

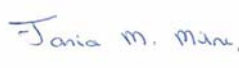


Dalgety Bay

Appropriate Person Report

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Contents

Executive Summary	4
1. Introduction.....	6
1.1. Part IIA of the EPA 1990	8
1.2. Implementation of the Radioactive Contaminated Land Regulations.....	8
1.3. Appropriate Persons.....	9
1.4. Determination of Appropriate Persons	10
1.5. Structure of the Report.....	11
1.6. Site Boundary	11
2. Information Search.....	15
2.1. Land Ownership and Land Activities Investigation	15
2.1.1. Summary	15
2.2. Ministry of Defence Activities	16
2.2.1. History and Development of Airfield	17
2.2.2. Radium Luminising & Development of the Radiation Protection Framework	20
2.2.3. Salvage, Incineration and Disposal Activities	21
2.3. Dalgety Bay New Town Development Activities.....	24
2.3.1. Dalgety Bay Sailing Club Activities	30
2.3.2. Fife Council Activities	32
2.3.3. Board of Trade Activities	33
2.3.4. Other Parties Activities	34
2.4. Interested Parties	35
3. Land Reclamation, Coastal Erosion and Topographic Changes.....	38
3.1. Topographic Changes	38
3.1.1. Infilling	43
3.2. Land Reclamation and Erosion	43
3.2.1. Boat Park to Ross Plantation.....	44
3.2.2. New Harbour to Headland	44
3.2.3. Rock Armour Placement and Replenishment.....	45
4. Identified Significant Pollutant Linkages.....	46
4.1. Origin of the Contamination in Relation to the Present State and Past History of the Area	48
4.1.1. Factual Investigation Information.....	49
4.1.2. Headland	50
4.1.3. Boat Park and Demarcated Area.....	54
4.1.4. Ross Plantation	55
4.1.5. Slipways	56
4.1.6. Other Areas	56
4.1.7. Non-radioactive Artefacts	57
4.2. Significant Pollutant Linkage Areas.....	58
5. Potential Class A and B Persons	61
5.1. Appropriate Persons.....	61
5.2. The Statutory Guidance	61
5.3. Appropriate Person - SEPA Findings	65
5.4. Class A Exclusion Tests.....	68
5.5. Class B Exclusion Tests.....	70
5.6. Apportionment of Liability	70
5.6.1. Hardship Considerations	71
5.7. Conclusions.....	71
6. References.....	72

Appendices

1. North, Central and South Study Area Plans
2. Information Sources
3. Correspondence
4. 1949 Minute of Sale, 1962 Disposition and 1964 Corrective Disposition
5. Title Deeds
6. Witness Statements
7. News Items
8. Timeline of Events
9. Scothomes Development Phase 4 Plan, Dalgety Bay Primary School Contour Plan and Moray Way South and North Contour Plan
10. Dunfermline District Council Planning Correspondence with DBSC
11. Photos of Model of Dalgety Bay New Town
12. Figures from Aerial Photo Report
13. Non- Radioactive Artefacts & Trial Pit Summary
14. DBSC Constitution
15. DBSC Resolution
16. Cross Section Figures

Figures

Figure 1: Site Location.....	6
Figure 2: Area Covered by Appropriate Persons Report.....	12
Figure 3: Dalgety Bay Beach Areas	13
Figure 4: Area of Dalgety Bay within scope of the current investigation	14
Figure 5: Dalgety Bay Beach Areas	48
Figure 6: GPR transects and a brief interpretation of the data Dec 2011 (Tyler 2011):.....	50
Figure 7: GPR transects at Dalgety Bay (Ruffell & Tyler 2012)	51
Figure 8: GPR Transects in Areas A & C (Ruffell & Tyler 2012).....	52

Tables

Table 1: Information Summary	15
Table 2: Parties Identified from Historical Accounts.....	35
Table 3: List of Parties Involved in Sale of Land Parcels at Dalgety Bay.....	36
Table 4: Parties Identified from Newspaper and Archive Documents.....	37
Table 5: Maps Used for Spot Height Comparison.....	38
Table 6: Comparison of Spot Heights from 1:10,000 (or equivalent) Maps	41
Table 7: Evidence for Significant Pollutant Linkages	47

Executive Summary

This Appropriate Person Report includes a comprehensive study of land ownership and history at Dalgety Bay. Donibristle airbase opened in August 1917 with the Royal Air Force (RAF) taking over in 1918. The airfield, HMS Merlin, was commissioned in 1939 as a Royal Naval Aircraft Repair Yard and decommissioned in 1959 before being sold off through the 1960s. Subsequently, Dalgety Bay New Town and industrial premises were built in the area. All interested parties, former or current owners or occupiers of the land, have been identified and contacted where appropriate. This Report should be read in conjunction with the Scottish Environment Protection Agency (SEPA) recently published Risk Assessment Report (Dale, P. 2013) and the Ministry of Defence contractors intrusive investigation report: AMEC Factual Investigation Report (AMEC, 2013c).

It is concluded that the luminising of aircraft instrument dials using paint containing radium-226 was routinely undertaken at HMS Merlin. This was common practice at such sites and is supported by witness statements. It is also understood that solid wastes arising were incinerated and disposed on site. Again this was common practice and witness statements recount the burning of dials and other cockpit parts with ashes being disposed near the shore.

This Report reviews historic aerial photographs of the site along with historic OS maps. These indicate the presence of a deposit of material in 1945 on the shore to the east of New Harbour which is later mapped as a refuse tip by OS in 1963/64. A second area mapped as a refuse tip by the same date is located at what is now Sealstrand. Both appear to be connected to what was the Salvage Section on the airbase.

Intrusive investigations undertaken by Ministry of Defence, witnessed by SEPA, and studies, including ground penetrating radar surveys, undertaken on behalf of SEPA identify a deposit of made ground at the Headland. This consists mainly of radioactive ash and clinker and associated radioactive and inert artefacts. Studies of the historic coastline and trial pit data suggest this material was deposited before 1959 when the site was operating as an airbase.

A second area of radioactive ash and clinker, also believed to be deposited before 1959, was identified to the landward side of the Demarcated Area, the Boat Park and the Slipways.

Aerial photographs show erosion of the Headland over time and accretion of sediments in the bay. Dalgety Bay Sailing Club emplaced rock armour at the Headland to reduce the extent of the erosion.

Analysis of historic spot height data and maps suggests it is unlikely that there were any major terrestrial disturbance of contaminated material by the developers or subsequent land owners at the Dalgety Bay New Town or associated industrial premises, with development proceeding on a plot by plot basis.

The contamination is the result of disposal of contaminated ash during the lifetime of HMS Merlin and this has been identified at depth in the Headland, Boat Park and Demarcated areas with no evidence that this material, deposited prior to 1959, has been significantly disturbed other than by coastal action.

Contamination on the foreshore at Dalgety Bay is the result of erosion of deposited material and subsequent re-working and re-deposition of contaminated marine sediments resulting from coastal erosion, as process which is considered to be a normal part of life.

SEPA does not consider that development companies associated with the New Town are an Appropriate Person as contamination was already present in the Headland when construction of the town commenced and was not subsequently disturbed.

The Dalgety Bay Sailing Club is considered not to be an Appropriate Person as it did not cause or exacerbate the contamination on the foreshore by constructing the clubhouse, emplacing the rock armour or extending the Boat Park area.

SEPA considers the Ministry of Defence to be the sole Class A Appropriate Person for the identified significant pollution linkage present in the Slipways Area, the Boat Park and the Demarcated Area.

1. Introduction

Dalgety Bay is located on the north side of the Firth of Forth in Fife, about 5 km east of the Forth bridge (Figure 1, Grid Reference NT 165 833). The nearest community is a late 1960's housing development, which is also called Dalgety Bay.



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Site Location

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Figure 1: Site Location

Dalgety Bay is a part of the Firth of Forth Special Site of Scientific Interest (SSSI) and also part of the Firth of Forth RAMSAR sites.

The bay is approximately 400 m wide by 500 m. At low tide the bay is exposed and reveals extensive mud flat habitat, interspersed with rocky outcrops. Along the southern margin of the bay is a pebble and shingle beach on which there is a general collection of debris, including building materials (bricks and fragments of suspected asbestos sheeting), clinker, broken glass, pieces of broken plates, porcelain and general litter. The shingle beach has a noticeable break in slope on the seaward side where the dip of the foreshore reduces and the sediment becomes a mud flat. The Fife coastal path runs along the coast at Dalgety until Ross Plantation where it enters the wood and reemerges after New Harbour. However a common footpath continues along the coast after Ross Plantation and onto the Sailing Club. A foot path follows the bay round to the remains of St. Bridget's Church. Behind the western side of the mudflats is a wooded area (Ross Plantation) with grass, trees, shrubs and a network of paths. South east of this area, near the headland, is a clubhouse owned by Dalgety Bay Sailing Club Limited, which has associated facilities for launching boats together with a jetty. There is a boat park for several dozen boats and a car park; the latter used by both Sailing Club members and the general public. Specific uses of the area are reported in Dalgety Bay Radiological Habits Survey report (CEFAS, 2013).

Radioactive contamination has been detected since at least 1990 on parts of the foreshore at Dalgety Bay, on land adjacent to the foreshore and in gardens that were historically part of the former Donibristle airfield site. The contamination is from the radionuclide radium-226 which together with its decay products can pose a significant hazard to human health via skin contact, ingestion, inhalation or external irradiation. Radium 226 is a long lived radionuclide with a half life of 1600 years and thus little radioactive decay will have occurred since it was extracted.

Since 1990, episodic monitoring at Dalgety Bay has continued to recover radioactive sources/items from the beach. In the past there have also been a number of investigations and remediation work has been undertaken to reduce the hazards in gardens, the most recent of which was performed by the MoD.

In March 2007 SEPA was given a specific duty for assessing sites historically contaminated with radioactivity, such as Dalgety Bay, under the Radioactive Contaminated Land Regulations.

In 2011 SEPA began to inspect the land at Dalgety Bay with a limited intrusive investigation into the headland area. A concurrent SEPA survey on the foreshore detected higher numbers of radioactive sources on the foreshore than had been reported previously some of which posed an unacceptable hazard to the public as a result an area of the beach was restricted to public.

To assist SEPA in its inspection in March 2012, MoD agreed to carry out a site investigation to review the whole affected area. The MoD also agreed produce potential management options for the site.

SEPA completed its risk assessment, in line with its duties required under the Radioactive Contaminated Land (Scotland) Regulations and associated Statutory Guidance, in 2013 (Dale, 2013) which concluded that significant possibility of significant harm is occurring on three areas of the foreshore at Dalgety Bay in line with the criteria set out in paragraph A.32 of the Statutory Guidance. For these areas current management arrangements, including signage demarcation, monitoring and

removal, are reducing the risks to the public and it is SEPA's current view that current management arrangements including monitoring and recovery, demarcation and signage offer sufficient management arrangements at present. SEPA has still to assess whether these arrangements would constitute "suitable and sufficient risk management arrangements" for the purposes of paragraph B.37(c) of the Statutory Guidance and the practicability, effectiveness and durability of these current measures are still to be assessed for the long-term.

SEPA agreed to carry out a concurrent investigation into the history of the contamination to identify the party(ies) responsible for the contamination. SEPA agreed that this investigation would be equivalent to that which SEPA would be required to carry out if the site had been identified as Radioactive Contaminated Land under Part IIA of the Environmental Protection Act 1990 and SEPA was required to identify those responsible party(ies) as an Appropriate Person(s).

Although SEPA uses the term "Appropriate Person" throughout this Report, it is important to remember that in terms of the legislation there can only be an Appropriate Person in respect of land which has been identified as Radioactive Contaminated Land. The term "Appropriate Person" means, in the context of this Report, someone whom SEPA considers would be an Appropriate Person if the site were to be designated as Radioactive Contaminated Land under Part IIA of the Environmental Protection Act 1990.

This Report sets out the enquiries which SEPA have made to find the Appropriate Persons for the Dalgety Bay Site. This Report also identifies the party(ies) whom SEPA considers to be Appropriate Persons for the significant pollutant linkages identified at the Dalgety Bay Site, which are also those party(ies) SEPA would wish to undertake voluntary management and any necessary remediation actions. Such voluntary management and any necessary remediation actions, once undertaken, would negate any need for designation.

1.1. Part IIA of the EPA 1990

The contaminated land regime, which is provided for in Part IIA of the Environmental Protection Act 1990 ("the 1990 Act") came into force in Scotland on 14th July 2000 in order to provide an improved system for the identification and remediation of land where historical contamination is causing unacceptable risks to human health or the wider environment. The regime places a duty on local authorities to identify and secure the remediation of contaminated land in their respective areas. The regime also provides for categories of contaminated land which require to be designated as special sites, and will be regulated by SEPA.

1.2. Implementation of the Radioactive Contaminated Land Regulations

Radioactivity was excluded from the provisions of Part IIA by section 78YC of the 1990 Act.

In March 2007, the Scottish Ministers, in exercise of powers conferred on them by sections 78A(9) and 78YC of the 1990 Act, laid before the Scottish Parliament the Radioactive Contaminated Land (Scotland) Regulations 2007 ("the RCL Regulations"). These Regulations were subsequently amended by the Radioactive

Contaminated Land (Scotland) (Amendment) Regulations 2007 and the Radioactive Contaminated Land (Scotland) (Amendment) Regulations 2009.

References in this document to sections of the 1990 Act are to those sections as modified by the RCL Regulations.

The objectives for the radioactive contaminated land regime are broadly the same as those for the conventional contaminated land regime. The extension of the regime allows for the identification and remediation of land which is contaminated by substances containing radioactivity. The radioactive contaminated land regime also applies the polluter pays principle, by seeking to require polluters/ owners to carry out remediation, and the principle of sustainable development.

However, whereas in the original Part IIA regime each local authority is the principle regulator for its area, the duty to identify and secure the appropriate remediation of radioactive contaminated land was placed on SEPA in order to ensure a consistent approach to radioactive contaminated land across Scotland.

The Radioactive Contaminated Land Regulations are modifying Regulations and have to be read in conjunction with Part IIA.

The Scottish Ministers have also issued Statutory Guidance on the application of the 2007 Regulations under sections 78A(2), 78A(3), 78A(6) and 78BB(4) of the 1990 Act. This Guidance (Environmental Protection Act 1990: Part IIA Contaminated Land The Radioactive Contaminated Land (Scotland) Regulations 2007 Statutory Guidance, 28 May 2009, SG/2009/87) ("The RCL Statutory Guidance") amends and adds to the existing Statutory Guidance (Environmental Protection Act 1990: Part IIA Contaminated Land Statutory Guidance: Edition 2, Paper SE/2006/44) ("The Statutory Guidance"). The specific parts of the Statutory Guidance which have been amended are Sections 1-4 and Section 18 of Annex 2, and Chapters A and B of Annex 3.

1.3. Appropriate Persons

Appropriate Persons are defined in Section 78(9) of the 1990 Act as those whom SEPA determines should bear responsibility for remediation in accordance with Section 78F. Those who caused or knowingly permitted a pollutant to be in, on or under the land are primarily responsible for remediation and are termed Class A persons. Where no Class A persons can be found, responsibility may pass to those who are the owner or occupier and are termed Class B persons. Where no Appropriate Persons can be found then SEPA have powers to remediate the land subject to sufficient funds being available.

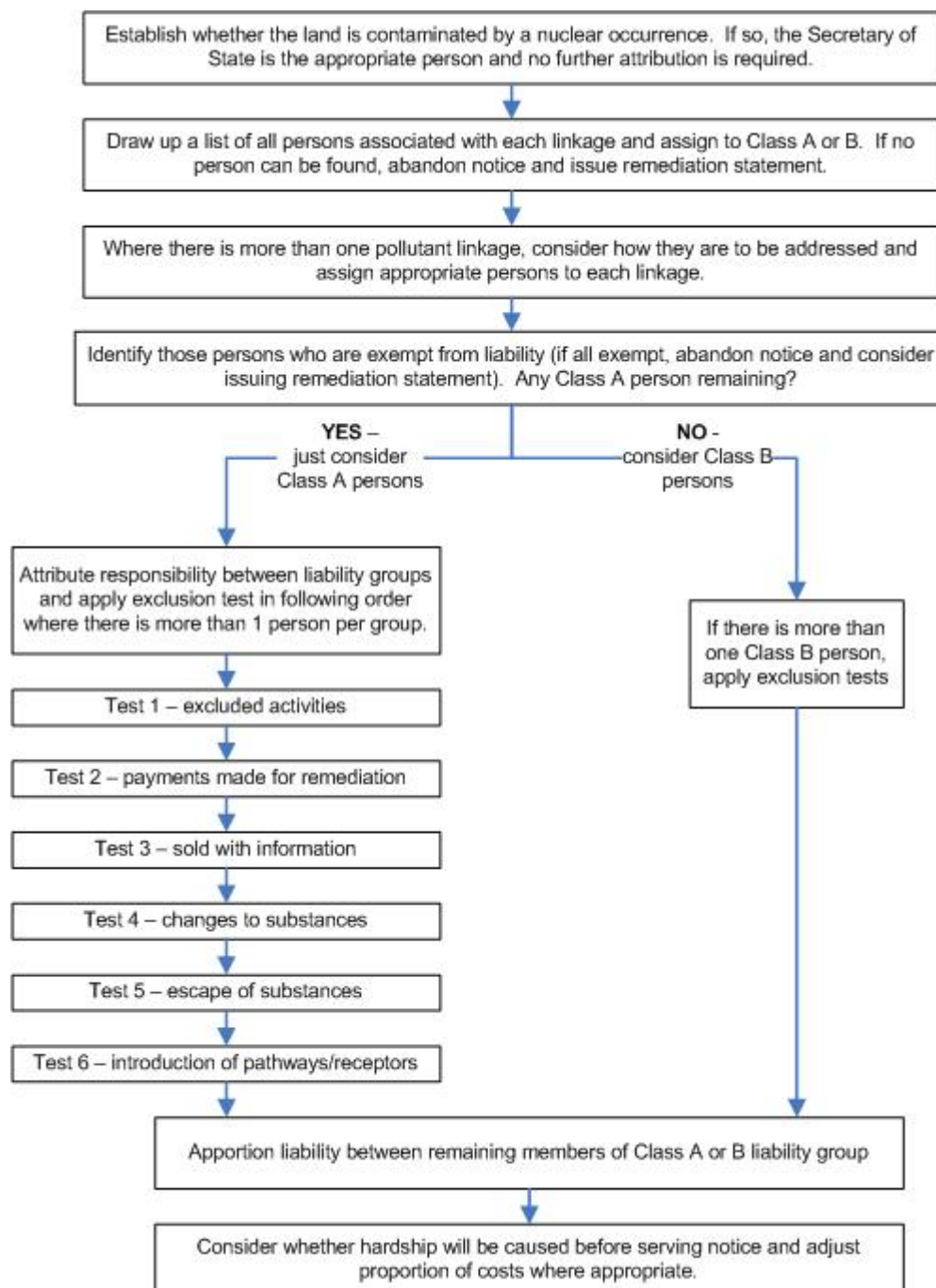
The Statutory Guidance requires SEPA to "identify all of the persons who would be Appropriate Persons to pay for any remediation action which is referable to the pollutant which forms part of the significant pollutant linkage" (D.10). The Statutory Guidance further requires that "To achieve this, the enforcing authority should make reasonable enquiries to find all those who have caused or knowingly permitted the pollutant in question to be in on or under the land" (D.11).

SEPA's identification of Appropriate Persons is to be made on the basis of the balance of probabilities and on the information available to it at the time of the decision (D.37).

It is the objective of this report to identify all the Appropriate Persons and form a record of all considerations and decisions made during the assignment of responsibility for remediation. This report is considered to be equivalent to the record required if the site had been designated as Radioactive Contaminated Land under Part IIA of the Environmental Protection Act 1990.

1.4. Determination of Appropriate Persons

The following flow chart indicates the steps that SEPA have taken to establish any Class A and Class B persons at the Dalgety Bay site:



1.5. Structure of the Report

The regulatory process SEPA has followed has been shown in Section 1.1-1.5. The remainder of this report details: the information sought and obtained by SEPA (Section 2) including land ownership and activities; land reclamation, coastal erosion and topographic changes (Section 3); areas where significant pollutant linkages are occurring (Section 4) including the extent of the contamination; potential Appropriate Persons (Class A and B) (Section 5); and finally implications and further action (Section 6)

SEPA's investigation of potential Appropriate Persons for the radioactive contamination at Dalgety Bay has involved a comprehensive search of all available information which is detailed in Table 1. For completeness, all relevant information has been included or referenced in this report (and as associated appendices). As no single piece of information obtained by SEPA in the process of this investigation has provided a full account of the origins of the contamination at Dalgety Bay, throughout the report several streams of information are brought together to corroborate or support information.

1.6. Site Boundary

The area covered by the Appropriate Persons investigation is presented in Figure 2 and comprises the whole of the former Donibristle airfield. The Ministry of Defence operated RNAS/RNAY Donibristle, which was commissioned as HMS Merlin from 1939-1953. In this report, we refer to the airbase as Donibristle.,



Area Covered by Appropriate Persons Report

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Figure 2: Area Covered by Appropriate Persons Report

Street names and areas are referred to throughout the report. Appendix 1 contains three street plans showing the current layout of the North, Central and South study area.

