

Meeting to discuss radioactive contamination at Dalgety Bay

Invited Organisations:

Fife Council
Health Protection Agency
Ministry of Defence
NHS (Fife)
NHS (ISD)
Scottish Executive
SEPA

Date: 25 November 2005

Time: 10:30

Location: Boardroom, Bremner House, Castle Business Park, Stirling.

Agenda

1. Introduction and purpose of meeting
 2. Agreement of Agenda
 3. Minutes of last meeting (Paper 01)
 4. Actions
 5. Feedback from Community Council – Minutes of meeting (Paper 02)
 6. Updates:
 - 6.1 Assessment of cancer incidence in Dalgety Bay (Paper 03)
 - 6.2 MOD – Disposal
 - 6.3 Media
 - 6.4 SNH
 7. Future management – possible signage (Paper 04)
 8. Press Issues
 9. A.O.C.B.
- 12.30 Close for Lunch

Meeting to Discuss Radioactive Contamination at Dalgety Bay

Date: 25 November 2005

Time: 10.30

Location: SEPA Corporate Office

Minutes of meeting

Present:

SEPA

Colin Bayes (Chairman) (CB).

Allan Reid (AR).

George Hunter (GH).

Paul Dale (PD).

David Orr (DO).

Alda Forbes (AF).

David Stone (minutes) (DS).

Scottish Executive

Arthur Johnson (AJ).

Kerrie Campbell (KC).

Ian Hall (IH).

NHS

Roger Black (RB).

Jackie Hyland (JH).

MOD

Iain Robertson (IR).

Fife Council

Phil Mawhood (PM).

HPA

John Burton (JB).

1. Introduction and Purpose of the Meeting

The chairman (CB) opened the meeting and thanked those present for attending. The meeting was intended as a follow on from that on 1st November. Fred Dawson (MOD) apologised for not attending the meeting but, as it had been decided that Defence Estates would be best placed to lead on the MOD response to issues associated with Dalgety Bay, would be withdrawing from the group.

2. Agreement of Agenda

The agenda had previously been circulated electronically. Attendees were happy with the content.

3. Minutes of the Last Meeting

The minutes from the previous meeting had been circulated and attendees were happy with the content. Fred Dawson (MOD), who was not present but had attended the previous meeting, commented by email that, in section 7 of the previous minutes, he had not mentioned a site at Gowkthrapple.

4. Actions

Actions arising from the meeting of the 1st November have driven the agenda of this meeting.

5. Feedback from meeting with Community Council (minutes presented as paper 02)

PD discussed the meeting of the 7th November 2005 with the Dalgety Bay and Hillend Community Council. Attendees included SEPA, the HPA, NHS Fife and Fife Council. PD gave a presentation detailing the findings of a recent SEPA commissioned survey and the implications of the findings in the light of the proposed Radioactive Contaminated Land regime. It was acknowledged that the local community were concerned about the actions currently taking place although it was recognised that there was little immediate hazard. The scope of the 1996 risk assessment was discussed.

Signage on the beach was also discussed. PM stated that Fife Council would be taking expert advice as to whether signs were required. HPA were considering the wording of the signs. The proposed wording would then be passed to Fife Council and agreement would be required on if and when the signs would go up.

PD was actioned to look at the extent of historical surveys and identify any land owners that are likely to be impacted. From the extent of the survey the headland was identified as being owned by the yacht club, the land to the east by Barratts and that to the west by private landowners.

PD to identify any land owners that are likely to be impacted

PM reported that there is diverse opinion as to the need for signs with the yacht club thinking there was no need for signs whilst community councillors would like to see signs with some acceptable form of wording.

Signage will be picked up at some future point.

IH asked about plans for residential development by Barratts. PM pointed out that whilst the land is owned by Barratts it is managed by the council and is not likely to be developed in the near future.

DO asked if the Local Community Council Meeting due to be held in December and attended by SEPA, Fife council and NHS Fife has been arranged yet. PD responded that it had not.

6. Updates

6.1 Assessment of Cancer incidence in Dalgety Bay (paper 03).

RB discussed the content of paper 03 which had involved standard cluster analysis using postcodes, records from the cancer registry and the number of predicted cancers based on population census. The analysis had faced a number of problems relating to the rapidly growing local population, its unusual age distribution and its relatively high socio-economic status. The finding was that the incidence of cancer in the area was not different from the expected level with respect to the age and socio-economic status of the population. There were no statistically significant excesses of cancers most frequently associated with radiation. An excess of *corpus uteri* cancer was unexplained but, given the 46 statistical significance tests performed, it would be unusual not to find such an excess.

PD asked whether, given that there was a 'false positive' with respect to *corpus uteri* cancer, there could be false negatives associated with the analysis. RB replied that this could be true but that it was difficult to imagine an exposure pathway that could result in *corpus uteri* cancer but not skin cancer.

RB noted that the 'unadjusted' number of cases of non-melanoma skin cancers over the period of assessment was significantly higher than expected (129 observed against 102 expected) but that this apparent excess disappeared when the appropriate adjustments for age and deprivation were included.

JH asked whether the non-melanoma skin cancers could be related to exposure to radium. There are 129 over the period that the assessment considered. RB responded that he would look at the anatomical distribution of the non-melanoma skin cancers so it could be seen if any might be linked to activity associated with contact in Dalgety Bay.

JH asked about the strength of effect of deprivation on non-melanoma skin cancer given that the results are significant until deprivation is taken into account at which point they become insignificant.

AJ noted that non-melanoma skin cancer in the general population is strongly associated with exposure to ultraviolet radiation rather than to ionising radiation and hence caution should be exercised in the interpretation of the unadjusted figures melanomas could be associated with exposure to UV. JH

responded that case notes would have to be considered before responding to this point.

IH made the observation that, generally, the public only become politically critical when work has not been done and not necessarily at the outcome of any work. He asked whether further work could be done in the assessment of cancer incidence to answer questions raised by JH. JH responded that additional work would be valuable. Whilst there is no suggestion, based on the assessment, that there is a risk presented by the presence of potentially hazardous materials on the beach, additional information may be 'teased out' from the cancer statistics by using medical case records. When asked by AJ whether this could give public reassurance, JH responded that this would be the case if there was no evidence of skin cancer associated with contact with materials on the beach.

PM asked whether case notes would give the information required. JH responded that case notes would not give all the information but that more detailed information could be gathered through interviews. The proposed study may not give all the answers but it would go some way to determining the risk associated with activity at Dalgety Bay.

JH and RB agreed that there would be value in obtaining case notes for non-melanoma skin cancer that are associated with the area and looking for a link.

AJ suggested that any proposals for further work on non-melanoma skin cancers should be discussed with appropriate staff in the Health Protection Agency Radiation Protection Division.

IH said that the discussion had been valuable and that the study will be valuable with respect to public confidence.

Action JH to seek to obtain and review relevant case notes

6.2. Beach Survey and Disposal.

IR discussed disposal routes for any material that is found on the beach and the initial positive response from MOD who, without accepting liability, had been prepared to accept financial responsibility and consider placing a 'line entry' into one of their current disposal routes. IR noted, however, that there is currently a barrel of historic material stored at Rosyth. There is no record of ownership and Babcock does not want to store anymore material without an identified disposal route. Whilst the MOD was willing to help they were waiting for SEPA to take the lead and additional discussion will be required as MOD will have to identify where resources will come from and the problem of waste currently stored at Rosyth as well as the level of future arisings will have to be addressed.

