associated with Options 1 and 2 are considered to be negligible against this background.

Option 1 will, however, cause substantial disruption to the local users of the harbour as a consequence of the size and operational requirements associated with the use of a hopper barge. Option 3 would also cause significant disruption as a result of the need to dewater, and therefore double handle, the dredged material. This option would also require traffic and other safety measures to be put in place in and around the harbour to protect local users.

6.0 Cost Considerations

Option 1 would require a suitable hopper barge and support vessel (as required) to be hired. Together with the mobilisation, labour and fuel costs, this option would be prohibitively expensive for a dredge of this scale.

Option 2 would require a land based excavator and a dump truck to be hired. Mobilisation, labour and fuel costs would also be incurred, though this can be minimised by use of a local contractor. In this instance, James Penman Plant Hire Ltd, a local company based in Kirkcaldy, Fife, has been identified as a potential contractor.

The costs associated with landfill disposal (Option 3) would be as per Option 2, but would also include the cost of establishing a dewatering area / facility for the dredged material, the hire of loaders and specialised trucks for the transport of the material to the landfill, and landfill gate fees (payable per tonne) that would apply at the point of disposal. As for Option 1, it is considered that this options would be prohibitively expensive for a dredge of this scale

7.0 Conclusions and Recommendations

Of the three options considered – disposal at sea (Option 1), disposal on foreshore (Option 2) and disposal at landfill (Option 3), it is concluded that the BPEO for the disposal of the dredged material from Dysart harbour is on the immediately adjacent foreshore to the west of the harbour. This option is the most practicable of the three options considered and can be managed within the harbour operator's budget constraints. The strategic and environmental impacts of this option are considered to be low, particularly if the mitigation measures detailed below are adopted, and any localised impacts would only be temporary (matter of days) in nature.

All other options were considered unsuitable on either strategic, environmental or cost grounds.

7.1Summary of Mitigation Measures

Dredging Operations:

I.The dredging operations will be limited to the navigable channel between the harbour entrance and the inner basin channel (stopping at the middle pier..

Disposal Operations

II.The dredging and disposal operations will take place during the winter / spring months, when recreational use of the area is at its lowest;

III.The material will be spread as thinly as possible across the disposal site, thereby maximising the potential for dispersion; and

IV.Any rubbish will be removed and disposed of at a licensed onshore site.

APPENDIX 1

CONSULTATION RESPONSE - SEPA

Our Ref: WML/WMX/General
Your Ref:

Alec Penman
113 Windmill Road
Kirkcaldy
Fife
KY1 3AW

If telephoning ask for
Kerryn Sievewright

02 February 2016

Dear Mr Penman

ENVIRON ENTAL PROTECTION ACT 1990 (AS AMENDED)
WASTE MANAGEMENT LICENSING (SCOTLAND) REGULATIONS 2011

Dredging of harbour mouth and controlled placement of dredged ands onto adjacent beaches at Dysart Harbour, Kirkcaldy

I refer to our recent meeting at Dysart Harbour and write with advice regarding SEPA's standing position on the controlled placement of dredged sands from harbours onto adjacent beaches.

Please note that Marine Scotland is the regulatory authority, and they should be approached in the first instance for advice on possible licensing requirements.

SEPA however recommend that disturbance to the shoreline be minimised and the shore restored to as near former condition following the works as reasonably possible.

Any dredging operation should also be cross checked to see if the proposed site is located in or adjacent to (within 2 km of) a designated bathing water. If so, ideally all physical operations should be done outwith the Bathing Water Season (1 June to 15 September). However I have conducted a requisite search of our records and can advise that there are no bathing water beaches within 2km.

Finally, the material should be deposited on the beach below Mean High Water Spring (MHWS) and allowed to disperse naturally. If any dredged material accumulates above MHWS, disposal operations must cease until the material has dispersed. Any rubbish materials should be removed and disposed of at a licensed onshore site.

Any proposed use of waste material above MHWS would require a waste management licence, or an exemption from the above regulations from SEPA.

Should you wish to discuss any matter concerning the issues of this letter please contact me at the Glenrothes office.