SEPA completed its risk assessment in 2013 (Dale, 2013) which concluded that significant possibility of significant harm is occurring on three areas of the foreshore at Dalgety Bay in line with the criteria set out in paragraph A.32 of the Statutory

Guidance. These areas are Areas C, D and E on Figure 3. These areas were identified from the agreed investigation area in Figure 4.

One of the main objectives of this report is to consider what actions have resulted in the contamination being present at Areas C, D and E and therefore considers a much greater area than these discreet locations.

Actions which could have caused the contamination to be placed at the site are likely to have occurred since radium was first purified in 1917. It was used extensively for luminising materials until the 1960s. Thus, the information searches performed by SEPA have considered all action between 1910 to date.

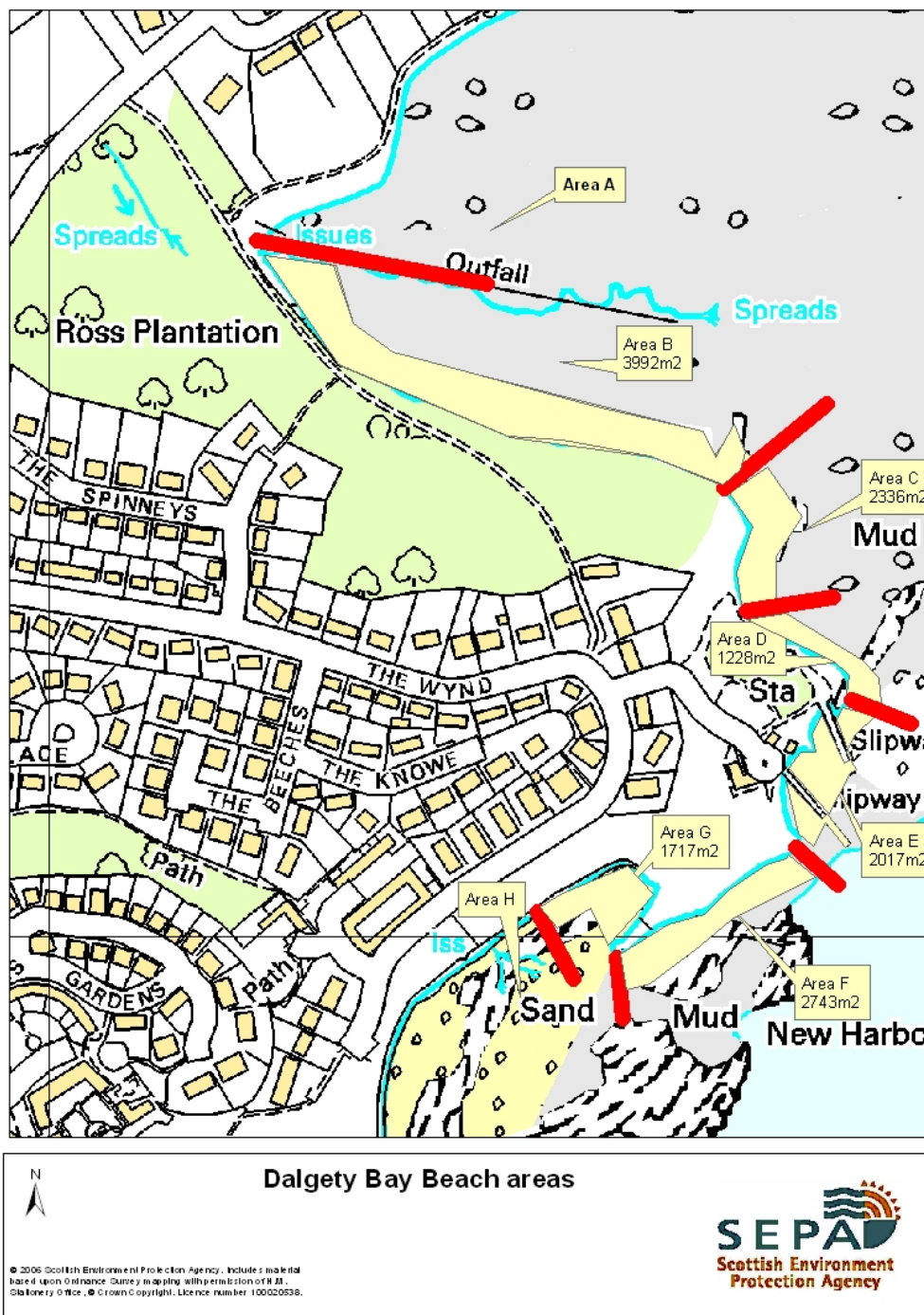


Figure 3: Dalgety Bay Beach Areas



Figure 4: Area of Dalgety Bay within scope of the current investigation

2. Information Search

Table 1 presents a summary of the information sources used by SEPA to compile this Section. This is further expanded in Appendix 2 where the data is ranked according to reliability.

Type of Information	Date Range Covered
Aerial Photography including Stereo Photography	1945-1998
OS Mapping (1:10,000 and 1:2,500 and equivalents)	1856-2012
Land Registry Searches	1924-2013
Fife Council Archives	1951-1995
Scottish National Archives	1991-1995
National Archives	1940-1969
Scotsman and Dunfermline Press Newspaper Archives	1927-1975
Published Historical Accounts	1917-1959
Historical Publications	1942-1951
Witness Statements	1940-2013
Previous reports completed by NRPB, SEPA, DIO, etc	1990-2013
Dalgety Bay Sailing Club Website	1971-2013
Hansard	1903-1996

Table 1: Information Summary

Interested parties have also been contacted and correspondence has been included in Appendix 3.

2.1. Land Ownership and Land Activities Investigation

Land ownership and activities in the Dalgety Bay area have been determined through, but not limited to, land registry searches, historic map searches, witness statements, standard enquiries to Fife Council, Ministry of Defence and development companies associated with Dalgety Bay.

2.1.1. Summary

Prior to the First World War the site was owned by the Earl of Moray and was open fields and ornamental gardens. The Earl of Moray donated approximately 150 hectares of land at his Donibristle Estate during the First World War for use as an airfield. Royal Naval Air Service (RNAS) Donibristle was opened in 1917.

In 1924, the Earl of Moray sold approximately 22 acres of land at the area concerned in this investigation to the President of the Air Council. In 1939, the airfield was commissioned as HMS Merlin, with the addition of a major aircraft repair yard (Royal Naval Aircraft Repair Yard or RNAY). HMS Merlin included a Salvage Section which consisted of a number of buildings in the south east of the airfield, between the location of houses on The Wynd and the area where Dalgety Bay Sailing Club Limited is currently situated.

Parts of the area were used as agricultural and grazing land between the mid 1950s and 1960. The airfield was decommissioned during 1959 and was sold by the Ministry of Defence in 3 separate parts; 101 hectares to Moray Estates in 1962, 22 hectares to the Board of Trade in 1964 and 27 hectares to Fife County Council in 1968.

The area was subsequently developed for residential and leisure uses. Outline planning permission for residential development was granted in May 1961. The first houses were built in the late 1960s in the central area of the former airfield around Coustan Drive south of the former runway area (1967 OS 1:10,000 map) and Inchmickery Road with sales documented in 1967 (Title deeds dated 1967, Appendix 5). Development in the southern area of the former airfield started in the early 1970s, with the first house in Sealstrand sold in 1971 (Title deeds Sealstrand 1971, Appendix 5). Dalgety Bay Sailing Club was formed in 1971 and the current clubhouse built in 1975 with an extension added in 2000 (Dalgety Bay Sailing Club website).

Industrial estates, Donibristle and Hillend, were established in the area of the former Repair Yard and the Accommodation Blocks in the late 1960s, early 1970s.

Currently, the area covered by the former airfield is owned largely by private individuals in the form of individual house plots. Industrial and commercial companies own or are tenants in the Industrial Estate areas. James Harrison Contracts Limited own Ross Plantation and the coastal path with the latter maintained by Fife Coast and Countryside Trust. Dalgety Bay Sailing Club Limited now own an area south of The Wynd. Moray Estates Development Company Limited retained ownership of the foreshore area (although Moray Estates sold the mineral rights for the foreshore to James Harrison Contracts Limited).

Further detail on development of the airfield, Dalgety Bay New Town, Industrial Estates and Dalgety Bay Sailing Club is presented in the following sections.

2.2. Ministry of Defence Activities

The modern Ministry of Defence was created in 1964 by the Defence (Transfer of Functions) Act 1964.

Although title to RNAS Donibristle was taken in the names of President of the Air Council and the Commissioners for the Office of Lord High Admiral of the United Kingdom and Ireland, the 1964 Act provided that the new Ministry of Defence would succeed to all property, rights and liabilities of the Admiralty and the Air Council in the UK, as well as those of the former Ministry of Defence, the War Office and the Ministry of Aviation.

The effect of section 2(2) of the 1964 Act is to transfer all liabilities from the Admiralty and the Air Council, including any applied retrospectively by Part IIA, to the Ministry of Defence. In this report, the term 'Ministry of Defence' includes their statutory predecessors set out above.

2.2.1. History and Development of Airfield

The information sources used to compile this section are listed in Appendix 1. Where OS maps have been used the published date and where known the survey date has been reported.

Donibristle airfield opened and was handed over to the Royal Naval Air Service (RNAS) in August 1917 with the Royal Air Force (RAF) taking over in 1918 when Donibristle became a Fleet Aircraft Repair Depot. In 1924, the Earl of Moray sold approximately 22 acres of land at the area to the President of the Air Council. In addition to the area sold in 1924, Moray Estates Development Company sold approximately 280 acres of land to the Commissioners for the Office of Lord High Admiral of the United Kingdom and Ireland (Disposition by Moray Estates in favour of the said Commissioners recorded GRS (Fife) 18th March 1953 (Appendix 5). Although the date of entry contained in this Disposition is 28th November 1950, it appears these areas were already occupied as part of RNAS Donibristle.

The station was reduced to a care and maintenance basis in 1921 but re-opened by the RAF in 1925 as a shore training base for disembarked carrier units and shore-based torpedo bomber squadrons (Mowat, R (undated)).

The airfield, in the form of hardstanding runways, is not shown on the 1:10,560 OS Map dated 1921 nor on the 1:2,500 OS Map from 1927. This is consistent with accounts of the planes taking off from the grass fields to practice deck landings on aircraft carriers out in the Firth of Forth (Simpson, E. 1999). Donibristle estate buildings are evident as is the stable block in the 1921 and 1927 maps. Estate roads are visible crossing the estate from north to south as well as along the coast at Ross Plantation. Ross Plantation is shown as wooded with a quarry feature (this is previously noted as an Old Quarry in the 1914-15 and 1896 1:2,500 maps and the 1921 1:10,560 map). An area of swamp/marsh is annotated to the northern coastal side of Ross Plantation (the landward side of where the current sewage outfall is located). A track is evident running through Ross Plantation running north and also south west towards the estate buildings. New Harbour is noted with sloping masonry reinforcing the coastline running westwards. A boat house is also noted at New Harbour. The Headland and Boat Park areas are shown as wooded. There is a Slaughter House with an associated pond in the vicinity of what is now Sealstrand. This is connected by a track leading off the coastal track through Ross Plantation.

The 1928 1:10,560 OS map shows the northern end of the airfield as featureless and without annotation. However, there is little or no change elsewhere. The Slaughter House is no longer labelled but the building and associated pond feature are still present.

On the 24th May 1939 Donibristle was commissioned as HMS Merlin with the addition of a major aircraft repair yard (RNAY) and it is probable that the hard runway, the permanent hangars and most of the hatted accommodation date from this period or soon after (Mowat, R, (undated)). Facilities at the site were extended in 1941 (Stott, I.G. 1978).

Buildings in the north west of the site comprised mainly of hangars and workshops, whilst buildings in the north east served predominantly as barracks. The central part of the airfield was occupied by hard standing runways and a few ancillary buildings. The central and southern areas were either open or wooded areas with little in the way of development. The exceptions to this were Donibristle House and stables in

the south of the site and the Salvage Section which occupied a number of buildings of various sizes in the south of the site (Enviros 2007a, Operational Phase Layout Map of HMS Merlin – no date).

The period between 1927 and 1959 is not well covered by OS mapping due to the intervening World War. However, there are a number of aerial photographs covering this period that have been used to establish the site conditions at that time. The majority of the aerial photographs cover the whole of the former airfield area.

The November 1945 aerial photograph covers Ross Plantation, the Headland and west of New Harbour. The photograph shows the presence of a number of buildings indicated by the Operational Layout Map as making up the Salvage Section. This area is connected to the central and northern areas of the airfield by a track/road that is additional to the estate roads noted in the 1927 1:2,500 OS map. To the north of the Salvage Section Ross Plantation is evident as a densely wooded area. The swamp/marsh feature annotated on the OS maps is evident in the northern part of Ross Plantation and is devoid of trees. The wooded area continues to the south and occupies the area that is currently owned by Dalgety Bay Sailing Club Limited (Headland and Boat Park areas). To the north west of the Salvage Section a number of planes are evident stored on grassed areas. The track leading to the pond feature, which is still present, in what is currently Sealstrand is shown. In the New Harbour area a bombing indicator arrow is present. To the east of New Harbour the coastline has changed substantially from the 1927 1:2,500 OS Map with the deposition of a fan shaped area of material. This area is connected to the estate road via a track.

A further aerial photograph was taken in April 1946 showing the same areas. There is little change to the buildings shown on the 1945 photograph. The area of deposited material and track in the vicinity of New Harbour appears unchanged. The track linking the area to the north with the area to the south west through Ross Plantation is more visible. The quarry can also be seen and the swamp/marsh area is still present. Tree clearance has taken place along the track along what is now Sealstrand. It is not clear whether the pond feature is still present. Increased numbers of planes are visible in the dispersal areas.

The 1948 aerial photograph shows the whole of the former airfield area. The Repair Yard and the Accommodation Blocks are evident in the north of the airfield with the runways to the south of this area. The central area of the airfield is occupied with various dispersed buildings. There is little change to the Salvage Section in the southern area of the airfield. The area of deposited material in the vicinity of New Harbour appears unchanged. The pond feature in what is now Sealstrand is evident.

The 1949 aerial photograph covers Ross Plantation, the Headland and west of New Harbour. Ross Plantation and the Headland area are covered in dense woodland as before with younger woodland evident to the north end of Ross Plantation. The swamp/marsh feature is visible as is the quarry feature. The pond feature in what is now Sealstrand is still evident. Parallel track lines are visible through the wooded area to the eastern end of the Salvage Section towards the bay (in what is now the northern Boat Park area). This track is not discernable on any further aerial photographs due to the clarity of images or tree cover. The area of deposited material at New Harbour is still visible with no substantial changes. There are no longer any planes visible in the dispersal areas. The buildings in the Salvage Section area remain unchanged.

The 1950 aerial photograph covers the whole of the former airfield. There is little change when compared to the 1949 photograph.

In 1952 after squadron 782 disbanded a civilian firm, Airwork Limited, contracted by the Admiralty took over communications and the task of running the airfield (Simpson, E. 1999). In November 1953 RNAS Donibristle (HMS Merlin) was reduced to care and maintenance and was handed over to HMS Cochrane whereby the accommodation blocks were used as barracks for naval artificers who were being trained at Rosyth (Airfield Review 2003, Simpson, E. 1999 and Stott, I.G. Air Pictorial Magazine, 1978).

The Enviros 2007 report indicates that records from the mid-1950s until 1960 detail that areas to the south and to the north west of the Salvage Section were leased by the Admiralty as grazing land (Enviros, 2007a).

The 1955 aerial photograph covers the whole of the airfield area. To the north the buildings of the Repair Yard and the Accommodation blocks are evident with the runway in the centre north of the site. It shows the buildings in the Salvage Section as largely unchanged from the 1949 photograph. The photograph confirms that areas to the south and to the north west of the Salvage Section have been fenced off into separate fields with evidence of cultivation. Ross Plantation also looks largely unchanged with the swamp/marsh area and the quarry feature evident. The pond feature in what is now Sealstrand is also present. There is coastline progression in the Boat Park Area with a hook-like feature prominent to the east and curving back in a north-westerly direction. It is unclear whether this material has been deposited anthropogenically or as a result of coastal action. There are approximate parallel lines evident on this promontory which could be seaweed strandlines or vehicle tracks. The fan shaped deposit in the vicinity of New Harbour is still clearly visible. The bombing arrow appears to be becoming overgrown. There are no planes located in the dispersal areas.

The 1959/58 1:10,560 OS Map (which was revised in the main before 1930 and re-surveyed in 1954 for major changes only) has the airfield labelled as Donibristle Airfield with the northern section appearing featureless and without any further annotation. The track layout in the southern area of the airfield site is visible. The aerial photography shows that since the 1927/28 1:2,500 OS map was created the coastline had advanced, however this area of deposited material is not shown on the 1959 map indicating that the coastline as drawn on the 1959 OS map has not been updated since 1927. The pond feature in what is now Sealstrand is still present on the map.

In 1959 the last aircraft passed through the yard (Mowat, R, (undated)) and on the 28th August 1959 RNAY Donibristle was closed with the exception of the Naval Store Department which remained open until October of that year (Airfield Review, 2003).

The 1959 aerial photograph covers the whole of the airfield area. There is little change to the buildings of the Repair Yard, the Accommodation blocks and also the runway and dispersed buildings in the centre of the airfield. The photograph shows the fan shaped deposited material still evident in the vicinity of New Harbour and largely unchanged since 1955. The hook-like feature in the current day Boat Park area has extended the coastline in this area and is no longer as distinctive. The buildings in the Salvage Section are largely unchanged and there are no planes stored in the dispersal areas. The areas to the south of the Salvage Section appear to be cultivated. The bombing arrow is still visible but overgrown. The quarry feature in Ross Plantation is not visible although the area is densely wooded and may be

obscuring the view. The swamp/marsh area is still present in the north of Ross Plantation. The pond feature in what is now Sealstrand appears to have been infilled. There has been tree clearance in this area and the track leading back to the main track between Ross Plantation and the coast appears to have been more heavily used than previous photographs indicate. Indeed there is a vehicle present on the track.

On the 8th February 1961 the sale of land at RNAS Donibristle to Moray Estates Development Company Limited was concluded (with the exception of the Repair Yard and the Accommodation blocks). However, the date of entry was 28th November 1959. The map accompanying the Minute of Sale is dated 1949 and revised February 1958 (Appendix 4), however, the base map differs very little to the 1927 1:2,500 OS Map and does not show any of the coastline features identified in the aerial photographs in the intervening period. As such it is not a reliable representation of the layout of the site at the date of entry; however it does show the building layout with detailed labelling. On the 18th December 1962 a disposition was recorded. The map accompanying this disposition (Appendix 4) is the 1926/27 1:2,500 OS Map and also does not show the condition of the site at the date. A corrective disposition was issued on 21st December 1966. The base map accompanying the corrective disposition (Appendix 4) is the 1963/64 1:2,500 OS map. This is also not a true representation of the layout of the site at date of entry in 1959 but more likely to be a good representation of when the first disposition was recorded in 1962 as this was the survey date for the map. The map shows the extension of the coastline at the Headland and labels it as 'refuse tip'. The Repair Yard was sold to the Board of Trade and the Accommodation Blocks to Fife County Council in 1963 and 1968 respectively (Appendix 5).

2.2.2. Radium Luminising & Development of the Radiation Protection Framework

Radium was first identified by Marie Curie in 1898 and refined in a pure metal state in 1910 by Curie and André-Louis Debierne. Radium is a radioactive element that was first purified from mineral ores in 1917 for various uses, including incorporation in paint to utilise its luminous properties. Radium based paints were painted onto aircraft instruments to assist the pilot with reading the gauges in night-time flying.

Radium luminising in the UK was undertaken between approximately 1918 and the 1960s and it is understood that luminising work was carried out at HMS Merlin, where aircraft dials and instrument panels were re-touched with luminiscent paint. Radium paint bottles would also have been stored at HMS Merlin.

The use of radium at HMS Merlin during operation as an airfield has been confirmed by a number of witness statements (Appendix 6) taken by SEPA and Fife Council and accounts (Appendix 7).

- A letter submitted to the Courier & Advertiser in 2011 from a former RAF instrument repairer in the 1940s reported that luminous paint was used on the Donibristle site (Appendix 7).
- SEPA met with an individual on 3rd October 2008 and again on 29th November 2011, who initially worked at the airfield in 1941 and following a period in the RAF returned to the site in 1947. The individual undertook a number of jobs on site, although was largely concerned with instrument

repair. This involved instruments (including luminised dials) being sand blasted and then rebalanced with the objective of removing all material from the dial, following which, paint would then be reapplied to the dial face using a tooth pick. All of the waste material including the tooth pick would be disposed. The stores had paint pots of radium which were few in number but around 10cm high with a screw cap. (Witness Statement 14)

- A witness statement taken by SEPA in April 2013 (Witness Statement 10) recalls the use of luminising paint at Donibristle during the period 1953 to 1958. The statement reports that there was one hangar where aircraft strip out and reassembly and luminising work was carried out. Paint came in paint pots equivalent to what is now used for model paints (approximately 20ml) and they would dry up easily when the lid was left off.
- In October 1996 a witness reported (Witness Statement 4) that in building 13 (this was located in what is now Donibristle Industrial Estate), the electrical repair shop where instrument repair for gyro's altimeters etc, it was here that luminising was done in the middle of the building. The work was carried out under Factory Inspectorate conditions. The operators wore detection films. There was a bench for three operators behind a glass leaded screen. Luminising paint came in granules or powder placed in a small quantity in a crucible and mixed with gum arabic. The dials were engraved and sprayed with matt finish paint and then given to the operators. They mixed the compound using toothpicks and filled the engravings until they were level with the dial face.