PD commented that he understood the concerns of the MOD but if SEPA were to use powers under RSA before Radioactive Contaminated land regulations come into force then the removal and storage of the material at

Dalgety Bay would go ahead and, as a result of court action, MOD would have to pay the associated costs.

PD suggested that a potential option would be for Scottish Executive (SE) to find funding.

IH stated that it was his impression that, following the meeting of the 1st November, the intention of this meeting was to agree a way forward. The material on Dalgety Bay was easy to identify and remove and the sticking point of storing and disposing would not lie well with the public. Given that Babcock already stores similar material at Rosyth they would be well placed to store the additional material, especially if they are involved in the survey and up lift of contamination from the beach. Providing a disposal route for existing and new material is supplied IH can not envisage why receiving the waste would be a major issue for Babcock.

IR mentioned a letter sent by Defence Estates (DE) to SE outlining the aid that DE were prepared to offer. The letter stated that it may take a year to arrange a disposal route and whilst there may be no budget at this moment, time remains to arrange funding to store materials from the beach at Rosyth in a manner that is safe and meets regulatory acceptance.

IH stated that between DE, Babcock and SEPA there is no clear view as to how the removal of the waste from Rosyth will be carried out. However there was an understanding that the waste from Dalgety Bay would be removed and stored at Rosyth. There remains only the issue of how the waste will be disposed from Rosyth.

IR mentioned that there had been an offer from DE to take material and dispose directly to Drigg but there was currently no direct disposal route.

IH said that SE had assumed that there would be a direct route open and were interested to find out how a route could be established. IH went on to state that there were two distinct issues here. Firstly, in the short term there is a need to remove material that is currently present at Dalgety Bay. Secondly what to do about the contamination over the longer term? Should SEPA intervene under RSA or through the Contaminated Land Regulations? If intervention is based on a risk based assessment, would it be required? IH stated that this meeting has to result in agreement on what to do with material that is currently on the beach and that it had been agreed at the meeting on the 1st November that a survey and uplift of material should be arranged as soon as possible.

PD discussed the financial costs of the survey and uplift. If SEPA were to remove the contamination from the beach under RSA then costs could be recovered. If SEPA were to remove the contamination from the beach under the contaminated land regime then MOD could be charged directly. IR responded that this assumes that the MOD is responsible for the contamination. MOD has not admitted liability and there is a landfill in the area that could be the source of the contamination.

DO pointed out that Babcock actually own and operate the site at Rosyth. Given their reluctance to accept waste without an identified disposal route then the contamination could be sent to another MOD site.

IR responded that the MOD had considered this but that this would require funding in addition to that currently in place at MOD sites for the storage and disposal of radioactive materials.

PM made the comment that the public would not see funding as an issue of relevance when considering the contamination at Dalgety Bay.

PD commented that it is unfortunate that the MOD can not facilitate the removal, storage and disposal of the contamination given that there is evidence to suggest that this is an issue where the MOD should be involved. The MOD would not have to accept liability for the contamination just fund its removal as a discreet package.

PM added that the local community council were keen to see MOD or SEPA pay for the removal of the contamination

CB commented that he was disappointed, especially following the meeting of the 1st November, that the subject could not be resolved and would have to report back within SEPA on the lack of resolution.

IR stated that if the issue was addressed as discreet packages then Babcock would be happy to co-operate with SEPA.

DO and PD responded that this was not the position they had received from Babcock (Stuart Fowell).

IR re-confirmed that the MOD want to see the contamination removed from the beach but were not admitting any liability although they were looking at how to make a financial commitment.

CB stated that this position and the commitment had been made at the meeting of the 1st November.

IR responded that the MOD policy team were now seeking assistance with the disposal route. There were a number of specific issues including: the provision, by SEPA, of data on the anticipated amounts of material to be removed from the beach; the requirement for SEPA to discuss the issues with Babcock; MOD not being in a position, financially, to open up a disposal route at this moment in time; that the issue of the beach survey sits with SEPA and that the MOD had not been able to find any correspondence that links the roles and responsibilities of the different bodies to develop a strategy for dealing with the issue. It was re-iterated that the MOD (and DE) does not admit liability for the contamination.

AR asked if the MOD would rather see the case prosecuted in the courts to assign liability.

IR responded that the case has not been made with respect to SEPA viewing this position.

PM asked that if SEPA wrote to the MOD stating that they were liable, would this clarify the position.

IR responded that the perception may be that the liability rests with MOD but this is not necessarily true. The materials could have been lawfully disposed and could then have become mobile in the environment.

CB stated that with respect to the issue of public health, nothing was being achieved.

IR responded that with the right support storage should not be a financial cost but that ultimate disposal will.

CB commented that it seems that no action can be agreed as there is no agreement on paying the costs.

PM stated that the priority was to get the contamination off the beach and into storage.

DO responded that Babcock would not want the material at Rosyth without a guarantee of its eventual disposal being funded.

PM asked whether the contamination could be stored at another MOD site.

IR responded that licenses could be amended but seeing as the quantities of material are unknown other projects at the sites could be placed at risk.

DO suggested that SEPA could give reassurances in this area.

IR answered that it could be viewed as ludicrous to ship the radioactive materials 150 miles to another site instead of transporting it 5 miles to Rosyth, a view that was agreed by CB.

IR re-iterated that Babcock would be willing to accept waste for storage at Rosyth but only if there was an agreed and open disposal route.

IH re-stated the fact that there were two issues: removing the material from the beach at Dalgety Bay and a long term solution for the material once it was in storage. IH went on to discuss a letter from SE (written by Elizabeth Grey) to MOD requesting assistance on the issue and how he was now puzzled that MOD had previously indicated their willingness to assist but now seemed to be unable to. Furthermore, the SE had not received a response to the letter.

IR responded that a response to the letter had gone out.

IH answered that the letter received from MOD does not answer the questions raised by SE (i.e. how to get the material off the beach). Either Babcock owns the waste on the Rosyth site and should be looking to dispose or it is being held on behalf of the MOD and, therefore, it should be a straightforward issue to hold more.

IR responded that SEPA gave Babcock the responsibility of storing the waste currently on site which was the result of a previous survey.

IH stated that waste was being held from both routine environmental surveys and surveys under specific contract. DO added that Babcock held a specific contract to hold the waste at the Rosyth site.

PD added that it was his recollection that during previous surveys the MOD had owned the site and had stored the waste on their site. Subsequently the site had been privatised and there was no clause in the contract for Babcock to hold the waste resulting from surveys.

PM asked what had happened with waste resulting from surveys undertaken before the formation of SEPA.

JB replied that waste removed during those surveys had been held by the HPA.

CB reiterated his disappointment with the lack of progress in resolving this issue at the meeting and expressed his concern at the media and public response.

PM asked why it cannot be just agreed now as to who should remove and store the waste.

DO responded that the issue of final disposal would have to be agreed. PD stated that until Babcock receives reassurance on final disposal there will be no storage at the Rosyth site.

IH stated that the SE had thought that the waste currently stored at Rosyth was owned by MOD and had written to MOD asking them to open a route for the disposal of materials arising from the surveys of Dalgety Bay. Whilst the issue of ownership of the waste at Rosyth is resolved there remains the issue of how to manage the contamination on the beach at Dalgety Bay.