Yours sincerely

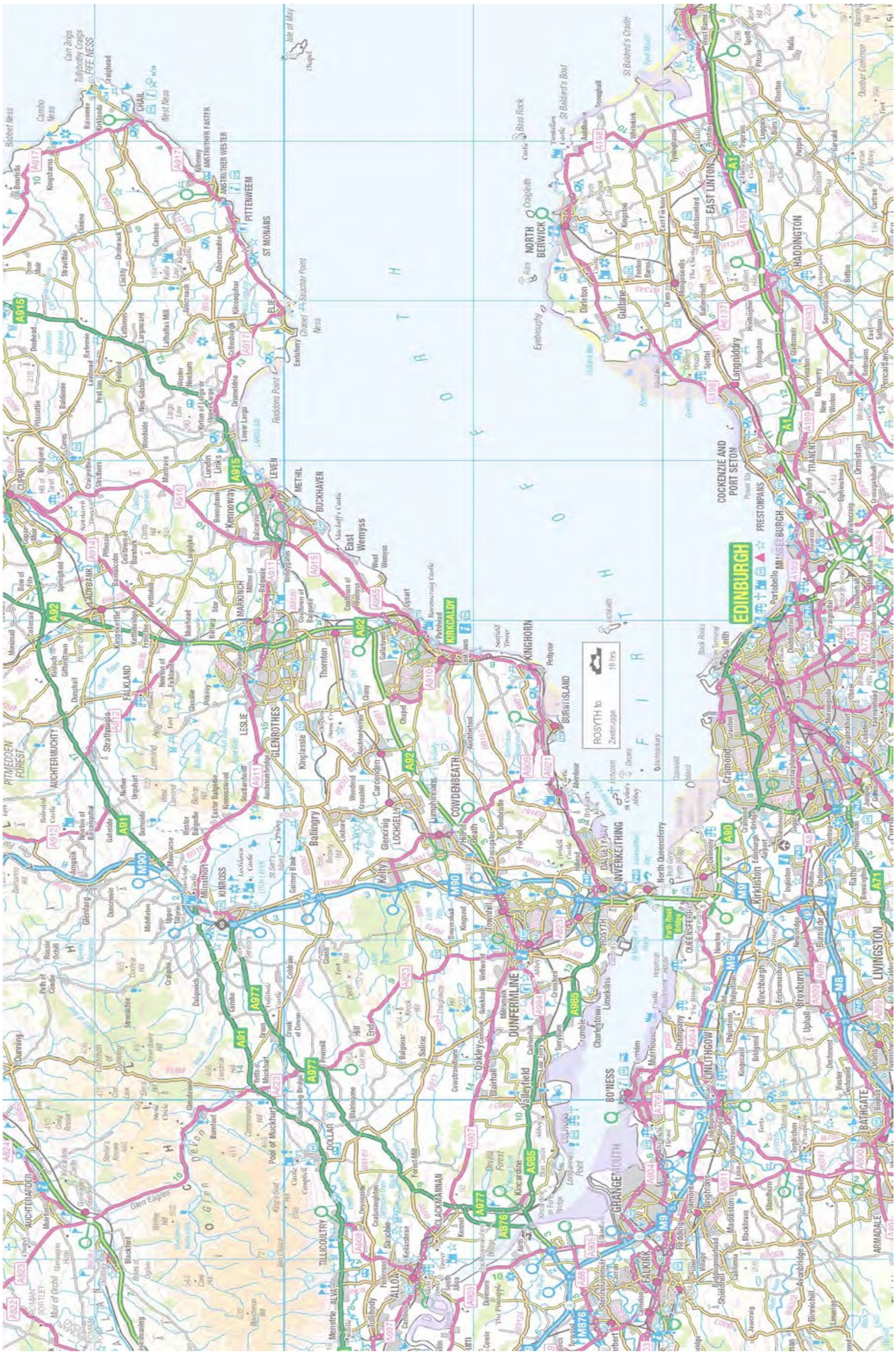
[redacted]

Kerryn Sievewright
Environment Protection Officer

APPENDIX 2

SITE MAP - FIRTH OF FORTH SSSI

APPENDIX 3



EDINBURGH
KIRKCALDY
DUNFERMLINE
GLENROTHES
INVERKEITHING
BURNTISLAND
KINGHORN
NORTH BERWICK
HADDINGTON
MUSSELBURGH
LIVINGSTON
LINLITHGOW
FALKIRK
ALLOA
KINROSS
LEVEN
ROSYTH to Zeebrugge

APPENDIX 4

Annex 1. Site map