In 1990, a letter from HMIPI to Lord James Douglas Hamilton details that: *“MoD confirmed that some 800 aircraft were scrapped during 1946 at the nearby RNAS HMS Merlin and that the aircraft would have contained instruments and equipment luminised with radium”; “There is evidence the debris from demolition work at the air station was used for infilling purposes between 1944 and 1951”*. The report continues by stating *“that there can be little doubt of the origins of the contamination and it is likely that there is more material buried inland from the beach”*. The report also states that *“they {vis MoD} seem willing to help with further monitoring and with any remedial action which may be necessary”*. (Appendix 2, File reference DD9/724)

At the September 1992 COMARE (Committee on Medical Aspects of Radiation in the Environment) meeting there was a paper from MOD detailing a list of their sites with radium luminising operations, and known to have been associated with radium luminising operations, including some known to have been involved in disposals the list included Dalgety Bay.

2.2.3. Salvage, Incineration and Disposal Activities

The operations of the airfield included the provision of an area for repair, maintenance and salvage. The site also had an incinerator located in the northern area of the airfield amongst the Repair Yard Buildings.

As previously mentioned in Section 2.2.1, HMS Merlin included a Salvage Section which consisted of a number of buildings in the south east of the airfield, between the location of houses on the Wynd and the area where Dalgety Bay Sailing Club Limited is currently situated.

National Archive documents entitled Donibristle – Aircraft Repair Yard – Functions – Scheme of Command and Superintendence dated 1940-1944 (Appendix 2, File reference ADM 1/15745) have been reviewed. Relevant documents are as follows:

- A document dated 27th February 1943 details that the estate roads have been severely damaged by the Salvage Section's ('salvage village') heavy transport and that either repair to existing roads is required or that new 'taxi-track' be laid.
- Another document details the visit of the Civil Lord of the Admiralty on 18th June 1943. As part of this visit the Salvage Section was reviewed and was described as "*primitive and seems to be mainly constructed out of local salvage material*". In July of that year documents detail that the Donibristle site will be included in the UK wide review of Naval Aircraft Salvage Sections detailing that additional Sections will be required and existing ones improved.

The 1945 aerial photograph shows a fan shaped area of deposited material east of New Harbour. On later maps this is labelled as a Refuse Tip (1964 1:2,500 OS map) and Refuse Tip (disused) (1970 1:2,500 OS map).

A Refuse Tip is also annotated on the 1964 1:2,500 OS map in the location of what is currently Sealstrand, approximately half way along. This area is labelled as a Slaughter House and old sandstone quarry in the earliest map reviewed (1856). By 1896/7 the quarry is labelled as a pond. This feature remains until approximately 1959 whereby the aerial photograph shows the pond feature to be infilled. In the 1963/64 1:2,500 OS map the refuse tip is labelled and it surrounds the western and northern sides of a pond feature. By 1967 (1:10,560 OS map) the whole of the pond feature is annotated with the symbol for refuse or slag heap. The 1970 1:2,500 OS map no longer shows this feature indicating that it has possibly been completely infilled or overgrown.

Both of the above areas, later labelled as refuse tips, are connected to the Salvage Section by tracks. The track to the tip at Sealstrand is evident on the 1945 aerial photograph and is now part of the coastal path. The track leading to the tip at the Headland is also present in the 1945 aerial photograph and is still used for informal access to the Sailing Club.

A number of witness statements taken by SEPA (Appendix 6) describe disposal operations from the airbase:

- A witness statement (6) covering the period between 1943 to 1944 confirms that the Donibristle site was disposing of building materials as well as aircraft parts on site at this time.
- A further witness statement (5) confirms that incineration of instruments panels from planes was occurring on site in 1946. Mounds of ash were being created by this practice with incomplete destruction of some of the dials as these were visible within the ash. This statement also confirms that the majority of the planes stored in the dispersal areas had the instrument panels removed. It also confirms that the ash from incineration was being deposited on site in close proximity to the shore although the exact position of the mound of ash in this case cannot be discerned.

- Another witness statement (10) covering the period 1953-1958 describes disposal of luminising paint. Following luminising paint bottles were disposed of in the dustbin. These were collected every morning by a wagon and taken down over the runway and down the hill, where the bay is, to the tip. All types of waste were dumped and each section had their own transport for taking waste to the tip.

Around the time that the airfield was reducing its operational support prior to closure (1959) a Note by the Joint Secretaries on the Disposal of Radioactive Wastes dated 15th May 1958 by the Cabinet Interdepartmental Committee on Atomic Health and Safety detailed a Report of the Panel of Disposal of Radioactive Wastes undertaken by the Radioactive Substances Advisory Committee dated March 1958. This report details the conditions under which workshops registered under the Luminising Regulations 1947 operated and documented disposal practices at that time. Although Donibristle is not mentioned specifically in the report, a SEPA witness statement from an apprentice aircraft electrician working at Donibristle (Appendix 6) details that luminising was still practiced at the site at this time (1953-1958) and it is likely that disposal practices were similar to those described in the report. Relevant extracts of the report are detailed below:

- At the time of writing of the report there were 37 factories, including 11 R.E.M.E. workshops and 3 R.N workshops registered under the Luminising Regulations 1947 made under the Factories Acts. Luminising powder is mixed with carrier to form a paint which is applied to instrument dials, the strength of the paint being anything from 5 microcuries per gram for clocks and watches to 75-100 microcuries per gram for instruments required by the Services or in aircraft. Reluminising is not often carried out at civilian factories, but at Services' workshops instruments are often reluminised as part of normal maintenance. Sometimes the scraping off of the paint which has lost its luminosity is done under water, when some of it is carried to the drains, but most is collected to form an important part of the solid waste. For the rest, the waste consists of rags and tissue papers used for cleaning applicators, flakes of dried paint, bottles, mixing dishes, faulty luminised parts and, if the exhaust air is filtered, ducting and filters.
- There are a few factories employing half-a-dozen to a dozen luminisers, but the majority have just one or two. In the smaller ones especially, conditions though they may be in conformity with the Luminising Regulations (now being revised) tend to fall short of those expected in a radiochemical laboratory. The exhaust air is rarely filtered. Tables, bench tops and floor coverings become contaminated too frequently and must be wasted. The solid waste from normal operation is generally combustible in nature and it is fairly general practice to pour contaminated solvent, used for cleaning equipment, on paper and rags and burn the whole under primitive conditions in the grounds. There is some local fall-out of ash; the petrol drum or old dust-bin used for burning the waste becomes fairly highly contaminated; and the ash remains for disposal. Non-combustible waste and the ash are generally buried in the grounds. Sometimes, and apparently usually at Services' workshops, all the solid waste is disposed of by burial. We consider that these establishments should be required to dispose of waste by an approved method.
- Ultimately, of course, all the radium turns up as solid radioactive waste. There is little harm from the single watch or clock disposed of with the house

refuse, since it can be safely handled and the material is virtually insoluble. But a different situation exists, for example, at premises where aircraft are broken down and the instruments are accumulated in heaps. We feel there may be need for control over the ultimate destination of these instruments, since there may be undesirably high levels of radiation near these dumps.

It is clear from this report that in 1958 disposal practices at these sites were not considered to be adequate and that an appreciable hazard from the radioactive content of the residual ash post incineration would remain on site following burial.

A Parliamentary debate, detailed in Hansard, on 24th November 1959 concerning the Radioactive Substances Bill (prior to the enactment of the 1960 Radioactive Substances Act) demonstrated how the 1958 report was taken forward and documents Lord Taylor as saying:

'...This applies to very large quantities of radioactive solids, but the small quantities are much more of a problem. The small users are much more likely to be careless about it than are the large users. The disposal of these wastes from factories present a real difficulty to the factory employer. The sort of thing he has to get rid of are valves, the cathodes of which have been treated with radium, and the solid waste from making and using luminous paints, particularly, for example, where large quantities of dials are being scrapped from obsolete aircraft. These dials individually present no hazard, but if a great many are concentrated together they become an appreciable hazard. The same applies to scraps of radium silver foil. The bulk destruction of instruments needs careful control. They can be buried or incinerated, but that is a fairly unsatisfactory way of doing it, particularly if, later on, the premises are sold to somebody else. The new owners may start building operations and come across the canister or a mass of this radioactive material without knowing what it is. It is to avoid that sort of difficulty that it is essential to have the registration provisions in this Bill.'

Appendix 8 contains a number of relevant extracts detailing the management of radium and associated wastes from this era and later periods.

This is consistent with a paper produced by Ministry of Defence (Clark, 1999), recognises that in the past, waste from the luminising process was dealt with as if it were non-toxic material. This normally resulted in the waste being burned on site in uncontrolled conditions and the ashes and debris resulting from this disposed of in a site dump. This dump was often a small landfill pit, and was also used for the dumping of many other materials, including batteries.

Correspondence received from Morton Fraser LLP on behalf the Ministry of Defence dated 20th December 2012 (Appendix 3) confirms that the Ministry of Defence introduced radium on to the site of the former RNAS Donibristle.

No documentary records relating to the disposal of radioactive contaminated waste materials from the airbase has been found in this investigation.

2.3. Dalgety Bay New Town Development Activities

The information sources used to compile this section are listed in Appendix 2. Where OS maps have been used the published date as well as the survey date where known has been reported.

Following the sale of the airfield (land parcels sold in 1962, 1963 and 1968) the land was developed for residential and industrial use.

In March 1960 Copthall Holdings (Dalgety) Development Limited was formed to build a new town at Dalgety Bay over the next 10 years sponsored jointly with Moray Estates Development Company Limited (AMEC, 2013a). Moray Estates Development Company Limited acquired 101 hectares in 1962 (although it appears that there was a mistake in the title deed, since Moray Estates Development Company Limited reconveyed the area to the Secretary of State for Defence in 1966 so that the Secretary of State for Defence could grant a corrective disposition which was recorded on 21st November 1966). This was then passed to Copthall Holdings (Dalgety) Developments Limited in 1967 with the exception of the foreshore area which is still owned by Moray Estates Development Company Limited. Although Moray Estates Development Company still owns the foreshore, the sale to Copthall Holdings (Dalgety) Developments Limited does include the rights to the minerals and sand in the foreshore.

Copthall Holdings (Dalgety) Developments Limited later changed its name to Donibristle Investments Limited and is now known as James Harrison Contracts Limited. The company still owns land to the north and west of the land owned by Dalgety Bay Sailing Club Limited, as well as the rights to the minerals and sand on the foreshore.

The 1967 sale of land to Copthall Holdings (Dalgety) Developments Limited also included some areas of land which were owned by Lord Doune, which were not part of RNAS Donibristle.

The 1960 aerial photograph covers the whole former airfield area. The Repair Yard Buildings and the Accommodation blocks are unchanged and the runway is still present. It shows that the Salvage Section buildings are still in place with little change since the 1959 aerial photograph. Ross Plantation and the New Harbour area are also largely unchanged. The area of deposited material in the vicinity of New Harbour is still present and largely unchanged. The coastline in this location appears to have been eroded slightly with a central portion of the headland having regressed to form two small promontories either side. The bombing arrow is still evident although becoming overgrown. The infilled pond feature in what is now Sealstrand shows little change from the 1959 photograph.

Records from Fife County Council Convenor's Committed dated 24th May 1962 reference the Government's decision to create an industrial estate on the site of the former naval repair yard at Donibristle (Amec, 2013a).

The 1963-64 1:2,500 OS Map (surveyed in 1962) shows the former road layout in the Salvage Section however the buildings are not shown. The airfield track and road layout are still visible as are the runways and the former airfield buildings. However, the Repair Yard buildings are now labelled as Donibristle Industrial Estate and the buildings are largely unchanged with the exception that a number of large hangars appear to be no longer present. The Accommodation blocks are labelled as Barracks. The area of deposited material in the vicinity of New Harbour is labelled as 'Refuse Tip' as is the area to the north and west of the pond feature in what is now Sealstrand appears smaller in size. The track connecting the former estate buildings to the north of the site through Ross Plantation is clearly marked. The quarry feature within Ross Plantation is also marked with trees in the centre of the feature. Although not a very clear aerial photograph the feature on the map can be

determined on the 1963 aerial photograph. The swamp/marsh feature is also marked in the northern section of Ross Plantation.

The aerial photograph from 1965 covers the whole of the former airfield area. The Accommodation blocks are largely unchanged however it is evident that some of the larger Repair Yard Buildings have been demolished. The road layout and the runway layout are still evident as are the former airfield buildings in the central part of the site. The Salvage Section buildings are still present in the south of the site. Ross Plantation, the area of infill (which is now Sealstrand) and the New Harbour area are also largely unchanged. The area of deposited material in the vicinity of New Harbour is still present and largely unchanged. The coastline regression as seen in the 1960 aerial photograph cannot be determined from this photograph. The bombing arrow is still evident although becoming increasingly overgrown.

The 1967 1:10,560 OS Map (surveyed in 1962/63) shows that the Salvage Section buildings are no longer present. The area of deposited material at New Harbour is annotated with the symbol for refuse or slag heap as is the tip in the area that is now Sealstrand. The airfield track and road layout are still visible as are the runways and the former airfield buildings. The quarry feature in Ross Plantation is no longer present but the swamp/marsh feature is still evident. The former Repair Yard is now labelled as Donibristle Industrial Estate and the buildings on the map appear to be those that were present when the site was an airbase with the exception that a number of the large hangars are no longer present. The former Accommodation blocks are labelled as Barracks and the building layout appears to be unchanged. There is no residential development in the area of the former airfield. However, Title Deeds (Appendix 5) dated 1967 show sales of plots in the area of Inchmickery Road and St Colme Road. This is due to the fact that this map was surveyed in 1962/63, i.e. the survey date was prior to development.

In 1968 Donibristle Investments Limited, a subsidiary of Argyle Securities took over the development of the new town (Simpson E., 1999).

The 1970 1:2,500 OS Map (surveyed in 1960) shows a number of buildings in the Donibristle Industrial Estate appear to have been modified or are no longer present. The former Accommodation blocks are now labelled as Hillend Industrial Estate with a number of new large buildings present. The runway is still evident, however a number of industrial type buildings have been built in this area. Some residential development is evident south of the runway area (Coustan Drive) and Dalgety Bay Primary School is present. The former airfield layout between the loop of the current Moray Way is present but the airfield buildings are no longer present. Development is evident with residential housing present in Crow Hill, Frankfield Place, Markfield Road. The former road layout in the Salvage Section is shown however, as in the 1963-64 Map, the buildings are not shown. The refuse tip in the Headland is now labelled as 'disused' and the tip in what is now Sealstrand is no longer marked. Ross Plantation quarry, as on the 1967 1:10,560 map, is no longer present, but the swamp/marsh feature is.

From a search of the Title Deeds (Appendix 5) it is evident that physical development of housing in the south of the former airfield area started in the early 1970s with the first plots in Sealstrand being sold in March 1971 (AMEC , 2013a).

The 1971 aerial photograph shows the presence of Donibristle and Hillend Industrial Estates to the north. It is evident that the former Accommodation blocks are no longer present and new industrial and residential buildings have replaced them. The runway is still evident as is some of the former airfield layout in this area. To the

south of the runway area further residential development has taken place and the school has been built. Development is evident on Sealstrand with a number of plots under construction. To the east of the school and to the south towards the former Salvage Section the former airfield layout remains visible. The buildings in the former Salvage Section are no longer present, but there is either land scarring or demolition rubble evident in the photograph where the buildings once stood. The land to the south of the Salvage Section is under cultivation. The fan shaped area of deposited material labelled as 'disused refuse tip' on the 1970 OS map is largely unchanged although it appears to have been further eroded since the 1960 aerial photograph with the central area having regressed further landward leaving two small promontories either side. The remainder of the Headland and Boat Park area are wooded. Donibristle stable block appears to be derelict. The quarry feature in Ross Plantation appears to be devoid of trees. The swamp/marsh area is still evident.

The 1973 aerial photograph shows little change from 1971 aerial photograph in the Donibristle and Hillend Industrial Estates. Further residential development is evident in the east and along Sealstrand. The Salvage Section buildings are no longer present. The area to the south of the Salvage Section looks to have been cultivated for crops and appears to have been harvested. This is confirmed by a Deed of Conditions dated 17th December 1973 referring to development at The Spinneys (AMEC, 2013a). The sailing club slipway has been constructed, however cloud obscures most of the eastern part of the headland and no further detail is visible. The fan shaped area of deposited material remains unchanged however a promontory has developed seaward at the coastline at the headland. This corresponds with the easternmost promontory as seen in the 1971 aerial photograph at this location. The Donibristle stable block appears to be still derelict.

A development plan dated 3rd October 1973 for development of Phase 4 by Scothomes Limited (Appendix 9) shows the quarry in Ross Plantation as 'Abandoned Quarry Infilled' and also shows an area to the north of Ross Plantation as 'Area to be Infilled'. This area coincides with the swamp/marsh annotated in northern Ross Plantation on the OS Maps.

The 1974 aerial photograph shows the majority of the former airfield area. Further industrial buildings constructed in the Hillend Industrial Estate and residential development to the east and west of the school are shown. Donibristle Industrial Estate appears largely unchanged. Moray Way South has been extended and a roundabout constructed. Further development of properties on The Wynd is evident with the construction of the road for The Spinneys. Two plots east of Donibristle Stables are under construction. There appears to be a building located on land which is currently owned by Dalgety Bay Sailing Club Limited. In the location of the present-day clubhouse there appears to be groundworks visible. New Harbour appears to be in a derelict condition. The fan shaped area of deposited material labelled as 'disused refuse tip' on the 1970 OS map is largely unchanged with the eastern promontory still present surrounded by boulders. Boats are evident close to the slipway and around into the area that is currently used as the Boat Park. A track is evident through the trees to what is now the Demarcated Area (Area C, Figure 3) in the north of the Boat Park. Vehicle tracks are evident in this area leading down to the sea. Regular linear features are also present in this area likened to mowing or crop cultivation lines. A small amount of tree clearance is evident around the coastal cul-de-sac end of The Spinneys and the quarry feature in Ross Plantation appears to be infilled which is consistent with the development plan dated 3rd October 1973. The swamp/marsh area noted on the 1963/64 1:2,500 OS Map appears to have vehicle tracks in a turning circle connecting to the track that leads along the coast in a north-south direction. There is a vehicle apparent on the track in the vicinity of this

feature. This area is co-incident with the 'Area Being Infilled' on the development plan dated 3rd October 1973.

The August 1976 aerial photograph shows the area south of the industrial estates to the coast. Dalgety Bay Heritage and Hidden History (Simpson, E. 1999) indicates that the runway was ripped up around 1976. The photograph shows that there has already been a road constructed across the runway and was present in 1974, but it also shows areas of the runway with linear scarring possibly indicative of tarmac removal. Further development of The Wynd is evident which is consistent with the evidence from the Title Deeds (Appendix 5) showing sales from 1973 onwards at The Wynd and The Spinneys by Scothomes Limited. Land at the Beeches was sold by Donibristle Investments Limited to Muir Homes in October 1975. Dalgety Bay Sailing Club's clubhouse has been constructed in its current position on the headland. The fan shaped area of deposited material remains unchanged although a promontory has developed seaward at the coastline at the headland. This corresponds with the easternmost promontory as seen in the 1973 aerial photograph at this location. The remnants of the bombing arrow are still evident in this area.

The 1977 1:2,500 OS Map shows the area to the east of the primary school up to the southern edge of Hillend Industrial Estate down to New Harbour. This confirms what is evident in the 1976 aerial photograph. The former swamp area noted in Ross Plantation is annotated with 'No veg' presumably meaning no vegetation. The sailing club building is present.

The 1:2,500 1978 OS Map (revised 1978) shows the area south of the industrial estates to the coast. The former runway layout is evident however the road layout is consistent with the 1976 aerial photograph. Development appears to be continuing along The Wynd, although there are still plots which are undeveloped. Development of Glamis Place and Glamis Gardens is still not evident. The sailing club clubhouse is noted on the map on the Headland.

The 1979 1:10,000 OS Map (surveyed 1977) shows that a number of buildings in Donibristle Industrial Estate are no longer present or have been modified from those present on the 1967 map. The former Accommodation blocks area is now labelled as Hillend Industrial Estate. The building layout is different from the 1967 map indicating that alteration or demolition of former airfield buildings has taken place. The former runway layout is still partially visible with industrial buildings labelled as Works now sited in the central portion of the former runway. The map shows residential development around The Wynd, The Spinneys, The Knowe and The Beeches, Oxcar Drive, Pinewood Drive and substantial development between the industrial estates and Moray Way. Mortimer Court is labelled and a road is present however there are no houses present.