AR asked whether the waste taken from Dalgety Bay in planned surveys can be disposed directly to the low level waste facility at Drigg and the costs recovered from the current land owners.

PD commented that this may not be publicly acceptable.

IH stated that there were differences between SEPA powers and duties. SEPA could therefore remove the contamination from the beach without

recovering the costs from the land owners. The costs could be met by the MOD either directly or by land owners who could recover their costs through the courts.

CB asked what storage facilities were available.

PD confirmed that there were other facilities that could receive contamination from the beach.

IR commented that the only reason other MOD sites were mentioned in previous meetings was because they had applied for authorisations under RSA to dispose of materials. This does not necessarily mean the sites have the facility to receive material removed from the beach at Dalgety Bay.

PD replied that the contamination had to be removed from the beach and asked if there were any MOD sites that could receive the material.

IR responded that he could not say if there was a suitable site.

CB stressed that an outcome has to be achieved and asked IR to take an action to consider how best the contamination can be dealt with.

Action IR to identify MOD sites that could receive the material.

GH commented that the waste can not go straight to Drigg as SEPA may want to analyse waste and undertake a prosecution of the polluter.

DO asked IR if who was actually representing the MOD.

IR responded that he represented DE which was an agency within MOD. It would be useful for SEPA, DE and Babcock to have discussion particularly as it could re-assure Babcock.

CB suggested that such a meeting be held over the next 10 days.

IH asked whether the contractor that SEPA engages to remove the contamination from the beach could then store the material.

CB replied that the source of funding for the storage would have to be identified.

IH responded that the costs can be recovered at some later time and that he would like to see some resolution of this issue at this meeting.

PD commented that there is an issue as to the availability of contractors.

PM returned to the subject of getting the contamination removed from the beach and then identifying who was financially liable.

IR re-iterated that Babcock's' position would have to be made clear.

GH commented that MOD are not concerned about the cost of storage but are concerned about the costs of disposal. This means they can not give a commitment to store.

IR agreed that if material was accepted for storage by Babcock there would be no storage charge as there is facility for this within the extant agreement between MOD and Babcock. However Babcock have concerns that there is no identified owner of a barrel that is currently stored so they are reluctant to accept another. They would store the waste if there was an open disposal route.

PM stated that this could all be agreed at a meeting between SEPA, MOD and Babcock.

IH suggested that this could be a positive route forward. SEPA could open a disposal route and look to recover costs at a later date using Section 30 of RSA.

PD responded that Section 30 of RSA assumes that the waste will not be lawfully disposed. This may not be the case under the contaminated land regime.

IH stated that he felt it was reasonable to utilise Section 30 especially as SE had asked MOD for assistance which was not forthcoming.

CB suggested that the meeting should move on to discuss other issues on the agenda and proposed the following actions:

- SEPA to look at possible approaches to surveying the beach, uplifting the contamination and its storage prior to disposal.
- MOD to assist in addressing public health issues associated with the contamination.
- A meeting is to be arranged between SEPA, MOD and Babcock.

6.3 Media

CB stated that we will have to advise that there is currently no agreed means of uplift of the material as there is no agreed facility for storage.

6.4 SNH

PD informed the meeting that Scottish National Heritage would like to be involved in addressing the issue of contamination on Dalgety Bay as the area is a SSSI.

7 Future Management and Signage

CB noted that a draft signage has been prepared by HPA which, if Fife Council are in favour, can be passed on to the community council.

PM agreed saying that Fife Council would like to see discreet signs in place at the entrance to the bay.

CB asked whether the group were happy to have NHS 24 as the contact number for further information.

JH stated that NHS Fife were awaiting a response from NHS 24 about putting their number on the sign. NHS Fife would not be happy for the sign to say it was produced by NHS Fife since it was produced by HPA.

JB stated that HPA did not want their contact number on the sign although he was unaware of the reason.

CB proposed joint badging of the sign between SEPA and Fife Council.

PM replied that he had no issue with Fife Council logo appearing on the sign but that the council would not want to be answering questions from the public.

JH asked where the public would go to obtain information about monitoring. It was agreed that a SEPA number could be placed on the sign as a compromise.

PD took an action to supply monitoring information and contact number to JH.

PM asked about the proposed timing of the signs.

PD/CB stated that the signs would be deployed as soon as possible and before any future monitoring.

KC inquired about the timing of the meeting with Fife and community council.

PM replied that it would be early December.

8 Press Issues

AF stated that there had been restrained press interest to date, mainly from local press and BBC Scotland. SEPA will have to prepare a media plan. Mr R Edwards would like an update from the meeting.

CB stated that he would be happy to meet with the BBC.

KC suggested that SEPA and SE work closely together in informing the media.

AJ suggested that given the complexity of the issue a press statement may be more appropriate than an interview.

AF responded that an interview would be more appropriate as Mr Edwards is keen to be kept informed on the issue.

CB commented that a meeting between SEPA, MOD and Babcock should be arranged prior to any media interviews. It was agreed that SEPA would take the lead on this and that DO would take an action to arrange meeting dates.

Action DO to arrange meeting with Babcocks

CB also confirmed that SEPA will be looking at a strategy of more frequent monitoring of the beach and removal of identified contamination.

GH noted that the monitoring and removal strategy may be affected when the Contaminated Land Regime comes into force in 2006.

9 AOCB

IH asked whether there had been any requests made to SEPA through the Fol Act.

PD responded that there had been numerous requests, many asking for a copy of the map depicting the location of identified contamination on the beach and the associated appendices from the recent publicly available report.

IH asked about additional risks to members of the public if the map and appendices are made publicly available.

The resulting conversation discussed whether releasing the map revealing the location of 'hot spots' may place the public at greater risk. This was viewed as inappropriate and it was decided that the map should be withheld from the public until the planned survey had been completed and the contamination removed.

PD asked about the media interest in response to the map being withheld, especially as signs are not yet in place.

PM commented that he was not convinced there was a link here.

PD responded that he had received a request from a member of the public who wanted to know where on Dalgety Bay was safe for him to take his grandchildren.

CB suggested that a map could be produced showing the broad areas where contamination was arising could be released rather than one actually identifying the specific hotspots.

DO pointed out that the withheld map could be misleading as the contamination is mobile.

IH commented that the next survey provides an ideal opportunity to determine the mobility of the contamination as the exact locations of the contamination between surveys can be compared.

PD stated that other requests under FoI are in regard to the recent survey and the potential for contamination in gardens that are local to the beach and a request for a copy of the minutes of this meeting.

CB moved the discussion on to the proposed desk top study and the requirement to liaise with HPA with regard to the risk assessment. Until the desk top study is completed (estimated as 2 months man time) the plan to increase the frequency of the surveying and removal of contamination is on hold. Additionally there is a requirement to identify the geographical extent of survey which can be achieved through SEPA having dialogue with HPA.

Action JB to lead on identifying a contact for SEPA within HPA.

Date of next meeting is Friday 13th January at 10.30.

Actions

- 1.1 PD to identify any land owners that are likely to be impacted**
- 1.2 JH to seek to obtain and review relevant case notes**
- 1.3 IR to identify MOD sites that could receive the material.**
- 1.4 PD to supply monitoring information and contact number to JH.**
- 1.5 Action DO to arrange meeting with Babcocks**
- 1.6 JB to lead on identifying a contact for SEPA within HPA.**

Meeting to discuss radioactive contamination at Dalgety Bay

Date: 1 November 2005

Time: 10:30

Location: The Queens Hotel, 24 Henderson Street, Bridge of Allan.