The 1979 aerial photograph shows the whole of the former airfield area. The runway layout is no longer evident. The development of the New Town is mostly complete with further development in the west of the area. There is little change to the area occupied by the sailing club. The headland promontory visible in the 1976 aerial photo has become smoother with accretion on the south western side.

The 1983 aerial photograph covers the whole of the former airfield area. The development of the residential areas and the industrial estates is pretty much complete. The site of the former Donibristle House is yet to be developed and the stables appear still to be derelict. The area occupied by the sailing club has changed with the renovation of New Harbour and the placement of what appears to be rock armour along the Boat Park area. The coastline at headland area has become

smoother with no promontories evident. From comparison with the 1979 aerial photograph it appears further material has been accreted or deposited on the south western side of the promontory and also the north eastern side to achieve the smoother coastline. There are boulders evident, possibly rock armour on the seaward side of the headland.

The 1984 1:10,000 OS Map (surveyed 1983) shows further residential development with properties now evident in Glamis Place and Glamis Gardens in the headland area with development further west around the Longhill Plantation area and also the presence of another school building in this area. Additional buildings are evident in the industrial estates.

The 1985/86 1:2,500 OS Map covers the western side of Dalgety Bay and the southern area of Donibristle Industrial Estate. The map shows little change from the 1983 aerial photograph.

The 1988 aerial photograph covers the majority of the former airfield area apart from the very northern end of the industrial estates. There is little change from the 1983 aerial photograph in the Industrial Estate areas and the residential development directly to the south of here as with the residential development to the west end of Dalgety Bay. There is little change to the Sailing Club area and little change to the coastline in this area. Rock armour is evident in the headland area from the aerial photograph.

The 1989 1:2,500 OS Map covers The Wynd and down to the Sailing Club along to Donibristle House. The Inland Rescue Boat station is now present in the vicinity of the Sailing Club at the head of the western slipway. There is little change otherwise.

The 1993 1:2,500 OS Map covers the whole of the former airfield area. An additional industrial building is evident in the Donibristle Industrial Estate. Again there is little change to the residential areas of Dalgety Bay at this time development is considered to be complete. The development in the vicinity of Donibristle house is not evident.

OS 1:2,500 maps dated 1994 and 1996 show the western area of Dalgety Bay and show no change.

The 1995 aerial photograph covers the south of the industrial estates down to the coast. The photo shows that the site of the former Donibristle house is now under development and the stable block has already been developed. The second slipway and a jetty are now evident. The clubhouse appears to be larger than that on the 1984 map. Further boat storage is evident and large boulders appear present along from New Harbour to the Headland area and in the Boat Park area, this could possibly be rock armour. There has also been some local building works since the 1984 map. The residential layout to the west end of Dalgety Bay appears to be consistent with the current day layout. Further industrial buildings are apparent at the southern end of Donibristle Industrial Estate when compared to the 1984 1:10,000 OS Map.

The 1997 aerial photograph shows the Headland area west to Donibristle Bay north to the southern end of Hillend Industrial Estate and east towards Crowhill. Residential development is still the same with the development in the area of Donibristle House still underway. There is little change in the Dalgety Bay Sailing Club area and little change to the coastline in the headland area. The Boat Park area appears to have progressed north eastward at the promontory however there is little change into the bay area of the Boat Park.

The 1998 aerial photograph covers the very southern area of the industrial estates down to the coast. Again there is very little change to the residential development as a whole with the exception that the development a Donibristle House is now complete. The central slipway is now evident at the Sailing Club. There is little change to the coastline around the Sailing Club area.

The 1999 1:10,000 map reflects what is evident in the 1998 aerial photograph. However, it only shows the partial development at Donibristle House indicating that it may have been surveyed prior to 1998.

The 2006 and 2012 1:10,000 Maps show little or no change across the former airfield area.

2.3.1. Dalgety Bay Sailing Club Activities

Dalgety Bay Sailing Club was formerly opened in 1972. The original clubhouse was a wooden garage located at the rear of where the existing top boat shed is now. 2.6 acres of land was leased to the sailing club by Donibristle Investments Limited at this time (Dalgety Bay Sailing Club website).

The 1974 aerial photograph shows the presence of the eastern slipway and boats moored in the Firth of Forth. The area where the current clubhouse is located has been cleared of trees and the land surface appears to be uneven.

By 1975 the current Clubhouse was built (Simpson, E. 1999). This is confirmed by the 1976 aerial photograph. The easternmost beach appears to be being used as a boat park. The rest of the area appears densely wooded.

The photo archive on the Dalgety Bay Sailing Club website shows the construction of the clubhouse. A photo dated 1974 shows a bulldozer and scraper and is labelled 'clearing the way for the new clubhouse'. Beyond the bulldozer there appears to be a mound of earth.

The area that the foundations were placed appears flat and level (1974 October Foundations Laid photograph). A series of photographs from 1975 show the clubhouse under construction. It is evident that the south elevation of the building is built on top of a mound. It is unclear from the photographs whether this has been purposely created for the construction of the clubhouse or whether this was present before construction. A photograph dated January 1975 shows a bulldozer moving material to create a mound against the masonry footings of the clubhouse on the southern elevation. Further information from Dalgety Bay Sailing Club Limited indicates that this mound was created by the material excavated from the foundations (Appendix 3). This is confirmed by witness statement 12 (Appendix 6) that confirms that the spoil from the foundations was placed around the building and feathered into the grass at this location.

The 1978 1:2,500 OS Map also shows the clubhouse and the slipway. The basement of the clubhouse was developed at this time to provide changing rooms and a kitchen for the clubhouse. The top boat shed (IRB Station) had been erected also (Dalgety Bay Sailing Club website).

The 1979 aerial photograph shows a second slipway to the west of the original slipway is now in place. The easternmost beach shows an increase in the number of boats being stored and additionally further storage is evident to the north in this area.

Anecdotal evidence suggests that the rock armour around the Headland and the Boat Park was placed and replenished throughout the 1980s (McPhail, C. 2013). This is confirmed by the aerial photography. Rock armour in the Headland is possibly evident in the 1979 aerial photograph with further rocks evident in 1983 photograph in the Boat Park area and the Headland area. The 1985 aerial photograph indicates that rock armour is present in the Headland area. Information from Dalgety Bay Sailing Club Limited (Appendix 3) suggests that the original additional ground added to the Headland was added from the construction site of the Forth Road Bridge and is understood to be mainly small rocks and shale. The rock armour in front of the Headland area was added to 8-10 years ago with larger rocks which also came from some additional work done for the Forth Road Bridge. This was confirmed by a witness statement that stated that the rock came from the work completed at Ferry Toll, Inverkeithing in 1999/2000 (Witness Statement 8, Appendix 6).

The restoration of New Harbour took place in 1980 (Dalgety Bay Sailing Club website). The Dalgety Bay Sailing Club website photo archive has photos of the restoration. The photographs show that this involved large machinery with two back actors present in the harbour in one of the photographs.

The 1985-89 1:2,500 OS Map shows the addition of the Inshore Rescue Boat Station (top boat house) building to the north east of the main club house.

Dalgety Bay Sailing Club purchased two areas of land from James Harrison Contracts Limited (formerly Cophall Holdings (Dalgety) Developments Limited and Donibristle Investments Limited), 1.26 acres of land in November 1984 with pier or jetty known as New Harbour and sea walls thereon and also 2.85 acres of land in September 1985 bounded on the west by The Wynd.

The details of the dispositions are:

1. Disposition by James Harrison Contracts Limited in favour of the Trustees of Dalgety Bay Sailing Club dated 29th November 1984 and recorded GRS (Fife) on 24th January 1986. This disposition transferred approximately 1.26 acres of land, and is the southern part of the Sailing Club.
2. Disposition by James Harrison Contracts Limited in favour of the Trustees of Dalgety Bay Sailing Club recorded GRS (Fife) on 24th January 1986. This disposition transferred approximately 2.85 acres of land, and is the northern part of the Sailing Club site.

Throughout the 1980s and into the 1990s the aerial photographs (1983, 1985, 1988, 1997, and 1998) show a progressive clearing of trees with an increase in boat storage areas.

The 1995 aerial photograph shows the jetty under construction. Information from Dalgety Bay Sailing Club Limited (Appendix 3) details that the jetty construction is two masonry walls with "rubble" (taken from the beach) between a concrete top.

The 1998 aerial photograph shows a formalised car parking area near the entrance to the sailing club.

The Dalgety Bay Sailing Club website includes photographs in the photo archive of the extension of the easternmost slipway. The photographs are not dated however it shows that construction comprised of wooden formwork to form the edges of the slipway containing re-enforcing mesh over which the concrete was poured and levelled directly onto the beach surface. It is unclear whether any levelling of the beach was carried out prior to the concrete being emplaced. Information provided by Dalgety Bay Sailing Club Limited (Appendix 3) confirms that the East Slip is built of concrete laid on the beach with re-bar reinforcement. The beach had a shallow (about 30cm deep) trench dug into the beach that runs down either side of the slipway to in effect form a shallow 'U' shape upside down. The information also details that the construction of the western slipway is also built directly onto the beach with out any reinforcement or side trenches.

Records from Dunfermline District Council show a partly retrospective application for coastal protection works (Appendix 10). Correspondence from Dalgety Bay Sailing Club dated April 1995 to the Council indicate that coastal protection works were undertaken by Dalgety Bay Sailing Club in the Boat Park area the previous year (1994) extending this area to the east. It also indicates that there were severe easterly gales over the past 2 years which had eroded the coastline exposing large chunks of concrete and causing collapse of the coastal path.

An eastern extension of the clubhouse took place in 2000 (Dalgety Bay Sailing Club website). This is confirmed by the OS mapping with the 1999 1:10,000 map showing the clubhouse without the extension and the 2006 1:10,000 map showing the eastern extension of the clubhouse.

Also present on the 2006 1:10,000 OS map is the bottom boat house. The Dalgety Bay Sailing Club website indicates that funding for this was received in 1997; however the construction date is not given.

In early 2010 there was a significant storm event at Dalgety Bay (McPhail C., pers comm., 2010) which reportedly caused significant local erosion at Dalgety Bay. This erosion included the removal of a 'bite' of the coastline on land now owned by Dalgety Bay Sailing Club Limited. Dalgety Bay Sailing Club reinstated the coastline with imported material which is evident from visual inspection of the area.

Dalgety Bay Sailing Club was an unincorporated association. In November 2012, the Club held an Extraordinary General Meeting at which it was resolved to transfer all of the Club assets to Dalgety Bay Sailing Club Limited with the Club then being dissolved. A copy of the relevant Resolution is attached at Appendix 15. Dalgety Bay Sailing Club Limited registered title to the Club land in November 2012 under Title Number FFE101846.

2.3.2. Fife Council Activities

Fife County Council purchased approximately 27 hectares of land in 1968 comprising the north eastern area of the airfield formerly used as accommodation, mess facilities and storage (Appendix 5). The Secretary of State for Defence (as successor to Commissioners for Executing the Office of Lord High Admiral of United Kingdom and Ireland and the President of the Air Council) granted a Disposition of this land to the County Council of the County of Fife which was recorded on 10th February 1969.

By 1979 the OS 1:10,000 map shows the former Accommodation blocks area now labelled as Hillend Industrial Estate. The building layout is different from the 1967 map indicating that alteration or demolition of former airfield buildings has taken place. Additional buildings and modifications to buildings has occurred in the period between 1979 and the present as indicated by the aerial photographs and OS mapping.

Title deeds (Appendix 5) indicate that plots or buildings in the Hillend Industrial Estate were sold by Fife County Council (subsequently Dunfermline District Council and Fife Regional Council) to individual companies starting in 1969 and throughout the 1970s, 1980s and 1990s.

Throughout the late 1980s and 1990s council housing was also sold to private individuals mainly in Cullaloe Court and Markfield Road.

Fife Council has the responsibility for coastal defence. The current Fife Shoreline Management Plan (Fife Council, 2011) indicates that Fife Council have a general policy of Hold the Line for currently defended sections of the coastline in the Dalgety Bay vicinity. Information from Fife Council Transportation and Environmental Services Department (Appendix 3) indicates that they do not hold any records with respect to coastal defence works in the vicinity of Dalgety Bay.

Fife Council also has the responsibility for the maintenance of Ross Plantation. Information from Fife Council (Appendix 3) has indicated that 'next to no works' within Ross Plantation has been carried out. More recently (since 1990s) Fife Council, as a precautionary measure, stopped any community planting or works by Council staff that might involve staff handling the soil and avoiding any contamination under their nails.

2.3.3. Board of Trade Activities

The Board of Trade purchased 22 hectares of land in 1964 comprising the North West area of the airfield formerly used as hangars and workshops (Appendix 5). The Disposition in their favour was granted by the Secretary of State for Air and the Commissioners for Executing the Office of Lord High Admiral of United Kingdom and Ireland and recorded on 11th February 1964. The Board of Trade subsequently leased the site to the Scottish Industrial Estates Corporation (Appendix 2, File reference BT 177/2008, BT 177/2009).

The 1967 1:10,560 OS Map shows the former Repair Yard is now labelled as Donibristle Industrial Estate and the buildings appear to be those that were in use when the site was an airfield with the exception that a number of the large hangars are no longer present. National Archive documents reviewed relating to the Industrial Estates Management Corporation for Scotland, dated 23rd March 1963, details that one of the conditions of sale was that the Admiralty was to remove a number of large hangars that had been sold by tender prior to entry.

From 1968 onwards Title Deeds (Appendix 5) indicate that plots or buildings in the Donibristle Industrial Estate were sold by the Board of Trade (subsequently the Scottish Development Agency and now Scottish Enterprise) to individual companies. Correspondence (included in Appendix 3) from Scottish Enterprise indicates that the Scottish Development Agency had disposed of all land and property at Donibristle Industrial Estate by 1990.

The 1979 1:10,000 OS Map shows that a number of buildings in Donibristle Industrial Estate are no longer present or have been modified from those present on the 1967 map. Additional buildings and modifications to buildings has occurred in the period between 1979 and the present as indicated by the aerial photographs and OS mapping.

Indeed information provided by Scottish Enterprise indicates that ground investigations were completed in the 1980s prior to the development of the plots for the assessment of foundation suitability (Appendix 3).

2.3.4. Other Parties Activities

Surface Water Drain.

A surface water drain was constructed in the former Salvage Section Area which drains on to the Demarcated Area (Area C). Witness 13 reports that the installation of the pipe was a trench to accommodate a 6 inch pipe which was then be backfilled. As a result the material would not have been moved from the site. The trench was dug to a depth of around 1m with rock breaker brought in to access where bedrock was encountered. The outfall of the pipe at the seaward side is via a flange which is generally around the height of the beach and as a result has to be periodically cleared when sediment deposits prevent the flange opening. As material was backfilled with material removed during the trenching exercise this would have resulted in no net movement of material. Furthermore, as no artefacts were encountered during trenching or in subsequent gardening it is unlikely any significant disturbance occurred as a result of this action.

Fife Coast and Countryside Trust

Fife Coast and Countryside Trust have been responsible for the maintenance of the Fife Coastal Path section from Ross Plantation to St Bridget's church since 2003. This includes maintenance of vegetation, path condition and repair. The path is laid with quarried winstone which is brought onto site (Appendix 3).

2.4. Interested Parties

Following the research carried out into the history of the former airfield this section identifies all of the interested parties that have been or are still currently owners/occupiers of the land.

Pre 1917 to 1959

Name	Area	Status	Date	Currently Exist
The Right Honourable Morton Gray Stuart, Earl of Moray	Whole of former airfield	Owner/occupier	Pre 1917- 1924	Deceased
President of the Air Council/ Commissioners for Lord High Admiral/ Ministry of Defence	As above	Tenant from 1917 to 1924 Owner occupier from 1924 to 1959	1917 - 1959	Yes
Airwork Limited	As above	Contractor to MOD	1952-1959	Yes Part of Babcock Group

Table 2: Parties Identified from Historical Accounts

1959 to Present

Following a search of the Title Deeds (Appendix 5), Table 3 details the parties that were identified as being involved with the development of the residential and commercial/industrial aspects of Dalgety Bay New Town.

List of parties involved in sale of land parcels at DB	First Title Deed	Area Covered in first deed	Registered with Companies House
Moray Estates Development Company Limited	1962 - 1966	101 hectares of land south of current industrial estates.	Yes
Board of Trade	1964	22 hectares of former RNAY now Donibristle Industrial Estate	N/A See Scottish Development Agency
County Council of Fife	1968	27 hectares of former Accommodation Blocks now Hillend Industrial Estate	N/A See Fife Council
Copthall Holdings (Dalgety) Developments Limited. Currently known as: James Harrison Contracts Limited. Formerly known as Donibristle Investments Limited	1967	Inchmickery Rd	Yes

List of parties involved in sale of land parcels at DB	First Title Deed	Area Covered in first deed	Registered with Companies House
James Turner & Company Limited	1967	Inchmickery Rd	Yes
Albert Thain Limited	1967	Land bounded by Moray Way to south	Yes
Anchor Construction Limited	1967	St Colme Rd	Yes
Scottish Special Housing Association	1967	Land bounded by north by Moray Way	N/A
County Council of Fife	1967	DB Primary School	N/A See Fife Council
South of Scotland Electricity Board	1967	Roadway from Inverkeithing to Aberdour to St Bridget's Kirk	N/A see Scottish Power plc
Varney (Glasgow) Limited	1968	Bounded on SE Partly by Moray Way	No Entry
A.B. Cant Limited	1970	Frankfield Crescent	Dissolved 2007
Scothomes Limited	1972	Cramond Place	Yes
Croick Cottage Limited	1972	Sealstrand	Dissolved 1996
Bruce-Turner (Contractors) Limited	1972	Inchmickery Rd	Dissolved 2011
Laidlaw Plan Homes Limited	1973	Doune Park	No Entry
Forth Homes Limited	1973	Bounded on north by Moray Way	Dissolved 2011
Muir Homes Limited	1974	The Wynd	Yes
Country Plan Limited	1974	The Wynd	Dissolved 1993
James Ross (Construction) Limited	1975	The Spinneys	Dissolved 1999
H Richmond & Co	1974	Land bounded by The Wynd	No
Dunfermline District Council	1975	2 plots bounded on NW by Maray Way North	See Fife Council
George Wimpey & Co	1975	Steeple Park	Yes
Church of Scotland	1976	Land bounded by Moray Way and Regent Way	No
Fife Regional Council	1977	7 Acres north of Longhill Plantation	Yes, Fife Council
Scottish Development Agency	1980	North West area of airfield	No Now Scottish Enterprise
Barratt Scottish Properties Limited	1983	The Wynd	Yes
Barratt Scotland Limited	1983	Old Chapel	Yes
Barratt Edinburgh Limited	1983	Barratts to Thomas Mitchell Builders	Yes
Thomas Mitchell Builders Limited	1983	Land bounded east by Moray Way west by St Davids road	No entry
Barratt Commercial Limited	1984	Shopping centre	Yes
Homequity Property Services Limited (latterly P H H Property Services)	1985	The Bridges	No Entry
Trustees for Dalgety Bay Sailing Club	1986	Land bounded on the west by The Wynd	Dissolved 2012
British Telecommunications PLC	1988	Western access road (disponed in 1967 mineral rights granted 1988)	Yes

Table 3: List of Parties Involved in Sale of Land Parcels at Dalgety Bay

Fife Coast and Countryside Trust have also been identified as being responsible for a section of the Fife Coastal Path.

Table 4 provides a list of other parties taken from newspaper and archive documents in addition to the list provided by the Title Deeds (Appendix 5).

Name	Date	Area Developed (where known)	Source of information	Registered with Companies House
Link Housing Association	1964	First phase of residential development	Dunfermline Press 12/09/1964	No Entry
A.M. Carmichael Limited	1964	First phase of roads and sewers	Dunfermline Press 26/12/1964	No Entry
Industrial Estates Management Corporation for Scotland	1962	Donibristle Industrial Estate	Dunfermline Press 12/05/1962	N/A see Scottish Enterprise

Table 4: Parties Identified from Newspaper and Archive Documents

Where these parties still exist (or the organisation of which they now form part), SEPA has sent correspondence in relation to the development of the area and the Appropriate Persons Investigation. Copies of correspondence and replies are provided in Appendix 3. Where information has expanded or added to the information used to compile this report it is referenced appropriately.

3. Land Reclamation, Coastal Erosion and Topographic Changes

It is evident from analysis of the aerial photographs and the OS mapping in the previous section that there have been significant changes in the coastline during and following the operation of the airbase. This section aims to characterise any changes in topographic land form, any land reclamation and any erosion of the study area.

3.1. Topographic Changes

The following maps have been examined to gauge the topographic contour levels across the former airbase from 1896 to 1984.

Date	Scale	Sheet No
1896/97	1:10,560 (contours in feet)	039SE /043NE
1928	1:10,560 (contours in feet)	039SE/043NE
1959	1:10,560 (contours in feet)	NT18SE
1967	1:10,000 (contours in metres)	NT18SE
1979	1:10,000 (contours in metres)	NT18SE
1984	1:10,000 (contours in metres)	NT18SE

Table 5: Maps Used for Spot Height Comparison

The topographic contours on the 1896 map show a shallow upward gradient from the coast evident from widely spaced contours from the Headland area north through Ross Plantation (sea level to 50 feet (approx 15m). A steeper gradient is apparent north of Ross Plantation towards what is now Moray Way North (50 ft to 100 ft (approx 15-30 m). The area that is now occupied by the industrial estates is relatively flat (100 ft to 150 ft (approx 30-45 m) over 550 metres distance).

From New Harbour westwards and up from Donibristle Bay there is a hill picked out by closely spaced contours up to the point known as The Steeple (above 150 ft (approx 45 m)).

The 1928-1984 maps show the same land form and very similar contour patterns.

There are a number of Spot Heights across the former airbase area as presented in the following table:

Approximate Area in Former Airfield	Approximate current day Location	Date	Approximate NGR	Height in Feet	Height in Metres (using conversion factor of 0.3048 for measurements in feet)	
Southern area of airfield (including Salvage Section, Ross Plantation, Donibristle House, east towards Crowhill)	The Wynd	1928	316372, 683127	28	8.5	
		1959	361360, 683134	28	8.5	
		1967	316365, 683140	28	8.5	
		1979	316350, 683190	-	7	
		1984	316350, 683190	-	7	
	West of Donibristle house	1928	315960, 682805	52.6	16	
		1959	Not present			
		1967				
		1979				
		1984				
	Donibristle house	1928	Not present			
		1959	Not present			
		1967	316026, 682859	30	9	
		1979	Not present			
		1984	Not present			
	Glamis Gardens (approx No 26)	1928	Not present			
		1959	Not present			
		1967	315863, 683135	38	11.6	
		1979	315863, 683135	-	12	
		1984	315878, 683139	-	12	
	Glamis Gardens (Number 9)	1928	Not present			
		1959	Not present			
		1967	Not present			
		1979	315863, 682945	-	18	
		1984	315863, 682945	-	18	
	Centre-east of Sealstrand	1928	316308, 683667	28	8.5	
		1959	316308, 683677	28	8.5	
1967		Not present				
1979						
1984						
1984						
East end of Sealstrand	1928	316413, 683671	17	5.2		
	1959	316390, 683688	17	5.2		
	1967	Not present				
	1979					
	1984					
1984						
East of Sealstrand on coastal path	1928	Not present				
	1959					
	1967					

Approximate Area in Former Airfield	Approximate current day Location	Date	Approximate NGR	Height in Feet	Height in Metres (using conversion factor of 0.3048 for measurements in feet)	
		1979	316521, 683712	-	6	
		1984	316521, 683712	-	6	
	Ross Plantation east of quarry feature	1928	316228, 683325	15	4.6	
		1959	316205, 6833349	15	4.6	
		1967	Not present			
		1979	Not present			
		1984	Not present			
	Land side of where the sewage outfall pipe emanates	1928	316123, 683449	13	4	
		1959	316127, 683470	13	4	
		1967	316123, 683428	13	4	
		1979	Not present			
		1984	Not present			
	Central area of airfield (north of Ross Plantation but south of Repair Yard and Barracks)	Regents Way north of the Public House	1928	Not present		
			1959	Not present		
1967			315611, 683597	99	30	
1979			Not present			
1984			Not present			
North side of the roundabout connecting Regents Way, Moray Way North.		1928	Not present			
		1959	Not present			
		1967	Not present			
		1979	315472, 683721	-	31	
East side of the roundabout connecting Regents Way, Moray Way North.		1928	Not present			
		1959	Not present			
		1967	Not present			
		1979	Not present			
Moray Way North in middle of road approximately in line with the path that leads past 14 Meadowfield		1928	Not present			
		1959	Not present			
		1967	Not present			
		1979	315722, 683792	-	34	
		1984	315722, 683792	-	34	
Northern area of airfield		Current A921 just north of Unit 9 Moss Way Donibristle Ind Est	1928	Not present		
			1959	Not present		
	1967		315792, 684350	136	41.5	
	1979		Not present			
	1984		Not present			

Approximate Area in Former Airfield	Approximate current day Location	Date	Approximate NGR	Height in Feet	Height in Metres (using conversion factor of 0.3048 for measurements in feet)
(including Repair Yard and Barracks)	North of Dalgety Bay Recycling Centre on Ridge Way	1928	Not present		
		1959	Not present		
		1967	316085, 684302	163	49.6
		1979	Not present		
		1984	316085, 684302	-	50
	Ridge Way in road north east of Bristol House	1928	Not present		
		1959	Not present		
		1967	Not present		
		1979	315872, 684213	-	43
	Current A921 just north of the Ramsay Building on the Donibristle Ind Est	1928	315696, 684285	128.7	39
		1959	Not present		
		1967	Not present		
		1979	Not present		
		1984	Not present		
	Current A921 north of Unit 8 West Way	1928	315871, 684382	135	41
		1959	315859, 684389	135	41
		1967	Not present		
		1979	Not present		
		1984	Not present		
	Current A921 just north of Unit 9 Moss Way Donibristle Ind Est	1928	Not present		
		1959	Not present		
		1967	Not present		
		1979	Not present		
1984		315797, 684354	-	41	
Track north of A921 and railway	1928	Not present			
	1959	Not present			
	1967	Not present			
	1979	315759, 684397	-	37	
	1984	315759, 684397	-	37	

Table 6: Comparison of Spot Heights from 1:10,000 (or equivalent) Maps

The spot height and contour information from the 1:10,560 and 1:10,000 maps dating from 1896 to 1984 show consistent levels and indicate that there has been little or no mass cut and fill operations across the area of the former airfield site to create flat development platforms during residential and industrial development.

This is also confirmed by the contours presented on the Scothomes development plan Phase 4 map dated 1973 (Appendix 9) which shows the northern end of The Wynd up to the roundabout with Moray Way South and The Spinneys.

Two further development maps with contour information, where the location is identifiable, (detailed in Appendix 9) also correlate to the contours presented in the OS maps confirming that little or no mass cut and fill has been carried out.

Stereo aerial photographs have also been viewed to establish any major topographic changes. Photographs viewed are listed in Appendix 2. The stereo aerial photographs confirm the OS mapping data indicating that no major topographic changes have occurred across the former airfield area during the residential and industrial development.

A Dunfermline Press article dated 15th April 1961 quotes Lord Doune (Chairman of Cophall Holdings) as being anxious that the development was high class and that the natural beauty of the site should be preserved as far as possible (Appendix 7).

A Dunfermline Press article dated 11th July 1964 shows the 3D model of the development plan for the Dalgety Bay New Town. The model shows that the development will encompass the existing landform and existing woodland would be preserved as an amenity for the town (Appendix 11).

Whilst there has been no mass cut and fill, earth movements will have occurred during development of residential plots locally with the excavation of foundations and the creation of roads. No documentary evidence or anecdotal evidence that details disposal routes for excess material gained from foundation excavation has been found in this investigation. Witness statement 12 (Appendix 6) has confirmed that construction occurred from plot to plot, working with the levels of the ground. The soils excavated for foundations were not taken off each building plot but were used within the garden areas of the houses as the foundations were not deep.

Within the land now currently owned by Dalgety Bay Sailing Club Limited there has been development in the form of the clubhouse. Information from Dalgety Bay Sailing Club Limited (Appendix 3) indicates that, to the best of their knowledge, the only part of the club grounds which had any significant ground works was the ground directly under the clubhouse prior to the building work being started. The material excavated to form the foundation trenches was backfilled around the club and can be seen as the mounding to the south west and northern parts of the clubhouse at ground floor level. No additional materials were imported onto site for this purpose. On addition of the eastern extension to the clubhouse, the material extracted for the foundations was again used to 'top up' the mound in front of the clubhouse.

Anecdotal information, detailed in a report by the NRPB on behalf of HMIPI dated August 1991 (Appendix 2) noted that some material excavated from the foundations of the club house had been relocated along the path just behind the foreshore at Sealstrand. This area was further investigated by Enviro in 2007 (Enviro 2007b) ash and clinker were reported in a number of locations up to 0.5m thick. Bedrock is near the surface in this area and consequently any made ground deposits are relatively thin. Radioactive sources were found and removed from a number of pits. SEPA inspected this area in June 2013 and found that there was evidence of radioactive materials but this was largely attributable to naturally present radioactivity. A single radium source was recovered in the upper horizon amongst 'blaes'. Such sources are consistent with earlier reports of sources present in the surface of the path which are believed to occur following storm events and deposits from the marine environment. Witness statement 12 (Appendix 6) states that no waste from the construction of the clubhouse foundations was placed on the coastal path and that the path was constructed using imported blaes.

A witness statement 8 (Appendix 6) indicates that a layer of sand was added along the foreshore in the Ross Plantation area in the late 1990s. It is thought that by 2000 this volume of sand was no longer discernable on the foreshore. Witness Statement 12 (Appendix 6) confirms that sand was placed in this area to improve the appearance and that the provenance of the sand was the silica sand quarry in Dunfermline.

3.1.1. Infilling

From the historic maps and aerial photographs it is evident that there are a number of areas that have been infilled over the years or labelled as refuse tips. These areas are:

- Quarry within Ross Plantation;
- Refuse tip in Headland (see section 2.2.3);
- Refuse tip at Sealstrand (see section 2.2.3);
- Area of swamp/marsh in northern Ross Plantation.

Quarry within Ross Plantation

This feature is evident in the earliest maps reviewed (1856). This feature remains largely unchanged until the 1967 OS 1:10,560 map where it is no longer marked, however it is still present in the photographs up until the early 1970s. A development plan dated 3rd October 1973 for development of Phase 4 by Scothomes Limited (Appendix 9) shows the quarry in Ross Plantation as 'Abandoned Quarry Infilled'. The 1974 Aerial photograph shows the quarry feature in Ross Plantation appears to be infilled which is consistent with the development plan dated 3rd October 1973.

Area of swamp/marsh in northern Ross Plantation

This feature is evident in the earliest maps reviewed (1856). A development plan dated 3rd October 1973 for development of Phase 4 by Scothomes Limited (Appendix 9) shows an area to the north of Ross Plantation as 'Area to be Infilled'. This area coincides with the swamp/marsh annotated in northern Ross Plantation on the OS Maps. The 1974 aerial photograph shows this area to have vehicle tracks in a turning circle connecting to the track that leads along the coast in a north-south direction. There is a vehicle apparent on the track in the vicinity of this feature. This area is co-incident with the 'Area Being Infilled' on the development plan dated 3rd October 1973. The 1977 1:2,500 Os map annotates this area with 'No veg' presumably meaning no vegetation. This area becomes progressively more vegetated up to the present. Witness statement 12 (Appendix 6) states that a construction company was allowed to dump material from the top end of the town in Ross Plantation by Donibristle Investments Limited (which later became James Harrison Contracts Limited).

3.2. Land Reclamation and Erosion

As described in the previous Section the 1945 aerial photograph shows a significant change in the coastline when compared to the 1927 1:2,500 OS map. To the east of New Harbour the coastline has changed substantially from the 1927 1:2,500 OS Map with the deposition of a fan shaped area of material as can be seen in Appendix 12 Figure A0.

Work has been carried out by the University of Stirling on SEPA's behalf to examine the aerial photography for the period 1945-1990 to document the changes in the coastal evolution in the Boat Park to Ross Plantation stretch of coast and also the New Harbour to Headland stretch of coast (Sneddon et al., 2013). A summary of which is presented below and figures are presented in Appendix 12.

3.2.1. Boat Park to Ross Plantation

1949-1959

The report indicates a substantial change in morphology between 1949 and 1955 in the Boat Park to Ross Plantation area. This change is characterised by a deformation to the south-eastern spit suggesting it accretes across the Bay in 1955 (Appendix 12 Figure A1). There is also a noticeable shift to the south of the Bay, suggesting partial infilling, the probable result of accretion as a result of the spits changing morphology. The difference in coastlines north of the North of the Bay site is believed to be caused by the rocky nature of this area. The spit also appears to have above average shadowing indicating an increased elevation in contrast to other features within the study area i.e. the spit was higher with a significant step down to the surrounding ground.

Between 1955 and 1959 the spit feature has been lost and the study area has been substantially infilled (Appendix 12 Figure A2). This is established by the loss of exposed rock, which has been replaced by coarse sediment infill. This marks the time of most significant change with the extent of infilling being almost equivalent to the infilling reported for the entire study period. The absence of the spit coupled with the associated sediment infill, points directly to the link between these two features, i.e. loss of the 1959 spit and sediment accretion in the Bay in 1959.

Post 1959

Following the infilling period of 1955-1959 the coastline was found to vary slightly as accretion and erosion continued at the site for the following 30 years. Between 1959 and 1990 the coastline underwent minor changes with accretion in the north of the study site, particularly around the northern rock formation. In the south of the study site erosion occurs between 1959 and 1990 with coastline retreating by several meters, before post 1990 expansion (Appendix 12 Figure A3).

3.2.2. New Harbour to Headland

The headland undergoes two primary changes one post 1949 and the second post 1960. This headland interpretation uses the higher quality photos as the headland does not benefit from a well-defined beach which is visible in all tidal conditions as found at the bay study site.

1945-1960

Of importance is the fan shaped feature in 1945 aerial photograph, an area marked as a refuse tip in later OS maps. This coastal section is seen to change over the subsequent years. The 1955 headland in comparison to the 1949 headland shows an expansion in headland occurring between 1949 and 1955, this expansion occurred in the northern part of the headland (Appendix 12 Figure A4). Over this time, the coastal part of the tip area is seen to change, perhaps through coastal

erosion or other mechanisms. This erosion may, in part, supply material to the spit described above. There is a minor second expansion in headland post 1955 that occurs mid-way up the headland as shown in the 1959 and 1960 headlands (Appendix 12 Figure A5).

Post 1960

Sometime between 1960 and 1973 a sandy promontory develops pointing out towards the ocean (Appendix 12 Figure A6). It is believed that this protrusion occurred after 1963 as it is not present in the lower quality 1963 headland photo. Post 1973 the promontory changes shape, perhaps through erosion on the southern side (Appendix 12 Figure A7). The variation in headland shape towards the south between 1973 and 1979 is likely to be a result of the fuzziness caused by sand and vegetation deposited on the rocks near the pier.

By 1985 the protrusion has been integrated in to the headland with a much smoother headland being present which curves around to the north of the study site. This smoother shape remains constant till 1990, with strong overlap found between the 1985 and 1990 headlands (Appendix 12 Figure A8). It is believed between 1990 and present today the headland accretes in the mid headland where it expands by around 10 metres.

The coastal interpretations have identified that between 1949 and 1955 the Bay and headland coastlands experienced substantial coastline evolution. The extent of change then diverged between the two areas analysed i.e. the Boat Park to Ross Plantation stretch of coastline and the New Harbour to Headland stretch. The most dramatic change for the Boat Park to Ross Plantation area was observed between 1945 and 1959. The spit which developed in 1955 was in all likelihood the source of sediment that subsequently accreted into the Bay, as observed in the 1959 aerial photograph. Evidence within the Headland area suggested that erosion of the “tip” area may well have supplied the spit observed forming into the Bay. After that, the headland experiencing gradual change across the subsequent 40 year period.

3.2.3. Rock Armour Placement and Replenishment

Details of rock armour placement and replenishment is presented in Section 2.3.1.

4. Identified Significant Pollutant Linkages

SEPA have conducted a Risk Assessment report (Dale, 2013) to identify the Significant Pollutant Linkages at the Dalgety Bay site. The following significant pollutant linkages have been identified:

EVIDENCE FOR POLLUTANT LINKAGES	
Linkage	Discussion
<p>Linkage:</p> <p>Radium sources within beach environment which are close to surface and can be encountered by the public via direct contact.</p>	<p>Source</p> <p>Shallow and deep sediments impacted by radium 226 contamination.</p> <p>Samples of radium indicate doses to humans would pose a hazard in excess of the relevant criteria in the RCL statutory guidance. Sources continue to be detected across the entire area, which are in excess of these criteria. Sources in excess of 10 MBq Ra-226 would give doses to the skin in excess of 10 Gray per hour. Sources of greater than 100,000 Bq Ra-226 would give ingestion doses in excess of 100 mSv for children. For lower activity sources the effects of skin thickness and greater solubility may mean that these sources could also deliver doses in excess of the relevant statutory criteria.</p> <p>Pathway</p> <p><i>Skin Contact and Ingestion</i></p> <p>Radioactive sources are present in the area, which continue to be mobilised and come to the surface. The public use the site as a whole. Skin contact and inadvertent ingestion pathways are present. Digging in sediment would provide a further pathway.</p> <p>Receptor</p> <p><i>Public</i></p> <p>The public have access to all of the area minus the current Demarcated Area.</p>
<p>SUMMARY OF LINKAGE:</p> <p>Based on mean solubility a 3-month old child would receive 100 mSv from ingestion of a 35 kBq source. For a 1-year old child this same dose is attributable to a source with an activity of 100 kBq, a number of such sources reported in the SEPA find data on our website have activities greater than this value and are of ingestible size¹. For an adult this would be a source in the order of 700 kBq the number of sources found to date with activities greater than this value is relatively low. Higher numbers of sources in excess of 35 kBq have been found in Areas C, D and E with fewer found outwith these areas.</p> <p>Equivalent sources continue to be found at Dalgety Bay which are in greatest in</p>	

¹ Assuming maximum size for ingestion of 20mm. From Litovitz Toby; Whitaker N, Clark L. (June 2010). ["Preventing battery ingestions: an analysis of 8648 cases."](#) Pediatrics 125 (6): 1178–83.

EVIDENCE FOR POLLUTANT LINKAGES	
Linkage	Discussion
	<p>number per area in Areas C, D and E (the currently Demarcated Area, Boat Park area and the Slipways area). When sources are removed from these areas they are repopulated with similar activity sources most likely as a result of coastal processes.</p> <p>For skin doses, based on Charles 2008, sources of 10 MBq would deliver 10 Gy/h to the adult skin. Two such sources were found in 2011 which would deliver such a dose rate, although in all likelihood at least one further source was also found in this area in 1990, it is therefore reasonable to assume that further caches of such sources exist.</p> <p><i>SEPA considers that significant possibility of significant harm from the identified Significant Pollutant Linkage is occurring on Area C, D and E at Dalgety Bay in line with the criteria set out in paragraph A.32 of the Statutory Guidance.</i></p> <p><i>For Areas C, D and E current management arrangements including signage demarcation and monitoring and removal is reducing the risks to the public. However, the practicability, effectiveness and durability of these current measures are still to be assessed.</i></p> <p>As the conditions set out in paragraph A.32 have been met the probability of a radiation dose in line with paragraph A.33 has not been assessed.</p> <p>SEPA does not consider that it has sufficient information to determine whether a significant possibility of significant harm from the identified Significant Pollutant Linkage is occurring at Areas B and F due to the uncertainties discussed at Part 5 of this Risk Assessment. SEPA will keep these areas under review and consider whether further inspections are required.</p>

Table 7: Evidence for Significant Pollutant Linkages

The areas referred to in Table 7 are represented on Figure 5.