Draft minutes of meeting.

Present:

SEPA

Colin Bayes (Chairman)

Allan Reid

George Hunter

Paul Dale

Alda Forbes

Ian Robertson (mins)

Scottish Executive

Richard Grant

Marianne Cook

Elizabeth Gray

Ian Hall

Neil Trotter

MOD

Fred Dawson

Iain Robertson

Fife Council

Phil Mawhood

Fife NHS

Jackie Hyland

HPA

Marion Milton

1. Introduction and Purpose of Meeting

The Chairman, Colin Bayes (CB), opened the meeting and thanked those present for being able to attend at short notice. He outlined the purpose of the meeting by expressing the need to determine and adopt a strategy for dealing with radioactive contamination at Dalgety Bay. Also, he noted that the forthcoming Radioactive Contaminated Land Regulations, the consultation of which began on 28 October, may have an impact on the strategy for Dalgety Bay. CB explained that a recent enquiry had been made by a journalist regarding monitoring work at Dalgety Bay in 2005. This had highlighted the need for developing a strategy for dealing with public

reaction to publicity about radioactive contamination at Dalgety Bay. He added that, in response to this enquiry, a copy of the findings of the monitoring project conducted at Dalgety Bay in March 2005 had been sent to Rob Edwards of the Sunday Herald on 31 October.

2. Résumé – history, monitoring results and initial hazard assessment.

Paul Dale (PD) gave a short presentation in which he explained that a series of 5 monitoring projects had been carried out, on behalf of SEPA, since 1997. In the first three of these, in 1997, 1998 and 2000 identified items of radioactive contamination were removed, where disposal routes were available, from the beach and stored, whereas in 2002 and 2005, a policy of non-removal had been adopted. In the 2005 survey, approximately 100 particles containing Ra-226 were identified which was consistent with earlier surveys. In this study, particles ranging from 5.5 – 427 kBq were detected and, for the most active of these, calculated committed effective doses of 388mSv and 115mSv were derived for inhalation and ingestion respectively. Similarly, skin doses of 50mSv would be delivered in approximately 35 minutes. These findings provided clear evidence that the potential existed for receiving skin doses in excess of 50mSv and committed effective doses greater than 3mSv. PD pointed out that 3mSv was the proposed threshold for the forthcoming Radioactive Contaminated Land Regulations but, currently, SEPA had no powers to intervene in cases of radioactively contaminated land. He also noted that the doses for inhalation and ingestion were likely to be pessimistic.

PD explained that, as the findings of the 2005 survey were very similar to those of the earlier surveys, the continued detection of an apparent constant distribution of contaminated particles indicated the existence of a re-population process that was maintaining equilibrium-type conditions. The possibility of a large cache of sources either offshore, on shore or along the coast cannot be disregarded.

Marion Milton (MM) added that the findings of a survey, conducted at Dalgety Bay in 1996 by the NRPB, had shown that the larger pieces of contaminated material, mainly clinker, were lower in activity compared with the smaller flakes of material which had much higher levels of radioactivity. She pointed out that inhalation of this material was unlikely. If ingested, these insoluble particles would not be readily absorbed but, in their passage through the body, would deliver most of the radiation dose to the gut.

Phil Mawhood (PM) asked if we could be certain that aircraft dials were the original source of the radioactive contamination.

Fred Dawson (FD) confirmed that the use of Ra-226 for luminising was a well established practice in the construction and maintenance of aircraft instrumentation.

Ian Hall (IH) mentioned that a report by Dr Robert Heaton in August 2000, (available on the Internet), had described the background to the origins of the contamination at Dalgety Bay.

PM mentioned that a sewer pipe crossing the beach had been renewed recently by Scottish Water. He added that he understood that appropriate radiological precautions had been taken by the members of staff who had carried out the work in the area of the foreshore and beach.

MM said that monitoring by NRPB had shown that the level of contamination in the vicinity of the pipeline was similar to the rest of the beach and that the radiological risk to the staff of Scottish Water carrying out the installation was minimal.

3. Intervention options

In reply to questions about the extent of the detected contamination, MM said that in an earlier NRPB monitoring survey, contamination was detected in a small area adjacent to the foundation of the sailing club and also in the garden of one of the nearby houses. She confirmed that the identified material in the garden had been removed and stored pending disposal.

Elizabeth Gray (EG) asked about the possibility of the existence of a larger source of contaminated material.

PD said that the monitoring programmes, carried out for SEPA, had shown that there were contaminated items in the headland that was subject to erosion.

CB suggested that there could be more than a single source, one of which could be re-deposition from the marine environment.

There was general discussion about possible sources of the contamination: eg erosion of contaminated land, diffusion from a large source of contamination, vertical re-circulation within a certain depth of sand or re-deposition from the marine environment. FD pointed out that if it were erosion or diffusion from a single source, repeat surveys would probably show a decline in measured levels of contamination. PD thought that the existence of a re-population effect would be consistent with the monitoring findings obtained over the set of surveys spanning the 8-year period of investigation.

George Hunter (GH) said that the monitoring work carried out on behalf of SEPA had not established the full geographical extent of the contamination. He said that it was necessary to establish risk criteria from which to derive threshold levels of contamination for defining the area of the monitoring survey. Also, he asked if the same equipment should be used in further monitoring surveys.

There was general agreement that there was a need for carrying out a monitoring project over a larger geographical area to determine the full extent of the land affected by the contamination and that the same or similar equipment should be used as this would permit comparison with previous survey data.

4. Communication – Community Council

Media

Others

The Chairman, CB, said that in view of the implications of potential radiation exposures, it was important to establish and maintain liaison with authorities and interested bodies.

PD said that SEPA had kept Dalgety Bay Community Council informed of the monitoring work that had been carried out.

CB made the point that the Community Council did not want 'Dalgety Bay' to attract a disproportionate level of attention in the public domain.

Neil Trotter (NT) asked about the policy for public access to the beach area.

EG asked if any information notices or warning signs had been posted at the beach.

GH said that no such notices or signs had been erected. He added that, although a policy of demarcation and control of access had not been employed hitherto, he was of the opinion that, in view of the radiological risks indicated earlier, compliance with the EURATOM BSS through the Radioactively Contaminated Land Regulations would necessitate adoption of such a policy when this legislation came into force in 2006.

MM added that, following the NRPB survey of the beach and foreshore, the Community Council had been warned not to carry out any further building work adjacent to the beach.

Ian Hall (IH) said that a risk-based assessment could show that there was no need to restrict access to the foreshore providing systematic monitoring was being conducted on a regular basis.

MM said that in view of the low specific activities of the larger pieces of clinker, this type of material posed only a low level of radiological risk. However, a problem could arise if fine, higher activity, material adhered to the hands.

Jackie Hyland (JH) asked if it was possible to predict future risks and the consequent implications for children playing in the area.

IH said that children were unlikely to collect material composed of fine particles, but potential danger could arise if a high activity particle became lodged under a finger nail.

JH said that it was not appropriate to make assumptions about how people behave.

EG stated that at Sandside Bay near Dounreay and at Aberdeen beach a policy of removal of identified contamination had been adopted. She added that, in her opinion, contamination should be removed even where the risk was minimal.

Allan Reid (AR) expressed the view that, as far as public perception is concerned, removal of all contamination would be the only acceptable solution.

IH said that a strategic risk assessment was required. He added that, from a cost/benefit analysis point of view, it would be prudent to remove contaminated items. Also, he suggested that in any future monitoring work involving removal of material, the location and level of activity of detected items should be recorded to permit comparison with data collected in previous surveys.

PD said that, given the uncertainties of the number of particles, hazard, risks and extent of contamination, it was appropriate to adopt a policy of demarcation, delineation and if necessary, control of access, by the competent body.

EG asked what information should be given to the public.

JH pointed out that the question will arise, 'Why did you not put up signs earlier'.

PM asked when signs should be erected.

JH said that it was necessary to start talking to people to make them aware of the situation.

NT suggested that signs should be used to inform the public of what is being done. He further suggested that the Community Council should be consulted about the use of the local press.

5. Agree strategy for intervention

The chairman summarised the outcome of the discussion at this stage by identifying three topics for attention:

- a) a need to carry out further work to determine the geographical extent of the area affected by contamination,
- b) methods of providing information and the signage which should be used to advise the public,
- c) re-commencement of a programme of monitoring with removal and storage of contaminated material.

GH expressed the opinion that, in considering various exposure scenarios, it was not appropriate to focus attention solely on deterministic effects.

NT enquired about possible effects on the food chain.

MM said that the herbs grown in the domestic garden, where contamination had been detected, did not show any signs of contamination.

Regarding the marine food chain, MM said that this was a topic that merited investigation

6. Future management

At this point in the discussions, CB suggested that a small group of representatives should meet with the Community Council.

AR said that on the basis of the experience of signage at Aberdeen beach, engagement with the Council is critical.

The Chairman said that he thought that a meeting with Fife County Council would be appropriate and suggested that PH, JH and SEPA representatives should attend.

CB raised the question of where Ra-226 contaminated material should be stored pending disposal.

FD, acknowledging that Rosyth Dockyard had been used in the past for this purpose, undertook to enquire about the possible use of an MOD storage/disposal waste-stream for Ra-226. Although FD was willing to assist with the recovery programme, he pointed out that the MOD did not accept liability.

In reply, CB said that, irrespective of the question of liability, he was pleased to acknowledge that the MOD was co-operating with SEPA and recovery would be carried out once MOD agree to take the waste.

The Chairman said that a current group was looking at SEPA, SE and MOD issues. He suggested that the remit should be extended to include Fife County Council.

On establishing that MM was not a member of this group, CB said that further consideration of membership of the group was necessary.

CB said that the next meeting of the current representatives was scheduled for 25 November. He expected that the agenda of this meeting would include consideration of the longer-term issues.

CB said that a letter should be sent to the Community Council stating that this meeting had taken place.

7. AOCB

EG asked about the timing of the planned monitoring survey work.

PD said that he expected it to be re-started before the end of the year once Mod have a disposal route available.

EG said that she hoped it would be possible to start it sooner than that.

NT asked if there were other sites associated with the disposal of aircraft parts.

FD said that there was a site near Stirling and another at Gowkthrapple in North Lanarkshire. He added that luminising other parts of military hardware had been a common practice and one not confined to aircraft instrumentation. He said that he was aware that there were other sites where there was a potential problem. He pointed out that any related issues at such sites would be addressed when the new radioactively contaminated land legislation came into force next year.

There being no other competent business, the Chairman thanked everyone for their attendance and contributions.

8. Date of next Meeting

The date of the forthcoming meeting was, as noted earlier, 25 November 2005.

The meeting closed at 12.30 pm.

UPDATED STUDY OF CANCER INCIDENCE IN DALGETY BAY, FIFE - 1975-2002

1. Summary

This study represents an update of a previous study designed to assess the incidence of radiation-associated cancers in the Dalgety Bay area of Fife, against a background of potential exposure to radium-226 disposed of locally during the 1940's. The study is complicated by rapid population growth, demographic change and the relatively high socioeconomic status of the Dalgety Bay population. To assess the risk of relevant cancers in the population of the study area, the observed numbers of cancers were compared to expected numbers derived from national background rates. For the most recent period evaluated (1986-2002), the ratios of observed to expected numbers were standardised for age, sex, and deprivation, yielding standardised incidence ratios (SIRs). The main findings for this recent period were as follows:

- Overall cancer incidence (all malignant neoplasms excluding non-melanoma skin cancer) in the Dalgety Bay area has tended to be slightly lower than the national average. However, the differences from national background rates are comparatively small and do not attain statistical significance.
- No higher than expected numbers of cases were observed in the cancers most frequently associated with radiation, and no significantly higher than expected numbers of cases were observed in the cancers classified as occasionally associated with radiation. Multiple myeloma (defined as occasionally associated with radiation) was found to have a higher than expected number of cases, but this excess did not attain statistical significance.
- In the group of cancers determined as rarely associated with radiation, Brain and other CNS, major salivary gland, rectum and connective tissue cancers were found to have higher than expected numbers of cases, but these also do not attain statistical significance. Corpus uteri cancer was found to have significantly higher than expected numbers of cases.
- Additionally pancreas cancer and childhood leukaemia were found to have higher than expected numbers of cases, but do not attain statistical significance.

In summary, there were no statistically significant excesses of cancers most commonly associated with exposure to ionising radiation. The excess of corpus uteri cancer is unexplained, but could represent a chance finding in the context of multiple significance tests.

2. Background

This investigation was conducted by the Information Services Division (ISD Scotland) of NHS National Services Scotland as part of a standing commitment to examine periodically the incidence of cancers in the Dalgety Bay area which might be caused by exposure to radium-226 disposed of locally during the 1940s.

The analyses reported here were based closely on those reported in a previous assessment: Black RJ, Sharp L, Finlayson AR, Harkness EF (1994). Cancer incidence in a population potentially exposed to radium-226 at Dalgety Bay, Scotland. *British Journal of Cancer* **69**, 140-143, and on subsequent updates to this study.

Two sets of analyses have been conducted: 1975-2002 with adjustment for age and sex and 1986-2002 with adjustment for age and sex, and the socio-economic characteristics of the Dalgety Bay population.

3. Data & Methods

Boice *et al* (1996)¹ ranked individual major cancer sites according to the degree to which ionising radiation had been identified as a causative factor. This ranking was used to identify the specific cancers to be considered in this updated study of cancer incidence in the Dalgety Bay area (see Appendix 1). The incidence of cancer of the pancreas, non-melanoma skin cancer and childhood leukaemia (each identified as having higher than expected risks in previous studies), and the incidence of all malignant neoplasms combined, excluding non-melanoma skin cancers, were also examined.

Observed incidence data presented here are based on the Scottish Cancer Registration System, extracted in November 2005.

Age- and sex- specific population estimates for Scotland are available at ISD Scotland by arrangement with the General Register Office for Scotland (GRO(S)). In order to assess whether the level of occurrence of cancer in the defined area appears to be unusual, information on local population estimates must also be assembled. Annual estimates of population are not calculated for areas below the level of the Local Council Areas, so for this study, population data at the census enumeration district and output area level(s) were taken from the 1971, 1981, 1991 and 2001 censuses.