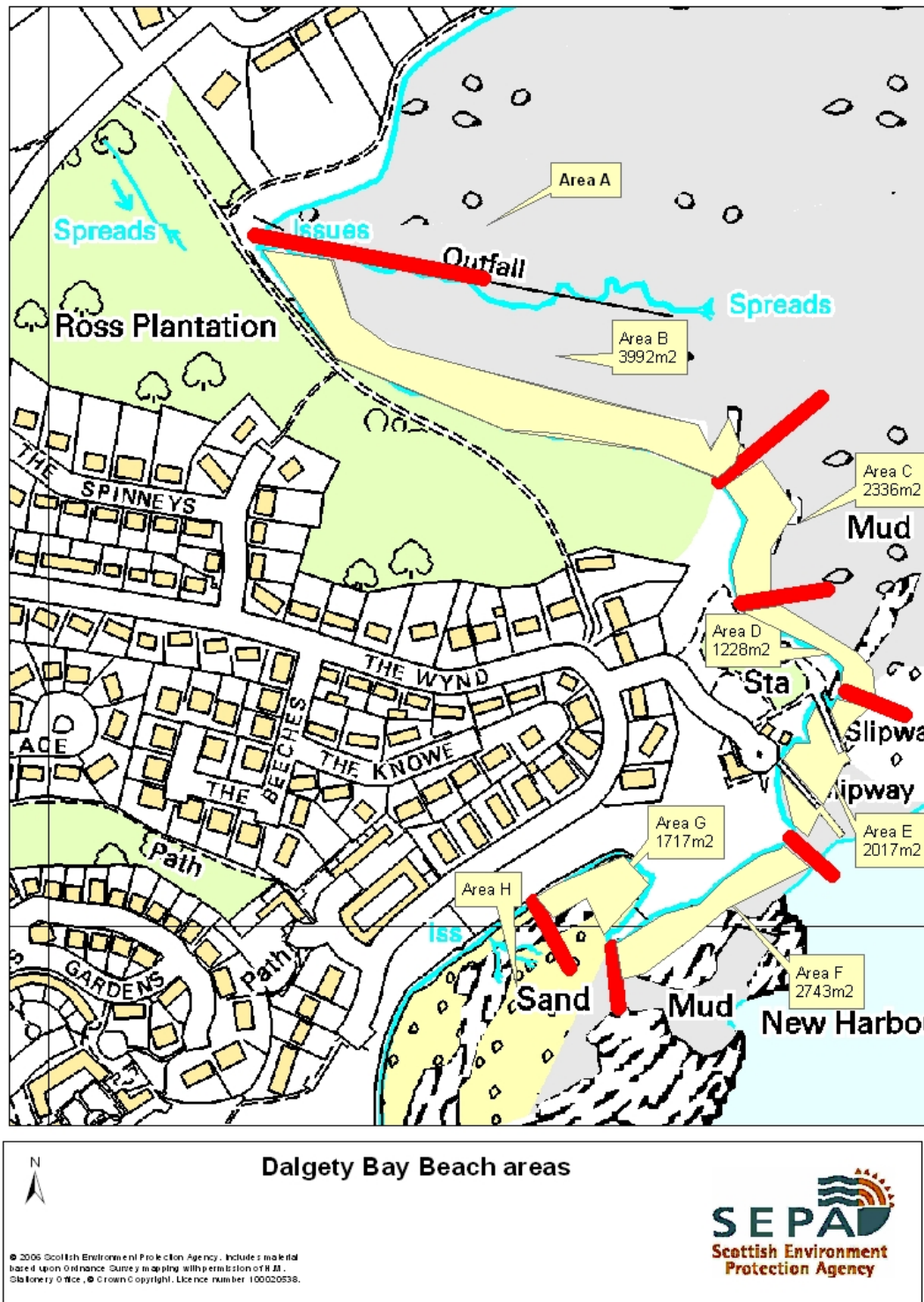


Figure 5: Dalgety Bay Beach Areas

4.1. Origin of the Contamination in Relation to the Present State and Past History of the Area

Since 1927 to date the coastline is known to have changed position. Initially with a shift seaward, then later by shifts landward. The processes involved in the seaward shifts which occurred at different places at different times are known to include the dumping of materials to form made ground, but may have also included natural

erosion of made ground with re-deposition of the same material after transport along the shore. However, extensive new ground above high tide level could only have been formed by the latter process through deposition of a spit, plus infilling of the area between the spit and the coast by waves during high tides. There are no unequivocal signs of this having occurred from the limited evidence provided by maps and aerial photographs. The principal process by which the coastline was shifted from the land into to the sea appears to have been the deliberate creation of made ground. The landward shifts of the coastline from its maximum seaward position seem to have occurred mainly in the eastern and north-eastern parts of the site and are most likely due to erosion of the built-out ground by waves, with subsequent deposition of the eroded materials either lower down on the beach slope more or less opposite the site of erosion or on the upper beach and beach slope further along the coast (Atkinson, T. 2013).

The Risk Assessment Report (Dale, P. 2013) established significant pollutant linkages on the foreshore as presented in Section 4.0. The following discussion aims to interpret the deposition history of the contaminated material from the evidence reported by the Ministry of Defence intrusive investigation (AMEC, 2013c) as well as other intrusive and non-intrusive investigations carried out at the former airbase and surrounding environs, plus the historical evidence of coastline positions interpreted from aerial photographs (Sneddon et al., 2013). The latter is the principal approach for establishing the timing of primary deposition of the contaminated made ground. As there are several time-points at which the position of the coastline can be established from aerial photographs, the timing of made ground deposition onto the beach that altered the coastline and moved it seaward can be bracketed into short intervals of a few years (Atkinson, T., 2013). It is important to establish when these time-points were as it has a bearing on the potential Appropriate Persons.

4.1.1. Factual Investigation Information

An intrusive investigation was carried out by Ministry of Defence contractors in November and December 2012 (AMEC, 2013c). This comprised trial pitting and completion of boreholes along the coastline from Ross Plantation in the north to New Harbour in the south west. Trial pit and borehole logs have been looked at in relation to two Ground Penetrating Radar (GPR) surveys were carried out by Queen's University Belfast on behalf of SEPA in 2011 (Tyler, 2011) and 2012 (Ruffell & Tyler, 2012). The intrusive investigation data has also been correlated with the coastline changes as interpreted by the University of Stirling from aerial photographs (Sneddon et al., 2013).

Cross sections presented in AMEC's Factual Report (AMEC, 2013c) have been reproduced with the relict coastlines superimposed. These are presented in Appendix 16 (Figures B1 to B6). These cross sections have been used in this section to interpret the approximate timing of deposition. The location of the cross sections is presented in Appendix 16 Figure B0.

4.1.2. Headland

GPR Surveys

The location of made ground deposits in the Headland area which are predominantly radioactive ash and clinker, mirror the findings of the 2011 GPR survey (Tyler, 2011). Figure 6 shows the 2011 GPR transects and a brief interpretation of the data.

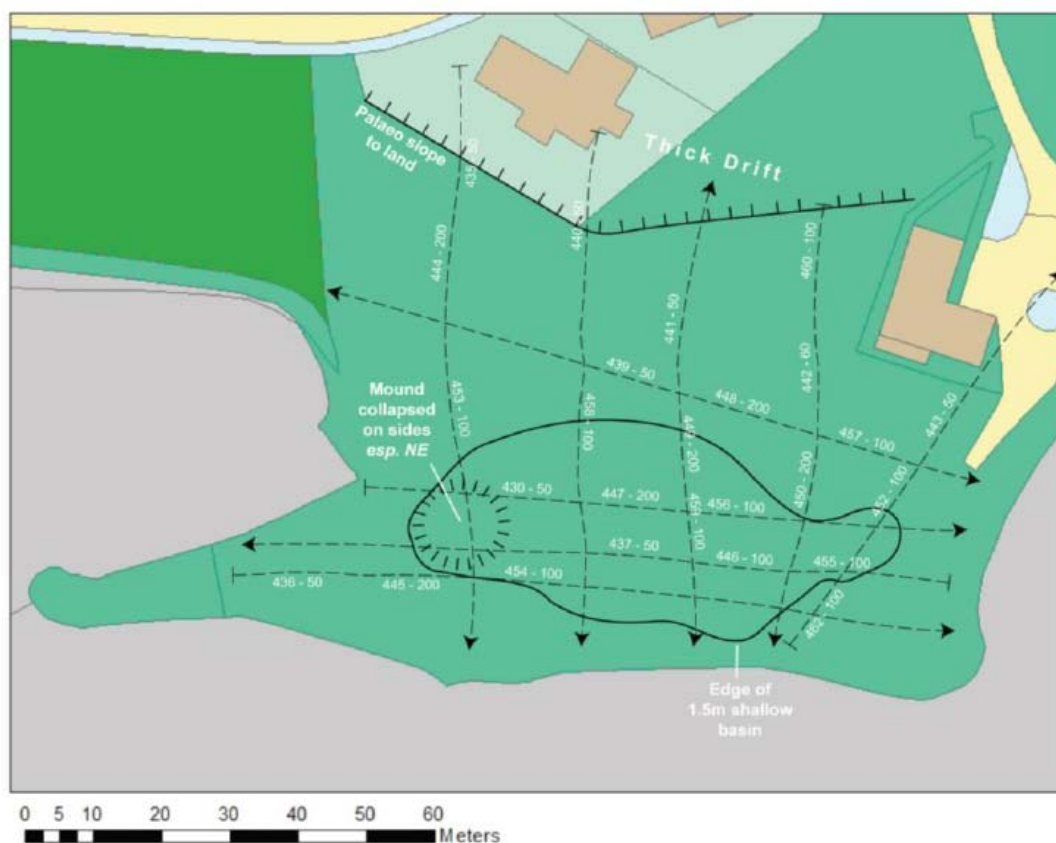


Figure 6: GPR transects and a brief interpretation of the data Dec 2011 (Tyler 2011):

This figure shows an outline of the main basin of the made ground. The basin infill was estimated to be about 2m deep from the surface of the site. The superficial infill material continues to the north under the club house and to the North West which may indicate separate minor basins of infill (around 1.5-2m deep).

The borehole and trial pit logs from the 2012 intrusive investigation (AMEC, 2013c) confirm this, showing made ground in this area generally of the order of 2m deep and up to 5m deep locally. The logs and the cross sections presented in the AMEC Factual Report (AMEC, 2013c) show the 'basin' of made ground shallowing in a south westerly direction towards New Harbour (Appendix 16 Figures B5 and B6) This 'basin' area identified in the GPR survey corresponds with the refuse tip as marked on the 1:2,500 OS map dated 1963/64. This is also consistent with the findings of the Enviro 2007 site investigation (Enviro, 2007b).

A further GPR survey was undertaken in 2012 (Ruffell & Tyler 2012). The report covers the Ross Plantation area, Demarcated Area and the Boat Park Area. The transects are shown in Figure 7 and Figure 8.

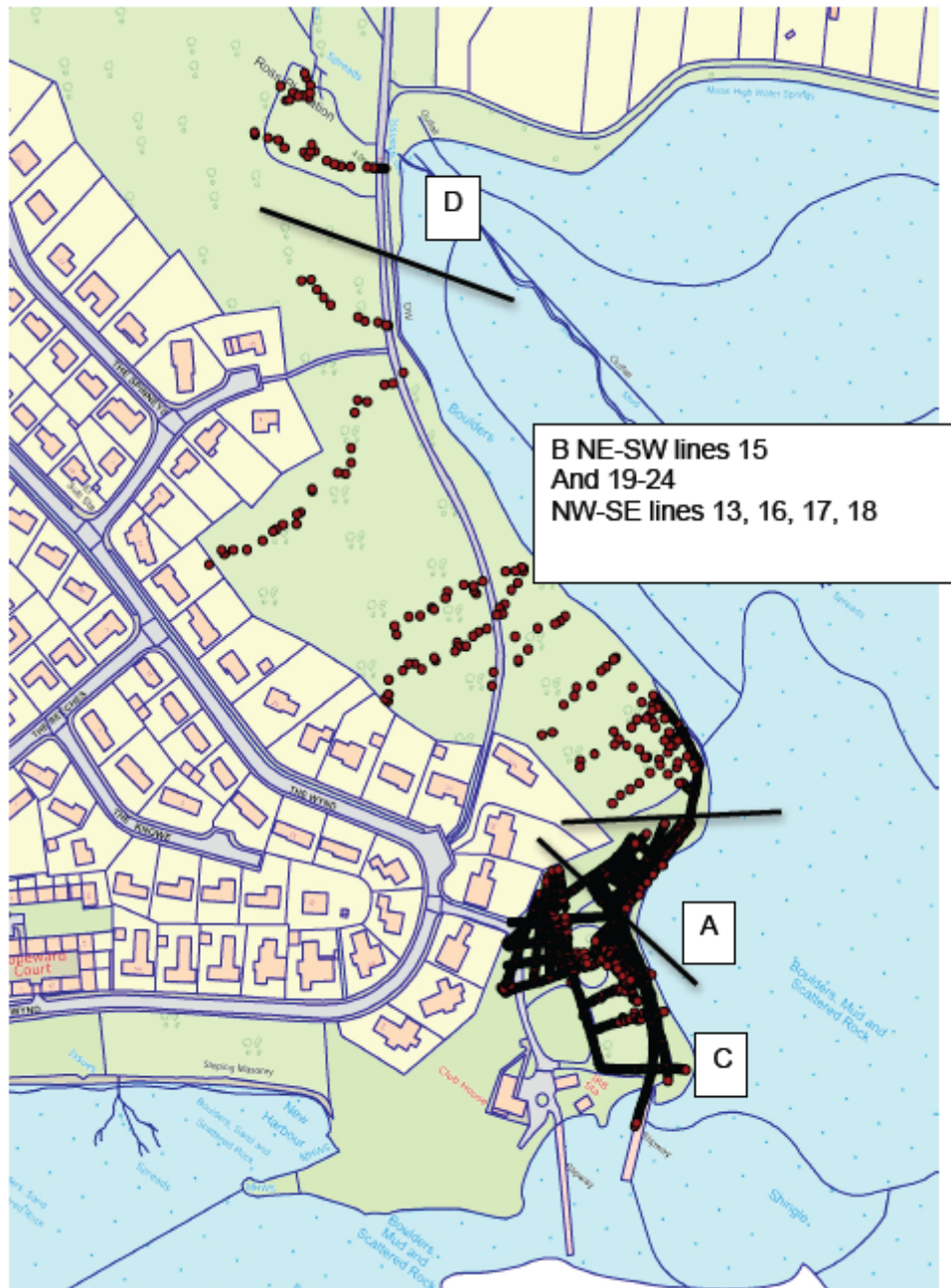


Figure 7: GPR transects at Dalgety Bay (Ruffell & Tyler 2012)

The results from the Demarcated Area (Area C) show a transition between a basin of infill material up to 1m thick to the south changing to very different material to the north of this area. This is confirmed by trial pit and borehole logs in the Amec Factual Report (AMEC 2013c) with trial pits in the south of the area (TP3/3/044, TP3/3/045, TP3/3/046, TP3/3/106, TP 3/1/026 TP3/1/025) showing inert made ground up to 1.5m thick overlying made ground of radioactive ash and clinker. The material type changes towards the north of the area where the made ground is predominantly ash and clinker made ground (TP3/1/024, TP3/3/037, BH3/3/005, TP3/2/031B).



Figure 8: GPR Transects in Areas A & C (Ruffell & Tyler 2012)

The results from the Ross Plantation area along the coastal path, comprises shallow superficial deposits on bedrock. This is confirmed in trial pits TP6/2/063, TP6/2/053 from the AMEC Factual report (AMEC, 2013c) and other trial pit locations in this area where interbedded ash and clinker layers with layers of sandier layers are up to 1m in thickness. Superficial deposits thicken towards the south west which is confirmed by trial pits TP5/2/049, TP5/2/052 in the AMEC Factual Report (AMEC, 2013c) as well as trial pits TP6 to TP8 and other locations in this area from the Enviro 2007 investigation (Enviros, 2007b) where mainly natural deposits thicken towards the south west.

The results from the Boat Park area show a 1-3m infill of superficial material underlies the area the boats are stored on. This infill is thickest in the southern area of the Boat Park on the path parallel to the shore. This can be seen in BH3/3/004 with up to 2m of inert material placed directly onto natural sediments and also in TP3/3/039 and TP3/3/042 with made ground including radioactive ash and clinker up to 2.2 m in thickness.

A thinner layer (1m) of superficial material underlies the mound and slope the boats are stored on. This is confirmed by TP3/3/041 and TP3/3/043 with under a metre of made ground or topsoil present overlying bedrock.

The findings from both the Enviro 2007(b) investigation and the AMEC 2013c investigation correlate well and confirm the findings of both GPR surveys undertaken

in 2011 and 2012. A third GPR survey was undertaken by Ministry of Defence Contractors (AMEC, 2013a). The output of that survey was difficult to interpret in relation to the intrusive investigation findings.

Coastline Reclamation and Erosion

The aerial photography indicates that the coastline has evolved significantly since the first available aerial photograph of the area taken in 1945. Indeed it is evident that substantial expansion in the Headland area had occurred in the period between the publication of the 1927 1:2,500 OS map and the 1945 aerial photograph with the fan shaped deposit of material later identified as a tip by the 1963/4 1:2,500 OS map (surveyed in 1962) Appendix 12 Figure A0. This feature is likely to have been eroded since its inception, as there is no evidence that the coastline was engineered to protect this material from coastal action.

A marine influence is evident at depth in deposits now considerably inland confirming what is seen in the aerial photographs; that the coastline was once further inland than it is presently. Trial pits (AMEC, 2013c) where this is evident are as follows:

- TP2/1/009 has interbedded radioactive ash with pockets of silty clay at 1.80mbgl overlying natural deposits (silt deposits with decayed plant remains). Further deposition of ash and clinker gravel overly this deposit. This location sits between the 1945 coastline and the coastline indicated on the 1927 1:2,500 OS map.
- TP2/2/016 also shows this interbedding of ash and clinker gravel with clayey silt at depth (0.7-2.5mbgl). Layers are indicated to dip 30° down to the north. The interbedded ash and clinker layer overlies natural deposits (silty clay/clayey silt with decaying rootlets and black mottling) and further deposition of non-interbedded ash and clinker is evident above the interbedded ash and clinker deposit. This location is located approximately 12m due west of the 1945 coastline and substantially closer to the coastline indicated in the 1:2,500 1927 OS map.

Correlating the trial pit and borehole logs with the relict coastlines it is apparent the majority of the made ground that makes up the headland was emplaced before 1959. Information from the trial pit and borehole logs indicate that this is primarily made ground with ash and clinker and radioactive point sources. It can be seen from Cross Section E from the AMEC Factual report (AMEC, 2013c), when the relict coastlines are placed on this cross section (Appendix 16 Figure B5), that much of the made ground subsequent to the 1955/59 headland does not contain any radioactive point sources or ash or any artefacts relating to this period of time and is likely to have been emplaced following 1959. As indicated by the coastline evaluation provided by the University of Stirling (Sneddon et al., 2013) a second period of deposition in the headland occurred from 1963 onwards and this cross section goes through the Headland where the aerial photographs indicate the majority of material has been accreted/added post 1963. This is inert material.

The cross section also shows radioactive ash and clinker on the toe of the foreshore. This is anthropogenic material that has been deposited by coastal action following ongoing erosion of the headland area. The erosion of material from the Headland introduced it to the marine environment with subsequent deposition on the toe of the foreshore slope and redeposition along the coastline to the north of the Headland and around into the bay.

There is no evidence that during the development of the New Town post 1960 that there was any anthropogenic disturbance of contaminated material deposited in the Headland prior to this date. Indeed the aerial photographs show the fan of deposited material later labelled a refuse tip in the 1963/4 1:2,500 OS Map as becoming progressively more vegetated and the bombing arrow that is present alongside this area becomes increasingly overgrown. The colour photograph in 1973 shows this area to be green with vegetation. Witness statement 12 indicates that this was the case when Dalgety Bay Sailing Club first occupied the site (early 1970s) and that the ash was only evident on the beach where it was leaching out. Fill and rock armour was added at the Headland in the late 1970s early 1980s (witness statement 12) replaced and replenished throughout the 1990s expanding the Headland by approximately 10m since 1990. This material is inert.

Excavation and re-use of material within the Headland was undertaken during the construction of Dalgety Bay Sailing Club clubhouse in 1974/75. Radioactive point sources have been detected within the mound confirming that this is the case (Tyler, 2011).

4.1.3. Boat Park and Demarcated Area

Coastline progression is indicated by the marine influence evident at depth in deposits now considerably inland indicating that the coastline was once further inland than it is presently in the Boat Park and Demarcated Areas. Trial pits (AMEC, 2013c) where this is evident are as follows:

- TP3/3/035 has shells evident in the ash and clinker made ground (1.2-1.3mbgl) this deposit overlies made ground in which fused sand is evident. This location lies seaward of the 1945 coastline and landward of the 1955 coastline.
- TP3/3/034 has shells evident in the radioactive ash and clinker made ground (0.95-1.25mbgl). This layer dips to 1.1m in the NNE of the pit. This deposit overlies natural deposits of sand. This location lies seaward of the 1955 coastline and substantially landward of the 1959 coastline.
- TP3/3/103 has a mollusc shell present within radioactive clinker made ground (0.65-1.90mbgl) overlying natural deposits of sandy silty clay. This location lies approximately 15m due west landward of the 1959 coastline.

Correlating the trial pit and borehole logs with the relict coastlines in this area it can be seen from Cross Sections C and D from the AMEC Factual Report (AMEC, 2013c) (Appendix 16, Figures B3 and B4) that the majority of made ground that makes up this area was emplaced before 1959. The borehole and trial pit logs in the boat park area indicate a layer of ash/clinker with radioactive sources at depth (0.15-1.2mbgl top of layer taken from cross sections C and D from AMEC Factual Report) up to 1m in thickness.

Trial pit TP3/3/045 used in Cross Section C (Appendix 16, Figure B3) also shows fused sand below the ash layer and overlying the natural deposits indicating direct burning on the beach. This fused sand is also evident in other locations in this vicinity either in made ground directly overlying natural deposits or in the natural deposits (TP3/3/45, TP3/2/026 and TP3/1/025). These locations are mostly seaward of the 1945-1955 coastlines but 20-50m approximately due west inland of the 1959 coastline confirming that burning on the sand was carried out at some time prior to 1959.

In Cross Section D (Appendix 16 Figure B4) we can see that radioactive ash and clinker reaches beyond the 1959 coastline, however it is evident from the aerial photographs that there was coastal regression in this area between 1955 and 1959 with the disappearance of the spit feature seen in the 1955 photograph.

There is no evidence that during the development of the New Town post 1960 that there was any disturbance of contaminated material deposited in the Boat Park and Demarcated Area. The 1959 aerial photograph of this area shows the Demarcated Area to be vegetated and subsequent photographs show no significant change until the early 1970s when minor tree clearance in this area started. In the 1980s and 1990s rock armour was added along the coastline.