The estimated age and sex specific populations at risk for each of these areas over the period 1975-2002 were calculated as a linear interpolation of the data for years between 1971 and 2001 and a linear extrapolation for 2002. The calculations also accounted for the changing population in the inter-censal periods in Scotland using GRO(S) mid-year population estimates.

The physical extent of the study area corresponds as closely as possible with the area described in the paper by Black *et al* (1994). Incidence data for Dalgety Bay were selected using 1971 Enumeration Districts for 1975, 1981 Enumeration Districts for years 1976-1985, 1991 Output Areas for 1986-1995, and 2001 Output Areas for 1996 onwards. In practice, the 1971 and 1981 Enumeration Districts were the same. Appendix 2 shows the area studied for 1975-1995 and Appendix 3 shows the area covered for 1996-2002.

Expected numbers of registrations for each cancer type in these areas were calculated by applying sex- and age-specific national rates to the estimated local population at risk. The results are presented as numbers of cancer cases observed, numbers of cases expected, and observed to expected ratios, with 95% confidence intervals calculated using standard methods². An observed to expected ratio (O/E) can be interpreted as an estimate of the true relative risk of contracting a disease for individuals in a group under study compared to individuals in a comparison group. An O/E ratio of 1.00 indicates identical risks in the study and comparison groups. However, the observed to expected ratio is subject to random variation, so confidence intervals are required to assess the extent to which the observed data indicate a true relative risk which differs from 1.00. By convention, a confidence interval that does not include the value 1.00 is interpreted as a statistically significant difference in risk between the two groups.

Additionally, in order to control for anticipated confounding by socio-economic status (Dalgety Bay being an area of relatively high affluence), a second set of expected numbers were prepared. Based on both 1991 and 2001

¹ Boice JD, Land CE, Preston DL (1996). Ionizing radiation. In Schottenfeld D and Fraumeni Jr, JF. *Cancer Epidemiology and Prevention*. Second Edition, Oxford University Press.

² Boyle P, Parkin DM. Statistical Methods for Registries. In: *Cancer Registration Principles and Methods* (Editors: Jensen OM, Parkin DM, MacLennan R, Muir CS, Skeet RG). IARC Scientific Publication No. 95. Lyon: International Agency for Research on Cancer, 1991.

Carstairs Deprivation scores (calculated at postcode sector level geography) in the lowest quintile (least deprived group), age-, sex- cancer registration rates, for Scotland, were calculated. To obtain both Scottish registration and population information:

- 1991 Carstairs' deprivation information was used to select registrations for the 10-year period 1986-1995 while 2001 Carstairs' deprivation information was used for the 7-year period 1996-2002
- 1991 census population data was used for the 10-year period 1986-1995 while 2001 census population data was used for the 7-year period 1996-2002. Calculations were performed on these data to take account of the changing population in the inter-censal periods in Scotland using GRO(S) mid-year population estimates.

Finally, the resulting expected cases were compared with the observed cases from the predefined Dalgety Bay area. Note: the deprivation-adjusted figures were calculated for the period 1986-2002 only, due to methodological complexities of producing figures for a longer time period, and difficulties in interpreting the results.

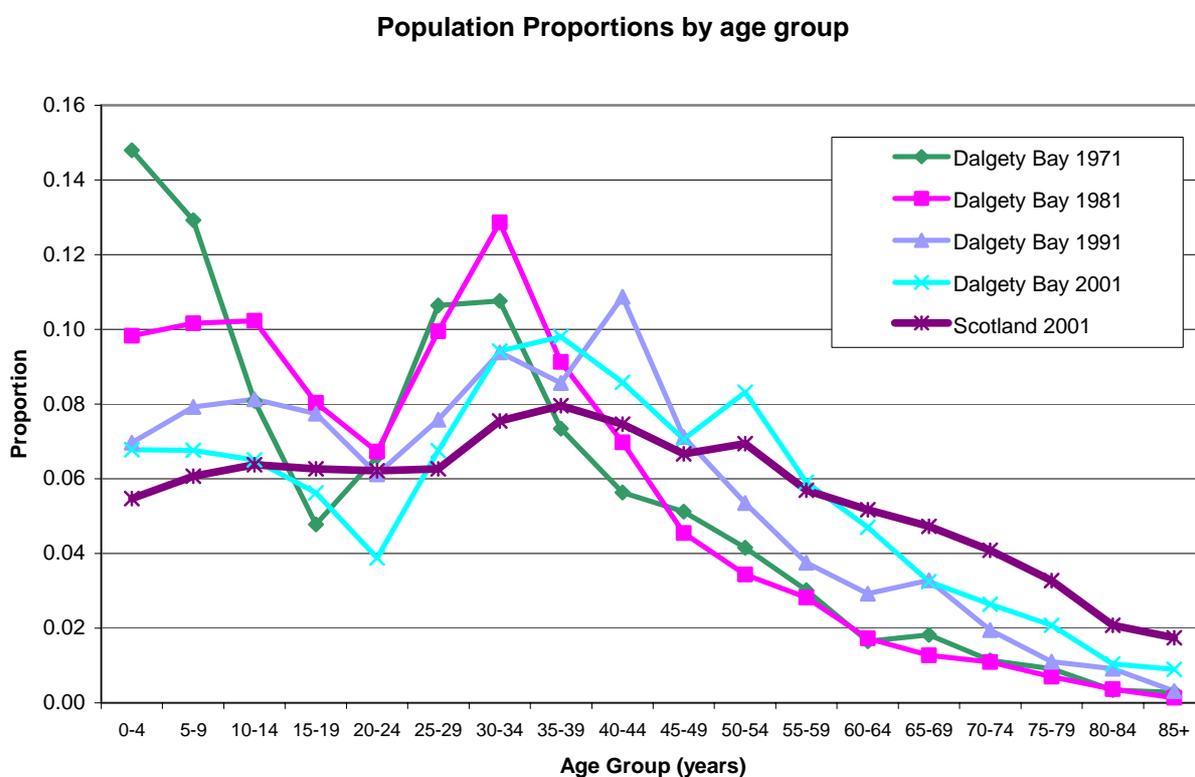
4. Population of the Dalgety Bay area

The Dalgety Bay area is known to have an unusual age structure in comparison to Scotland as a whole (Figure 1). At the time of the 1981 census, there was a high proportion of 25-39 year olds compared to Scotland, and at the time of the 1991 census there was a high proportion of 25-44 year olds compared to Scotland. In the 2001 census the 30-44 and 50-54 age groups represented a higher proportion of the population in Dalgety Bay than in Scotland as a whole. The proportion of the population in the 60+ age groups is lower than in Scotland and follows a similar, if slightly higher, pattern to previous census data taken in the Dalgety Bay area.

The Dalgety Bay area is also known to be an area of low socio-economic deprivation, with 96.6% of the population in the least deprived Carstairs' deprivation quintile in 2001.

4.1. Population age structure in Dalgety Bay compared with Scotland

Figure 1: Population age structure in Dalgety Bay in 1971, 1981, 1991, and 2001: population proportions by age group



5. Results adjusted for sex and five-year age group for 1975-2002

The observed incidence of the investigated cancers in the Dalgety Bay area, compared with expected values based on overall rates for Scotland, are shown in tables 1A to 1D.

Table 1A. Incidence of “Group A” cancers (Cancers frequently associated with radiation) adjusted for sex and five-year age group (1975-2002)

Cancer Site	Observed registrations	Expected registrations	Standardised Incidence Ratio O / E	Lower 95% confidence interval	Upper 95% confidence interval
Leukaemia	15	15.32	0.98	0.55	1.62
Thyroid	6	3.76	1.60	0.59	3.48
Female Breast	92	84.6	1.09	0.89	1.33

Table 1B. Incidence of “Group B” cancers (Cancers occasionally associated with radiation) adjusted for sex and five-year age group (1975-2002)

Cancer Site	Observed registrations	Expected registrations	Standardised Incidence Ratio O / E	Lower 95% confidence interval	Upper 95% confidence interval
Lung	74	112.99	0.65	0.52	0.82
Stomach	10	27.04	0.37	0.18	0.68
Colon	44	46.61	0.94	0.67	1.28
Oesophagus	7	15.30	0.46	0.18	0.94
Bladder	22	26.97	0.82	0.51	1.23
Ovary	12	14.87	0.81	0.42	1.41
Multiple myeloma	8	6.51	1.23	0.53	2.42

Table 1C. Incidence of “Group C” cancers (Cancers rarely associated with radiation) adjusted for sex and five-year age group (1975-2002)

Cancer Site	Observed registrations	Expected registrations	Standardised Incidence Ratio O / E	Lower 95% confidence interval	Upper 95% confidence interval
Brain and other CNS	11	11.46	0.96	0.48	1.72
Kidney	7	12.01	0.58	0.23	1.20
Liver and intrahepatic bile ducts	2	4.55	0.44	0.05	1.59
Major salivary gland	2	1.57	1.27	0.15	4.60
Non-Hodgkin's Lymphoma	18	17.33	1.04	0.62	1.64
Malignant melanoma of skin	21	15.94	1.32	0.82	2.02
Rectum	32	23.78	1.35	0.91	1.92
Corpus uteri	16	9.06	1.77	1.01	2.86
Bone and articular cartilage	0	1.59	0.00	-	-
Connective tissue	3	3.43	0.88	0.18	2.56

Table 1D. Incidence of “Group D” cancers (Miscellaneous) adjusted for sex and five-year age group (1975-2002)

Cancer Site	Observed registrations	Expected registrations	Standardised Incidence Ratio O / E	Lower 95% confidence interval	Upper 95% confidence interval
Pancreas	18	14.42	1.25	0.74	1.97
Childhood Leukaemia (0-14)	4	2.12	1.89	0.51	4.83
Non-melanoma skin (nmisc)	129	101.60	1.27	1.07	1.51
All malignant neoplasms excluding nmisc	536	597.60	0.90	0.82	0.98

Data source: SOCRATES (Scottish cancer registration database); these figures prepared in November 2005. Population data supplied to ISD Scotland by GRO(S).

From the above results, the incidence of cancer was higher than may be expected for thyroid, female breast, multiple myeloma, major salivary gland, non-Hodgkin's lymphoma, malignant melanoma of skin, rectum, corpus uteri, pancreas, childhood leukaemias and non-melanoma skin cancer(s). However, the results were only significantly higher than expected for corpus uteri and non-melanoma skin cancer(s). The incidence of cancer was significantly lower than expected for lung, stomach and oesophagus cancers, as well as all malignant neoplasms (excluding non-melanoma skin cancer).

6. Results adjusted for sex, five-year age group and deprivation for 1986-2002

The observed incidence of the investigated cancers in the Dalgety Bay area, compared with expected values based on overall rates for Scotland, are shown in tables 2A to 2D.

Table 2A. Incidence of “Group A” cancers (Cancers frequently associated with radiation) adjusted for sex, five-year age group and deprivation (1986-2002)

Cancer Site	Observed registrations	Expected registrations	Standardised Incidence Ratio O / E	Lower 95% confidence interval	Upper 95% confidence interval
Leukaemia	10	13.42	0.75	0.36	1.37
Thyroid	3	3.71	0.81	0.17	2.36
Female Breast	77	80.72	0.95	0.76	1.19

Table 2B. Incidence of “Group B” cancers (Cancers occasionally associated with radiation) adjusted for sex, five-year age group and deprivation (1986-2002)

Cancer Site	Observed registrations	Expected registrations	Standardised Incidence Ratio O / E	Lower 95% confidence interval	Upper 95% confidence interval
Lung	63	62.81	1.00	0.78	1.28
Stomach	9	15.53	0.58	0.27	1.10
Colon	40	42.68	0.94	0.67	1.27
Oesophagus	6	11.35	0.53	0.19	1.15
Bladder	18	20.12	0.89	0.53	1.41
Ovary	11	13.44	0.82	0.41	1.47
Multiple myeloma	7	5.95	1.18	0.47	2.42

Table 2C. Incidence of “Group C” cancers (Cancers rarely associated with radiation) adjusted for sex, five-year age group and deprivation (1986-2002)

Cancer Site	Observed registrations	Expected registrations	Standardised Incidence Ratio O / E	Lower 95% confidence interval	Upper 95% confidence interval
Brain and other CNS	11	9.79	1.12	0.56	2.01
Kidney	5	11.26	0.44	0.14	1.03
Liver and intrahepatic bile ducts	2	3.61	0.55	0.07	2.00
Major salivary gland	2	1.23	1.63	0.20	5.87
Non-Hodgkin's Lymphoma	16	16.95	0.94	0.54	1.53
Malignant melanoma of skin	17	20.66	0.82	0.48	1.32
Rectum	29	21.67	1.34	0.90	1.93
Corpus uteri	16	8.92	1.79	1.03	2.91
Bone and articular cartilage	0	1.23	0.00	-	-
Connective tissue	3	2.85	1.05	0.22	3.08

Table 2D. Incidence of “Group D” (Miscellaneous) cancers adjusted for sex, five-year age group and deprivation (1986-2002)

Cancer Site	Observed registrations	Expected registrations	Standardised Incidence Ratio O / E	Lower 95% confidence interval	Upper 95% confidence interval
Pancreas	11	10.31	1.07	0.53	1.91
Childhood Leukaemia (0-14)	2	1.67	1.20	0.14	4.32
Non-melanoma skin (nmisc)	115	117.62	0.98	0.81	1.17
All malignant neoplasms excluding nmisc	450	482.73	0.93	0.85	1.02

Data source: SOCRATES (Scottish cancer registration database); these figures prepared in November 2005. Population data supplied to ISD Scotland by GRO(S).

From the above results, the incidence of cancer was higher than would be expected for multiple myeloma, brain and other CNS, major salivary gland, rectum, corpus uteri, connective tissue and pancreas cancers and also for childhood leukaemias. However, the incidence of cancer was only significantly higher than expected for corpus uteri cancer. None of the results are significantly lower than expected.

When adjustments are made for deprivation (in addition to age and sex adjustments), in most cases, the observed to expected ratio is attenuated to the extent that it is not statistically significant. Similarly, the higher than expected results for thyroid, female breast, non-Hodgkin's lymphoma and malignant melanoma of skin cancers are also diminished. However, despite such adjustments, there remain higher than expected numbers of multiple myeloma, major salivary gland, rectum and pancreas cancers and childhood leukaemia, and significantly higher than expected numbers of corpus uteri cancer. In addition, higher numbers of brain and CNS and connective tissue cancers were indicated when adjustments were made for deprivation. Note also that all cancers with significantly lower than expected incidence (when adjusted for age and sex) become non-significant once deprivation was adjusted for.