It is known from a retrospective planning permission, dated 1995 that Dalgety Bay Sailing Club added material in the southern Boat Park area in 1994 following erosion of this area by winter storms (Appendix 10). From the plans submitted it is estimated that an area of approximately 350m² was added in this area with an approximate volume of 590m³ of material. This advanced the Boat Park area 5-7m seaward. The provenance of the material used is documented as being clean rock from Braefoot and also quantities of roadstone, broken concrete, sandstone and sand and gravel. This can be seen in Cross Section D (Appendix 16 Figure B4) in TP3/3/039 where 1.5m of inert made ground comprising gravel with a concrete boulder and gravelly clay with the main constituent of the gravel being sandstone and concrete overlying radioactive made ground of ash and clinker with radium identified. It is also evident in other locations in the Boat Park area such as TP3/3/036 with 1.9m of inert made ground comprised of sand and gravel containing cobbles of brick and sandstone overlying radioactive made ground of clinker and in BH3/3/004 where inert made ground comprising sandy gravelly clay with cobbles of brick and sandstone was placed directly onto natural sediments.

The northern area of the Demarcated Area around to Ross Plantation shows a transition between made ground material directly placed onto the beach and anthropogenic material deposited by coastal action. Trial pit logs start to show thin (0.05-0.1m thick) interbedded ash and clinker layers with more dominated sandy layers in TP6/2/065, TP6/2/064 and TP6/2/063 into Ross Plantation. These layers are generally directly overlying natural deposits indicating that marine deposition of this anthropogenic material is more likely than direct deposition in these areas.

AMEC's findings in the field (AMEC, 2013c) fits with both hypotheses posed by experts from the Dalgety Bay Particles Advisory Group and the University of Stirling report (Sneddon et al, 2013) that the either the spit observed in the 1955 aerial photograph has accreted into the bay area and also along the coastline of Ross Plantation or direct deposition of material into the bay with subsequent accretion along the coastline of Ross Plantation occurred. These hypotheses are consistent with the AMEC Coastal Processes Report (AMEC, 2013b).

4.1.4. Ross Plantation

The trial pit logs along the coastal area of Ross Plantation show a marine influence to the deposits of anthropogenic material. As previously discussed this is represented in the logs by thin interbedded layers of ash and clinker with more sand dominated layers with the presence of shells within this material. Cross section A (AMEC, 2013c), as adapted in Appendix 16 Figure B1, shows this marine deposition influence

where it can be seen from the logs that there is an interbedding of more ash or clinker dominated layers with more sand dominated layers. These layers are generally directly overlying natural deposits indicating that marine deposition of this anthropogenic material is more likely than direct deposition in this area.

4.1.5. Slipways

Trial pits completed in this area show anthropogenic material including radioactive ash and clinker overlying natural sediments on the foreshore in this area (TP7/2/082, TP7/2/081, TP7/2/101, TP7/2/083). There was only one landward trial pit conducted (TP2/1/010) indicating inert made ground.

4.1.6. Other Areas

Other areas of infilling were identified through compiling the history of the site these are:

- Quarry within Ross Plantation

A report compiled by NRPB for HMIPI dated 25th May 1992 details a survey completed in the Dalgety Bay area. This covered the 'undeveloped land' behind the beach and included the quarry within Ross Plantation. No activity was found at this location. This was further confirmed by the latest site investigation (AMEC, 2013c) with Trial Pits TP5/2/048 to TP5/2/052 having no radioactive point sources.

- Refuse tip at Sealstrand

A report compiled by Enviro for Defence Estates dated August 2007 (Enviros 2007b) details exploratory locations in this area. No ash and clinker was located in the area of the noted refuse tip and no radioactive particles were found.

- Area of swamp/marsh in northern Ross Plantation

Limited monitoring was undertaken in this area in 2011. Due to the surface water and nature of the material no comprehensive radiological monitoring of the area was possible.

Previous reports have also documented localised contamination being found in the following areas:

- gardens in the former Salvage Section area

A report compiled by NRPB for HMIPI dated August 1991 details a survey completed in the Dalgety Bay area. Seventeen gardens in the area of the former Salvage Section were surveyed along with other areas. In one garden two discrete items were found under 10cm of topsoil. In another 2m³ of contaminated clinker and ash was removed from a small area. (Appendix 2)

A further survey was conducted 1991 detailed in a report compiled by NRPB for HMIPI dated 25th September 1991. Contamination was found under a doorstep. The contamination consisted of a layer of clinker and ash on top of compacted clay with a reasonable defined boundary. The appearance corresponded with information from the owner that the material had been brought from another part of the property to level the area before construction of the doorstep. A volume of 0.7m³ of radioactive material was removed. (Appendix 2)

A report compiled by Enviro for Defence Estates dated August 2007 (Enviro, 2007b) details exploratory locations in this area. Nine locations in this area noted radioactive ash and clinker. These nine locations are within or are close to the footprint of the former Salvage Section.

- the coastal path along by Sealstrand

A report compiled by NRPB for HMIPI dated August 1991 details a survey completed in the Dalgety Bay area. This covered the path just behind the shore at Sealstrand where anecdotal evidence stated that some of the material excavated for the foundations of the Dalgety Bay Sailing Club clubhouse had been relocated along the path. A number of areas were excavated that indicated higher than background counts. A few discrete particles were removed. In each case the activity was well below the surface of the path which was covered in compact dressing. It is unknown where the locations of the particles were. (Appendix 2)

This area was further investigated by Enviro in 2007 (Enviro, 2007b) with a number of trial pits at the eastern end of the path (east of the former refuse tip noted in this area). Ash and clinker were found in a number of locations up to 0.5m thick. Bedrock is near the surface in this area and consequently any made ground deposits are relatively thin. Radioactive particles were found and removed from a number of pits.

SEPA inspected this area in June 2013 and found that there was evidence of radioactive materials but this was largely attributable to naturally present radioactivity with a single radium source recovered in the upper horizon amongst 'blaes'. Such sources are consistent with earlier reports of sources present in the surface of the path which are believed to occur following storm events and deposits from the marine environment. Witness statement 12 (Appendix 6) states that no waste from the construction of the clubhouse foundations was placed on the coastal path and that the path was constructed using blaes.

4.1.7 Non-radioactive Artefacts

Non-radioactive artefacts have been found co-located within the ash and clinker layers and also within made ground comprised of other materials. A full inventory of artefacts found during the AMEC 2013c investigation has been compiled and is presented in Appendix 13.

At the foreshore it is evident that artefacts are at the surface and pottery, asbestos tiles and Bakelite objects are easily visible. Trial pits completed in the foreshore area (the majority pre-fixed with TP7) have anthropogenic material present within the marine sediments.

At the terrestrial locations artefacts are present at depth co-located with ash and clinker and also within made ground comprising other materials.

Dated artefacts were found in many trial pits. These were mostly dated pieces of pottery the majority dated to 1944. There were numerous pieces of pottery with the Navy Army and Air Force, Institutes (NAAFI) insignia.

Bricks were also found within the made ground. There were many types with distinguishing marks relating to the brickworks of provenance. The dates of these brickworks range from 1828 to 1981.

Several items of Bakelite switch housing were found with patent marks.

Commonly found alongside the ash and clinker was blue corroded battery material.

Metal bars were found in TP6/02/053 and TP2/3/018 appeared to have been laid at set intervals and were looped at one end. These are similar to those found in Sommerfeld tracking used historically for road surfaces and taxiways. Coconut husk material was found in TP3/3/045. This is possibly coir matting that was commonly used as an underlay with the Sommerfeld track when the formation is soft and muddy (Flight Magazine 27 July 1944). As noted in Section 2.2.3 National Archive documents entitled Donibristle – Aircraft Repair Yard – Functions – Scheme of Command and Superintendence dated 1940-1944 (Appendix 2 File reference ADM 1/15745) a document dated 27th February 1943 records Sommerfeld tracking being used at Donibristle around the Salvage village.

A round metal disc fragment, noted as possible dial backing was found in TPNH096 at 0.2mbgl.

More modern artefacts were found in a number of trial pits. A disposable lighter was found in TP2/3/019 at 0.7mbgl. A bread packet and a fertiliser bag were recovered from TP3/2/032 from 0.4mbgl. A wrapper dated 1976 was found at 0.1mbgl in TP2/2/015. A coke can was recovered from TP2/3/018 at 2.0mbgl (it is noted that there were large voids in this pit).

4.2. Significant Pollutant Linkage Areas

The areas identified in the Risk Assessment report meeting the definition of significant possibility of significant harm are Areas C, D and E, shown on Figure 5.

For areas B and F the significant possibility of significant harm from the presence of radioactive contamination is more uncertain due to the uncertainties in the assessment.

Terrestrial Sources

SEPA considers that it is more than likely (i.e. greater than on the balance of probabilities) that the primary source of radioactive sources on the foreshore forming part of the identified significant pollutant linkage is the onshore deposits of ash and clinker that contain radioactive sources.

It can be seen from the work completed by the University of Stirling (Sneddon et al., 2013) that the primary terrestrial deposition of this material was prior to 1959. The aerial photography demonstrates that the Headland area (landward side of Area F), more specifically the area that was mapped by OS as a refuse tip in 1963/4, suffered erosion likely from the inception of deposition, pre-1945, onwards up until approximately 1979 and into the 1980s when rock armour was placed to prevent erosion. As stated in the DIO Coastal Processes Report (Amec, 2013) it is likely (i.e. greater than on the balance of probabilities) that the 'source of contaminated particles is the tipped material forming the bulk of the reclaimed area forming and updrift of Promontory 1' (Promontory 1 in this case being the Headland area). Any further made ground material added to the Headland post 1979 was inert and sourced from upgrades to the Forth Road Bridge access roads (Appendix 3).

However, it is clear that the former refuse tip on the Headland (landward side of Area F) is not the only area where ash and clinker with radioactive sources was deposited. Trial pit and borehole logs show that there is a distinct layer of ash and clinker with radioactive sources at depth (1-2mbgl) in the landward side of Area C, D and E which was deposited prior to 1959. To the northern end of Area C it is evident that there is a transition between emplaced deposition and marine deposition of made ground containing radioactive sources. Ongoing erosion of these areas over the years (up until the 1980s and 1990s in the case of the Boat Park area (landward side of Areas C and D) where rock armour was placed to prevent erosion) is also another likely source of the radioactive contamination seen on the foreshore.

From the factual data it is unlikely that any major terrestrial movement of made ground deposits containing radioactive ash and clinker has occurred post 1959.

The Headland apart, the areas identified as being infilled (Ross Plantation Quarry, marsh and tip at Sealstrand) are unlikely to be the source of contamination seen on the foreshore. Apart from the fact that these areas do not contain radioactive point sources, they are too far inland to be the source of the radioactive contamination on the foreshore. The areas of localised contamination seen in gardens are also unlikely to be the source of the contamination seen on the foreshore due to the small volumes involved and the inland position of the contamination in the gardens. The area of ash and clinker on the path at Sealstrand is also unlikely to be the source of the contamination seen on the foreshore due to the small volumes reported here (0.05-0.5m thick layers Enviro, 2007b). This area of the coast is protected by emplaced rocks and engineered masonry and the path sits at 1.2m above the foreshore. The sheltered coastal environment in this location with reduced wave and energy exposure means that erosion in this area is limited (AMEC, 2013b). This coupled with the coastal protection means that any deposits of radioactive ash and clinker remaining in this area are very unlikely to be the source of the contamination seen on the foreshore.

Construction of the clubhouse involved levelling of the ground and also the construction of a mound on which the southern elevation of the building is built upon re-using excavated foundation material. However, whilst disturbance of deposited material is evident it is unlikely to have exacerbated the transportation of contamination into the marine environment.

Additional made ground material has been added to both the Headland (landward side of Area F) and also the Boat Park area (landward side of Area D) post 1979 however, data from the factual investigation (AMEC, 2013c) indicates that this is inert.

The rock armour around the Headland (landward side of Area F) and the Boat Park (landward side of Areas C and D) areas was placed from the late 1970s onwards. Maintenance of the rock armour indicates that coastal surges and storm conditions are common meaning that rock armour requires to be replenished to avoid further erosion. From the Coastal Processes Report (AMEC, 2013b) it is evident that the rock armour has not been engineered to prevent the movement of particles of up to 8mm being moved by typical daily wave frequencies (excluding storm events). Therefore transportation of contamination from the terrestrial source to the foreshore areas is still likely to be occurring on a daily basis with further significant contaminant mobilisation during storm events.

The jetty constructed by Dalgety Bay Sailing Club in the 1990s was built with two walls with “rubble” (taken from the beach) between and a concrete top. Whilst it is likely that contaminated sediments were already present on the beach from erosion of landward deposits in the Headland, on which the construction was completed the infill of “rubble” (taken from the beach) may have moved radioactive sources into the jetty. It is unknown if radioactive contamination was moved into the jetty during its construction since it is now impossible to distinguish between contamination which may have been emplaced during construction and that which has subsequently been deposited through coastal processes.

Reworked Material from Terrestrial Sources

A likely secondary source of radioactive sources on the foreshore is the re-working of beach sediments already containing contamination. It is evident from the factual investigation (AMEC, 2013c) that beach sediments on the foreshore and seaward slope toe of the Headland, Jetty area, Boat Park/Designated Area, and the upper beach alongside Ross Plantation, contain ash with artefacts and radioactive sources. The bulk of this material is likely to be made ground historically eroded from the terrestrial deposit in the Headland, Boat Park and Demarcated areas (landward side of Areas F, D and C) now present in the marine environment. Further re-working of this foreshore material will expose radioactive sources at the surface or deposit them at shallow depth where they can be detected.

Timing of Depositional Events

With respect to the timeline, it is apparent that the primary deposition of the contaminated material in the Headland, Boat Park and Demarcated Areas (Areas F, D and C) was prior to 1959. From the research undertaken as part of this investigation and detailed in previous sections at this time the site was operated by Ministry of Defence and predecessors in the form of an airbase with an associated aircraft repair yard and salvage section. Following the sale of the airbase in 1959 it is apparent that there has been no major terrestrial disturbance of the contaminated material by the subsequent owners Copthall Holdings (Dalgety) Developments Limited (currently known as James Harrison Contracts Limited and having also been known as Donibristle Investments Limited) and latterly Dalgety Bay Sailing Club that would further exacerbate the transportation of contamination into the marine environment.

5. Potential Class A and B Persons

5.1. Appropriate Persons

Section 78A(9) provides ““Appropriate Person” means any person who is an Appropriate Person, determined in accordance with section 78F below, to bear responsibility for any thing which is to be done by way of remediation in any particular case”.

Section 78F provides:

“(1) This section has effect for the purpose of determining who is the Appropriate Person to bear responsibility for any particular thing which the enforcing authority determines is to be done by way of remediation in any particular case.

(1A) In relation to any land contaminated by a nuclear occurrence, the Secretary of State is deemed to be the Appropriate Person.

(2) Except where subsection (1A) applies and subject to the following provisions of this section, any person, or any of the persons, who caused or knowingly permitted the substances, or any of the substances, by reason of which the contaminated land in question is such land to be in, on or under that land is an Appropriate Person.

(3) A person shall only be an Appropriate Person by virtue of subsection (2) above in relation to things which are to be done by way of remediation which are to any extent referable to substances which he caused or knowingly permitted to be present in, on or under the contaminated land in question.”

Section 78F(1A) provides that “in relation to any land contaminated by a nuclear occurrence, the Secretary of State is deemed to be the Appropriate Person.”

The nature of the contamination at Dalgety Bay is not derived from a nuclear occurrence, and section 78F(1A) does not apply.

5.2. The Statutory Guidance

The Statutory Guidance provides as follows (9.8 – 9.14):

“9.8 [] In the context of Part IIA, what is caused or knowingly permitted is the presence of a pollutant in on or under the ground.”

“9.9 In the Scottish Executive’s view, the test of “causing” will require that the person concerned was involved in some active operation, or series of operations, to which the presence of the pollutant is attributable. Such involvement may also take the form of a failure to act in certain circumstances.”

“9.10 The test of “knowingly permitting” would require both knowledge that the substances in question were in, on or under the land and the possession of the power to prevent such a substance being there. (*House of Lords Hansard 11 July 1995 col. 1497*)”

“9.11 Some commentators have questioned the extent to which this test might apply with respect to banks or other lenders, where their clients have themselves caused or knowingly permitted the presence of pollutants. With respect to that question, Earl Ferrers said “I am advised that there is no judicial decision which supports the contention that a lender, by virtue of the act of lending money only, could be said to have “knowingly permitted” the substances to be in, on or under the land such that it is contaminated land. This would be the case if for no other reason than the lender irrespective of any covenants it may have required from the polluter as to its environmental behaviour, would have no permissive rights over the land in question to prevent contamination occurring or continuing.” (*House of Lords, Hansard, 11 July 1996, col. 1497*)”

“9.12 Some commentators have, in particular, questioned the position of a person who, in his capacity as OWNER or occupier of land, is notified by the LOCAL AUTHORITY about the identification of that land as being CONTAMINATED LAND under section 78B(3). They have asked whether the resulting “knowledge” would meet the “knowingly permit” test as set out in paragraph 9.10 above. In the Scottish Executive’s view, it would not. The legislation clearly distinguishes between those who cause or knowingly permit the presence of pollutants and those who are simply owners or occupiers of the land. In particular, this is evident in sections 78F, 78J and 78K which all relate to the different potential liabilities of OWNERS or occupiers as opposed to persons who have “caused or knowingly permitted” the presence of the POLLUTANTS.”

“9.13 Similarly, section 78H(1) requires consultation with OWNERS and occupiers for the specific purpose of determining “what shall be done by way of REMEDIATION” and not for the purpose of determining liability. In the Scottish Executive’s view, this implies that a person who merely owns or occupies the land in question cannot be held to have “knowingly permitted” as a consequence of that consultation alone.”

“9.14 It is ultimately for the courts to decide the meaning of “caused” and “knowingly permitted” as these terms apply to the Part IIA regime, and whether these tests are met in any particular case. However, indications of how the test should be construed can be obtained from case law under other legislation where the same or similar terms are used.”

The Concept of Causing

The series of principles set out by Lord Hoffman in the case *Environment Agency v Empress Car Co. (Abertilly) Limited* (1999 2 A.C. 22) are a helpful guide to the concept of “causing” pollution.

Lord Hoffman laid out the following principles:

“I shall try to summarise the effect of this discussion:

1. Justices dealing with prosecutions for “causing” pollution under section 85(1) should first require the prosecution to identify what it says the defendant did to cause the pollution. If the defendant cannot be said to have done anything at all, the prosecution must fail: the defendant may have “knowingly permitted” pollution but cannot have caused it.

2. The prosecution need not prove that the defendant did something which was the immediate cause of the pollution: maintaining tanks, lagoons or sewage systems full of noxious liquid is doing something, even if the immediate cause of the pollution was lack of maintenance, a natural event or the act of a third party.
3. When the prosecution has identified something which the defendant did the justices must decide whether it caused the pollution. They should not be diverted by questions like “What was the cause of the pollution?” or “Did something else cause the pollution?” because to say that something else caused the pollution (like brambles clogging the pipes or vandalism by third parties) is not inconsistent with the defendant having caused it as well.
4. If the defendant did do something which produced a situation in which the polluting matter could escape, but a necessary condition of the actual escape which happened was also the act of a third party or a natural event, the justices should consider whether that act or event should be regarded as a normal fact of life or something extraordinary. If it was in the general run of things a matter of ordinary occurrence, it will not negative the causal effect of the defendant’s acts, even if it was not foreseeable that it would happen to that particular defendant or take that particular form. If it can be regarded as something extraordinary, it will be open to the justices to hold that the justices did not cause the pollution.
5. The difference between ordinary and extraordinary is one of fact and degree to which the justices must apply their common sense and knowledge of what happens in the area.” (34)

These principles from Lord Hoffman’s speech are consistent with earlier case law on the meaning of “cause or knowingly permit.”

The case *Alphacell Limited v Woodward* [1972] 2 All ER 475 was one of the first cases to deal with the meaning of the phrase. Alphacell was convicted of the offence of causing or knowingly permitting to enter a stream any poisonous noxious or polluting matter” contrary to section 2(1) of the Rivers (Prevention of Pollution) Act 1951. The pollution in this case was caused by leaves blocking pumps and pipes which normally prevented a tank overflowing. The tank then overflowed into a river.

Alphacell eventually appealed to the House of Lords. The question submitted to the House of Lords was “whether the offence of causing polluting matter to enter into a stream contrary to section 2 of the Rivers (Prevention of Pollution) Act 1951 can be committed by a person who has no knowledge of the fact that polluting matter is entering the stream and has not been negligent in any relevant respect.”

Lord Wilberforce made the following comments:

“The subsection evidently contemplates two things – causing, which must involve some active operation or chain of operations involving as a result the pollution of the stream; knowingly permitting, which involves a failure to prevent the pollution, which failure must be accompanied by knowledge. I see no reason either for reading back the word “knowingly” into the first limb, or for reading the first limb as, by deliberate contrast, hitting something which is unaccompanied by knowledge.”

“In my opinion, causing here must be given a common sense opinion.”

Lord Salmon commented “It seems to me that, giving the word cause its ordinary and natural meaning, anyone may cause something to happen intentionally, or negligently or inadvertently without negligence and without intention.”

In the case *Lockhart v National Coal Board* 1981 S.L.T. 161, the Coal Board was also charged with causing or knowingly permitting poisonous, noxious or polluting matter to enter a stream, although this offence took place in Scotland so the offence this time was contrary to section 22(1) of the Rivers (Prevention of Pollution) (Scotland) Act 1951. A closed mine had filled with water, after the pumping system was discontinued and the polluted water from the mine had overflowed into streams in the vicinity.

The court made the following relevant comments:

“I take from the *Alphacell* case that “cause” in the subsection involves some active or positive operations leading to the pollution, and that, in my view, is what I have to look for here.”

“In considering causation within the meaning of [the Rivers (Prevention of Pollution) (Scotland) Act 1951], (1) the prosecution must prove that the accused carried out some active operation or chain of operations the natural consequence of which is that polluted matter entered a stream (2) knowledge and foreseeability are not matters which require to be provided (3) a common sense meaning must be given to causing (4) neither negligence nor mens rea needs to be established (5) consideration has to be given to things such as natural forces, the act of a third party or an act of God, if the evidence justifies the bringing of such matters into consideration.”

The Concept of “Knowingly Permitted”

The judgement on the *Alphacell* case also considered the meaning of “knowingly permitted”. The following comments from Lord Salmon and Lord Cross of Chelsea respectively are relevant:-

“The creation of an offence in relation to permitting pollution was probably included in the section so as to deal with the type of case in which a man knows that contaminated effluent is escaping over his land into a river and does nothing at all to prevent it.”

“The contrast drawn in the section between cause and knowingly permit shows that a man cannot be guilty of causing polluting matter to enter a stream unless at the least he does some positive act in the chain of acts and events leading to that result.”

Part IIA Case law

SEPA has also considered the cases *R (on the application of Redland Minerals Limited) v Secretary of State for Environment, Food and Rural Affairs* [2011] Env. L.R. 2 and *R (on the application of Crest Nicholson Residential Limited Limited) v Secretary of State for Environment, Food and Rural Affairs* [2011] Env. L.R. 1. These cases are two applications for permission to bring judicial review against two remediation notices served under Part IIA which relate to the same site.

Redland carried out chemical works on the site, resulting in bromide and bromate contamination. They sold the site to Crest for development. Crest was broadly aware of the bromide contamination in the soil (although not the extent of bromide contamination in the groundwater at the site) when they bought the site, but were not aware of the bromate contamination.

Crest broke some hardstanding and removed some topsoil. These actions caused the contamination to spread deeper into the soil and groundwater at the site.

Despite not having introduced any contaminants to the site, and despite being unaware of the presence of bromate, Crest was considered to be an Appropriate Person for having caused the contamination. Their application for judicial review was refused.

Fifteen percent of the cost of remediating the bromate contamination and fifty five percent of the cost of remediating the bromide contamination was apportioned to Crest. The remainder was apportioned to Redland. Redland's share of the cost of remediation for the bromide was reduced due to a partial application of sold with information test.

5.3. Appropriate Person - SEPA Findings

SEPA's identification of Appropriate Persons is to be made on the basis of the balance of probabilities and on the information available to it at the time of the decision (Paragraph D.37 of the Statutory Guidance).

Ministry of Defence

SEPA considers the Ministry of Defence to be an Appropriate Person for the following reasons:

1. The Ministry of Defence operated an airfield in the area under investigation from 1917 until 1959, as detailed in Section 2.2.1;
2. The Ministry of Defence used Radium at the airbase for the purpose of luminising aircraft dials and instruments (see Section 2.2.2; Appendix 6; COMARE, 1992). No records have been found that the radioactive material was removed from the airbase before closure (Section 2.2.3);
3. RNAS Donibristle contained a Salvage Section for repair, maintenance, salvage and breaking of aircraft. The Ministry of Defence disposed of waste, (including building waste, aircraft, instrument panels, radium paint and bottles used for radium paint) at the airbase by incineration and dumping (see Section 2.2.3; Appendix 2 file reference DD9/724, Appendix 6);
4. The Ministry of Defence deposited material in the Headland area from 1945 (and likely before) until 1959 without any evidence of coastal protection. This is later marked as a refuse tip on OS maps. This area is connected to the Salvage Section by tracks. This deposited material has been shown to consist of substantial amounts of ash and material containing radioactive sources (see Section 2.2.1, 2.2.3, 4.1, Appendix 2 file reference DD9/724);
5. Factual evidence confirms the presence of contaminated material (associated with radioactive and non-radioactive artefacts which can be linked to historic Ministry of Defence operations) at depth in the Headland and also in the Boat Park and Demarcated Areas deposited prior to 1959 (see Section 4.1);
6. The terrestrial deposits of radium contaminated ash and clinker are the likely source of the radioactive sources on the foreshore which form part of the identified significant pollutant linkages (see Section 4.2);
7. There is no evidence that the terrestrial deposits of radium contaminated ash and clinker have been disturbed, with the exception of the mound created for Dalgety Bay Sailing Club, other than by coastal action (see Sections 2.3.1, 2.3.2, 2.3.3, 3.1, 4.1).

SEPA considers that the presence of radium contamination on the foreshore is also due to:

1. Coastal erosion of the deposited material containing radioactive contamination (see Sections 4.1, 4.2); and
2. Re-working and re-deposition of contaminated sediments already present in the marine environment due to the above in the foreshore area (see Sections 4.1, 4.2).

SEPA considers these events to be ordinary, rather than extraordinary; in terms of Lord Hoffman's decision in *Environment Agency v Empress Car Co. (Abertilly) Limited* referred to above. SEPA considers that the actions of the Ministry of Defence identified are the cause of the contamination.

SEPA considers that the above confirms that the Ministry of Defence has caused or knowingly permitted a pollutant to be in, on or under the land and is described as a Class A person by virtue of section 78F(2) of the EPA 1990.

Development Companies

SEPA does not consider that any of the development companies named in Section 2.4 would meet the definition of an Appropriate Person and that they did not cause the contamination by carrying out development of Dalgety Bay New Town for the following reasons:

1. The deposited radioactive material in the Headland was already present prior to the date of entry of the land in 1959 as shown by aerial photography and confirmed by factual data (see Sections 2.2.1, 2.2.2, 2.2.3, 2.3, 3.2, 4.1); and
2. The factual data indicates that the contaminated material at depth in the Boat Park and Demarcated Areas was deposited prior to 1959 prior to the date of entry of the land (see Section 4.1).

Dalgety Bay Sailing Club

SEPA does not consider that Dalgety Bay Sailing Club is an Appropriate Person and that it did not cause the contamination by carrying out construction of the clubhouse, emplacement of rock armour and extending of the Boat Park or movement of contaminated material to the coastal path at Sealstrand for the following reasons:

1. Whilst localised disturbance of deposited contaminated material is evident in the area of the clubhouse on the landward side of the Headland area it is unlikely to be the source of the radioactive particles of the foreshore forming part of the identified significant pollutant linkage (see Sections 2.3.1, 4.1, 4.2);
2. Additional material has been added to both the Headland (landward side of Area F) and also the Boat Park area (landward side of Area D) post 1979 however, data from the factual investigation indicates that this is inert (see Section 2.3.1, 4.1, 4.2; witness statement 12 Appendix 6)
3. Ash and clinker reported in the area of the path at Sealstrand is also highly unlikely to be the source of the contamination seen on the foreshore due to the small volumes of material reported, the coastal protection in this area and the sheltered coastal environment limiting erosion of this area. Witness statement 12 and correspondence from Dalgety Bay Sailing Club Limited state that material was not moved from land owned by Dalgety Bay Sailing Club Limited (see Section 3.1, 4.1, 4.2)

SEPA considers that the action of the Dalgety Bay Sailing Club has been to mitigate the contamination through the armouring of the headland and moving of inert material onto the headland area.

SEPA does not consider that Dalgety Bay Sailing Club is an Appropriate Person and that they did not cause the contamination by carrying out construction of the jetty for the following reasons:

1. It is unknown if radioactive contamination was moved into the jetty during its construction since it is now impossible to distinguish between contamination which may have been emplaced during construction and that which has subsequently been deposited through coastal processes (Section 2.3.1, 4.2);
2. SEPA cannot find on the balance of probabilities that Dalgety Bay Sailing Club caused any radioactive contamination to be present on the foreshore in Areas C, D and E as a result of the construction of the jetty.

Dalgety Bay Sailing Club was originally a members club, taking the legal form of an unincorporated association. A copy of its former constitution can be found in Appendix 14.

Although Appropriate Person is a key concept in the 1990 Act, there is no definition of "person" in either Part IIA or the Statutory Guidance. The Interpretation Act 1978 defines as "'person" includes a body of person corporate or unincorporated".

Dalgety Bay Sailing Club was dissolved at an Extraordinary General Meeting of the Club on 28th November 2011. A copy of the resolution dissolving the Club is at Appendix 15.

Dalgety Bay Sailing Club Limited now owns the assets and property of Dalgety Bay Sailing Club.

As part of its investigation, SEPA has considered the legal status of the Sailing Club, and the effect of its dissolution. The Statutory Guidance at paragraph 9.16 states "It is ultimately for the courts to decide whether, in any case, it can be said that no CLASS A PERSON has been found. In the Scottish Executive's view, the context in which the word is used in Part IIA implies that a person must be in existence in order to be found.

Although the issue is academic, since SEPA concludes in this report that it does not consider that the Club caused or knowingly permitted any contamination, since Dalgety Bay Sailing Club has been dissolved, SEPA's view is that it cannot be "found".

Moray Estates Development Company

SEPA has also considered whether the owner of the foreshore, Moray Estates Development Company Limited, could be an Appropriate Person by having knowingly permitted the contamination. SEPA has found no evidence that Moray Estates were aware of the contamination until the radium was detected in 1990. The Ministry of Defence did not disclose the contamination when Moray Estates contracted to buy the site back in 1960 and the letter from Gillespie MacAndrew, at Appendix 3, confirms that Moray Estates position is that they were unaware of the contamination until 1990. The Statutory Guidance (paragraphs 9.12 and 9.13 quoted in Section 5.2) makes it clear that to be a knowing permitter requires more than simply being an owner or occupier of land. It also makes it clear that when a land

owner becomes aware of contamination following consultation or notification under Part IIA, that knowledge alone cannot make the owner a knowing permitter. Although no formal notifications or consultations have been taken under Part IIA in respect of Dalgety Bay, SEPA considers that Moray Estates have only obtained knowledge of the contamination following the involvement of regulators, and do not consider they have knowingly permitted the contamination.

5.4. Class A Exclusion Tests

Six exclusion tests apply for Class A persons which must be applied in sequence as indicated by Part 5 of Chapter D of the Statutory Guidance. SEPA has determined the application of Exclusion Tests to the Ministry of Defence as follows.

Test 1 Excluded Activities (D.48)

A person is not considered to have caused or knowingly permitted contamination arising through:

- *the provision of financial assistance*
- *underwriting an insurance policy*
- *creating a tenancy or granting occupation for a person who caused or knowingly permitted contamination*
- *consigning a waste to another person, which resulted in the presence of a significant pollutant linkage, provided that the duty of care requirements were met*
- *issue of a statutory permission, licence or consent*
- *failure to take statutory enforcement action*
- *the provision of legal, financial, engineering, scientific or technical advice*
- *undertaking a site investigation, provided that the investigation itself does not lead to the creation of a significant pollutant linkage*
- *providing a service under contract*

The effect of this test is to completely remove any liability (D.42)

SEPA does not consider that the Ministry of Defence is an Appropriate Person by having carried out any of the excluded activities.

SEPA does not therefore consider that Test 1 applies to the Ministry of Defence.

Test 2 Payments Made for Remediation (D.57)

This test excludes from liability those who have already met their responsibilities through provision of payment to enable remediation to have been conducted and ceased to have any control over the condition of the land after provision of the payment. Payments made voluntarily, under contract or made in the course of civil legal action should be taken into consideration. The effect of this test is that the person who received the payment acquires the excluded person's liability, in addition to any existing liabilities (D.43).

SEPA has not found there to be any members of the liability group for the identified significant pollutant linkages other than the Ministry of Defence, and it is not possible for the Ministry of Defence to have discharge its liability by making a payment to another member of the group.

SEPA does not therefore consider that Test 2 applies to the Ministry of Defence.

Test 3: Sold with Information (D.57)

Where the person who caused or knowingly permitted contamination sells the land, and the buyer is made aware of the contamination, then the seller is excluded. The effect of this test is that the person who bought the land acquires the excluded person's liability, in addition to any existing liabilities (D.43). However, it should be noted that the buyer does not automatically become a causer or knowing permitter (D.61).

The Secretary of State for Defence sold its land at Dalgety Bay to Moray Estates Development Company Limited. The date of entry for that sale was 28th November 1959. A copy of the Minute of Sale is included at Appendix 4, and the relevant Title Deeds (Appendix 5) are:

- Disposition by Secretary of State for Air and Commissioners for the Office of Lord High Admiral to Moray Estates Development Company recorded GRS Fife on 18th December 1962; and
- Disposition by Her Majesty's Secretary of State for Defence to Moray Estates Development Company recorded GRS Fife 21st November 1966.

SEPA does not consider that these documents include information that would allow Moray Estates Development Company Limited to be aware of the presence of radium on the land.

Moray Estates Development Company Limited has confirmed to SEPA that they had no information at the time of the sale which would have reasonably allowed them to be aware of the presence of radium (Appendix 3).

The Ministry of Defence has not provided SEPA with any information that suggests that Moray Estates Development Company Limited had any information which would have reasonably allowed them to be aware of the presence of radium at the time of the sale.

SEPA does not therefore consider that Test 3 applies to the Ministry of Defence.

Test 4: Changes to Substances (D.62)

This excludes those who caused or knowingly permitted a substance, which only later resulted in a significant pollutant linkage through a chemical or biological change arising from another substance which was later introduced by another person. This only applies where the change was not foreseen (D.63). The effect of this test is to completely remove any liability (D.42).

The radium which forms part of the significant pollutant linkages has not led to the creation of a significant pollutant linkage only because of its interaction with another substance.

SEPA does not therefore consider that Test 4 applies to the Ministry of Defence.

Test 5: escaped substances (D.65)

Those who kept a substance in, on, or under land are excluded from liability where the escape of the substance leading to creation of a significant pollutant linkage was

due to the action of another Appropriate Person. The effect of this test is to completely remove any liability (D.42).

SEPA has not found there to be any members of the liability group for the identified significant pollutant linkages other than the Ministry of Defence. Furthermore, SEPA does not consider that any other party has caused or knowingly permitted the pollutant to have escaped from other land to Areas C, D and E. This deposited material in the Headland, Boat Park and Demarcated Areas is likely to have been eroded or directly placed into the marine environment, as there is no evidence that the coastline was engineered to protect this material from coastal action (see Sections 2.2, 4.1, 4.2).

SEPA does not therefore consider that Test 5 applies to the Ministry of Defence.

Test 6: Introduction of Pathways or Receptors (D.68)

This test excludes from liability those who are only liable by virtue of introduction of a pathways or receptor by another Appropriate Person. This may arise where someone has addressed a significant pollutant linkage by breaking a pathway and the other person removes the barrier, thereby re-establishing the linkage. The effect of this test is to completely remove any liability (D.42).

SEPA does not consider that the identified significant pollutant linkages exist only because another person has introduced a pathway or receptor forming part of the significant pollutant linkage. The deposition of the contaminated material was prior to 1959. Access to the foreshore area was not restricted as far as is known during the operation of the site as an airfield and no restrictions have been placed on access to the foreshore since the sale of the former airfield, with the exception of the current safety restrictions implemented in 2006 and further in 2011. Therefore the receptors and pathways of ingestion, inhalation, skin contact and external dose rates as identified in SEPA's Risk Assessment (Dale, 2013) have been in place during and since the deposition of the contaminated material.

The construction of the slipways and jetty by Dalgety Bay Sailing Club involved construction directly onto the beach. However, whilst this has increased the usage of this area of the foreshore this area was already accessible by the public prior to construction and therefore the significant pollutant linkage was already in existence.

SEPA does not therefore consider that Test 6 applies to the Ministry of Defence.

5.5. Class B Exclusion Tests

As a Class A person has been identified SEPA will not consider Class B persons any further.

5.6. Apportionment of Liability

Once exclusions have been made, SEPA should determine how costs should be apportioned between members of the liability group. Where there is only one member, then that person bears all of the costs. In this case the only Class A person identified is the Ministry of Defence.

5.6.1. Hardship Considerations

The financial circumstances of those liable for remediation should have no bearing on the procedures for exclusion, apportionment and attribution (D.35). However, before serving a notice, SEPA should consider whether, had it carried out the requirements of the notice on behalf of the Appropriate Persons, it would be able to recover costs. Where all or part of the costs would not be recovered, then a notice should not be served in respect of those requirements. In effect, where service of a notice would cause hardship to any Appropriate Person on whom it was served, no notices should be served. It is therefore important that consideration is given to hardship before a notice is served.

Hardship is not defined in Part IIA and it has its ordinary meaning of “hardness of fate or circumstances, severe suffering or privation” (Paragraph 10.8 of the Statutory Guidance). Responsibility of the costs above the “hardship limit” cannot be reallocated to other responsible people: SEPA needs to cover these costs. In such circumstances, SEPA will issue a remediation statement, do the work and seek recovery of costs from all Appropriate Persons, in the case of those who would suffer hardship, up to the hardship limit only.

It is anticipated that Appropriate Persons will provide information to SEPA demonstrating that they would suffer hardship as a result of a notice being served. Paragraph E.13 indicates that SEPA should expect relevant information to be presented.

5.7. Conclusions

SEPA considers that the Ministry of Defence has caused a pollutant to be in, on or under the land and is described as a Class A person by virtue of section 78F(2) of the 1990 Act, and is the sole Class A Appropriate Person responsible for the identified significant pollutant linkage present in Area C (Demarcated Area), Area D (Boat Park Area) and Area E (Slipways Area).

6. References

Airfield Review Magazine (2003), July p.71

AMEC (2013a), Dalgety Bay, Fife Land Quality Assessment, Phase One: Desk Study, DIO Project No:12920

AMEC (2013b). Dalgety Bay Coastal Processes Review. Rr415i2 March 2013.

AMEC (2013c), Dalgety Bay Factual Land Quality Assessment, Investigation Report, DIO Project No. 13032

Atkinson, T. (2013) pers com

CEFAS (2013), Radiological Habits Survey: Dalgety Bay, 2012

Chorlton, M. (2012), Action Stations Revisited Volume 7, The Complete History of Britain's Military Airfields: Scotland and Northern Ireland. ISBN 9 780859 791557

Clark, S.M., (1999), Radioactive Wastes in a Conventional Military Environment, RTO MP-39.

Dale, P. (2013), Dalgety Bay Radioactive Contaminated Land Risk Assessment.

COMARE, 1992. Minutes of the Committee on Medical Aspects of Radiation in the Environment, September 1992 meeting.

Contaminated Land Statutory Guidance, (2006), Edition 2 May 2006 Paper SE/2006/44

Dalgety Bay Sailing Club website: <http://dbscweb.wordpress.com/>

Enviros (2007a), Dalgety Bay Information Review, Project No: 12920

Enviros (2007b), Dalgety Bay Land Quality Assessment, Phase Two: Intrusive Investigation, Project No: 12920

Fife Council (2011) Fife Shoreline Management Plan 2011, <http://www.fifedirect.org/minisites/index.cfm?fuseaction=page.display&pageid=C040877C-B767-3F71-8454BE5167C5BC58&siteID=C03E446A-0241-A6A5-7462DD169B215841>

Flight Magazine (1944), 27th July 1944, p101

Fight Deck Magazine (1951), p61-63

McPhail, C. (2010) pers comm.

McPhail C, (2013), Comments on AMEC Coastal Processes Report

Mowat, R (undated), Forays into Fife: "Donibee": the story of Donibristle Airfield, p23-27

Radioactive Contaminated Land (Scotland) (Amendment) Regulations 2007

Radioactive Contaminated Land (Scotland) (Amendment) Regulations 2009.

Radioactive Substances Advisory Committee, (1958). Report of the Panel on Disposal of Radioactive Wastes, March 1958.

Ruffell, A., Tyler, A.N. (2012), Ground Penetrating Radar Survey at Dalgety Bay, Project No: P107312

Simpson, E. (1999) Dalgety Bay Heritage and Hidden History, 1999.

Sneddon, C.R., Tyler, A.N., Hunter, P.D. (2013), Historic Aerial Photography Interpretation for Assisting Regulatory Enforcement.

Stott, I.G., (1978), Memories of "Merlin", The Story of R.N.A.S. Donibristle, 1939-53, Air Pictorial Magazine, p 468-469

The Radioactive Contaminated Land (Scotland) Regulations 2007 Statutory Guidance

Tyler, A.N. (2011), Dalgety Bay Headland Investigation, Project No: PO0880311