7. Discussion

It is important to consider the following issues when interpreting the results of this analysis:

1. The quality of cancer incidence data. Cancer registration data are believed to be of reasonably high quality in Scotland, both in terms of accuracy^{3,4} and completeness of ascertainment.⁵
2. Accuracy of population denominator data. When analysing data for small areas it is necessary to estimate person-years at risk based on census output. We have had to assume that the population characteristics of the study area between the census years 1971, 1981, 1991 and 2001 have changed in a linear fashion. However, the validity of our population estimates could have been affected, for example, by migration, especially occurring shortly after one or more of the censuses.
3. Despite the aggregation of incidence data spanning periods of more than 10 years, the number of some individual cancer registrations occurring is still relatively low, reflected by wide confidence intervals around the estimates of observed/expected ratios.
4. In the context of multiple tests of statistical significance, it is important to bear in mind that some apparently significant results can arise purely through the play of chance.

In summary, after standardisation for age, sex, and deprivation, there were no statistically significant excesses of any of the cancers most commonly associated with exposure to ionising radiation. The only cancer with a statistically significant excess is cancer of the corpus uteri (SIR 1.79; 95% CIs 1.03-2.91). While this is unexplained, it seems unlikely to be related to radiation exposure. It could represent a chance finding in the context of multiple significance tests.

³ Brewster D, Crichton J, Muir C. How accurate are Scottish cancer registration data? *Br J Cancer* 1994; **70**: 954-60.

⁴ Brewster DH, Stockton D, Harvey J, Mackay M. Reliability of cancer registration data in Scotland, 1997. *Eur J Cancer* 2002; **38**: 414-417.

⁵ Brewster DH, Crichton J, Harvey JC, Dawson G. Completeness of case ascertainment in a Scottish Regional Cancer Registry for the year 1992. *Public Health* 1997; **111**: 339-43.

Appendix 1: Cancer sites and coding used.

Group A. Cancers frequently associated with radiation

Cancer Site	ICD-10 code	ICD-9 code
Leukaemia	C91-C95	204-208, 202.4
Thyroid	C73	193
Female Breast	C50	174

Group B. Cancers occasionally associated with radiation

Cancer Site	ICD-10 code	ICD-9 code
Lung	C33+C34	162
Stomach	C16	151
Colon	C18	153
Oesophagus	C15	150
Bladder	C67	188
Ovary	C56	183.0
Multiple myeloma	C88+C90	203, 238.6, 273.2, 273.3

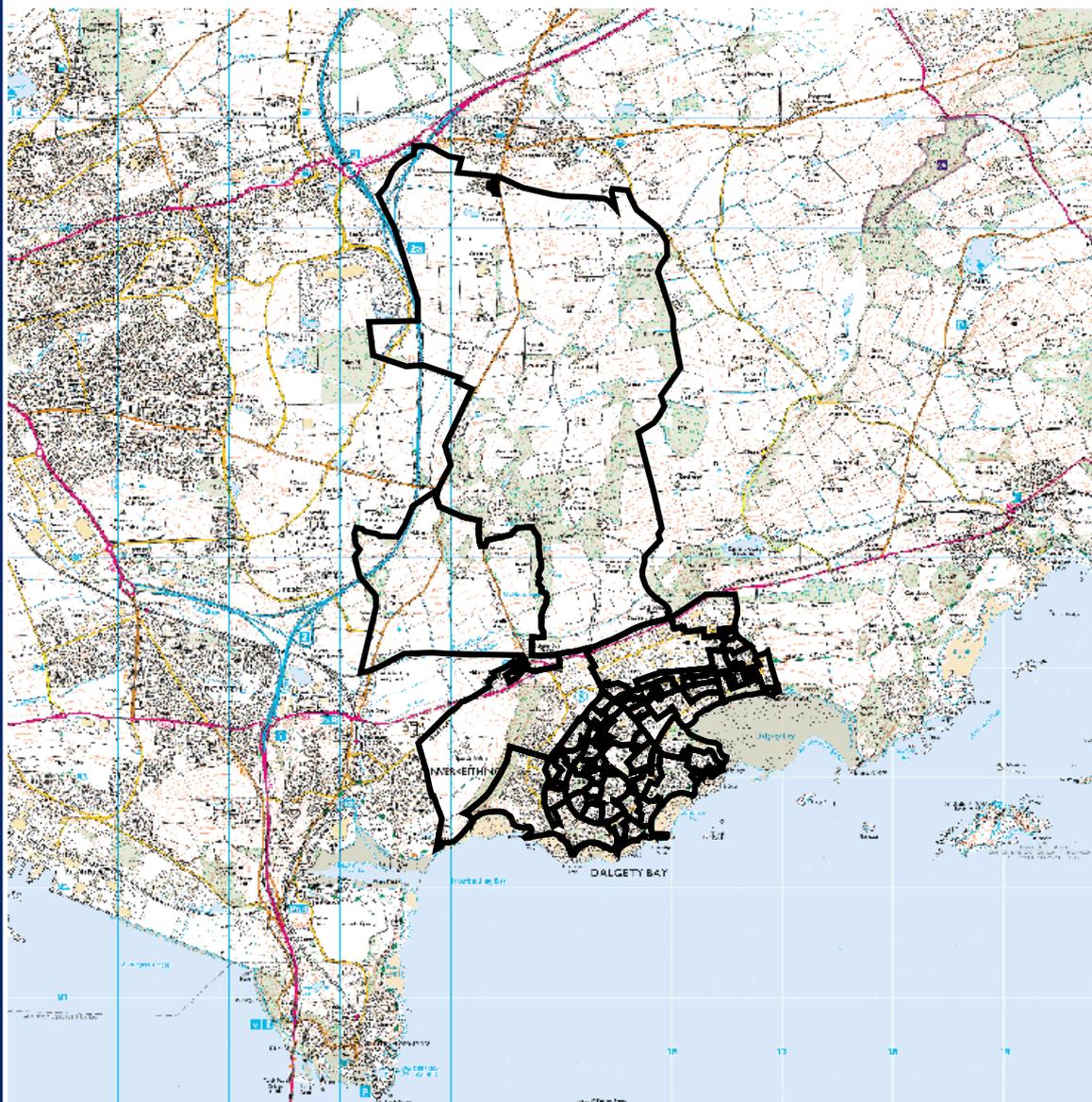
Group C. Cancers rarely associated with radiation

Cancer Site	ICD-10 code	ICD-9 code
Brain and other CNS	C70-C72	191+192
Kidney	C64+C65	189.0+189.1
Liver and intrahepatic bile ducts	C22	155
Major salivary gland	C07+C08	142
Non-Hodgkin's Lymphoma	C82-C85	200, 202.0-202.2, 202.8
Malignant melanoma of skin	C43	172
Rectum	C19-C20	154.0+154.1
Corpus uteri	C54	182
Bone & articular cartilage	C40+C41	170
Connective tissue	C47+C49	171

Group D. Miscellaneous

Cancer Site	ICD-10 code	ICD-9 code
Pancreas	C25	157
Childhood Leukaemia (Age range 0-14)	C91-C95	204-208, 202.4
Non-melanoma skin	C44	173
All malignant neoplasms excluding non-melanoma skin	C00-C96 xC44	140-208 x173

Appendix 2: Area defined as Dalgety Bay for 1971/1981 Electoral Districts and 1991 Output Areas



Legend

 1991 Output Areas

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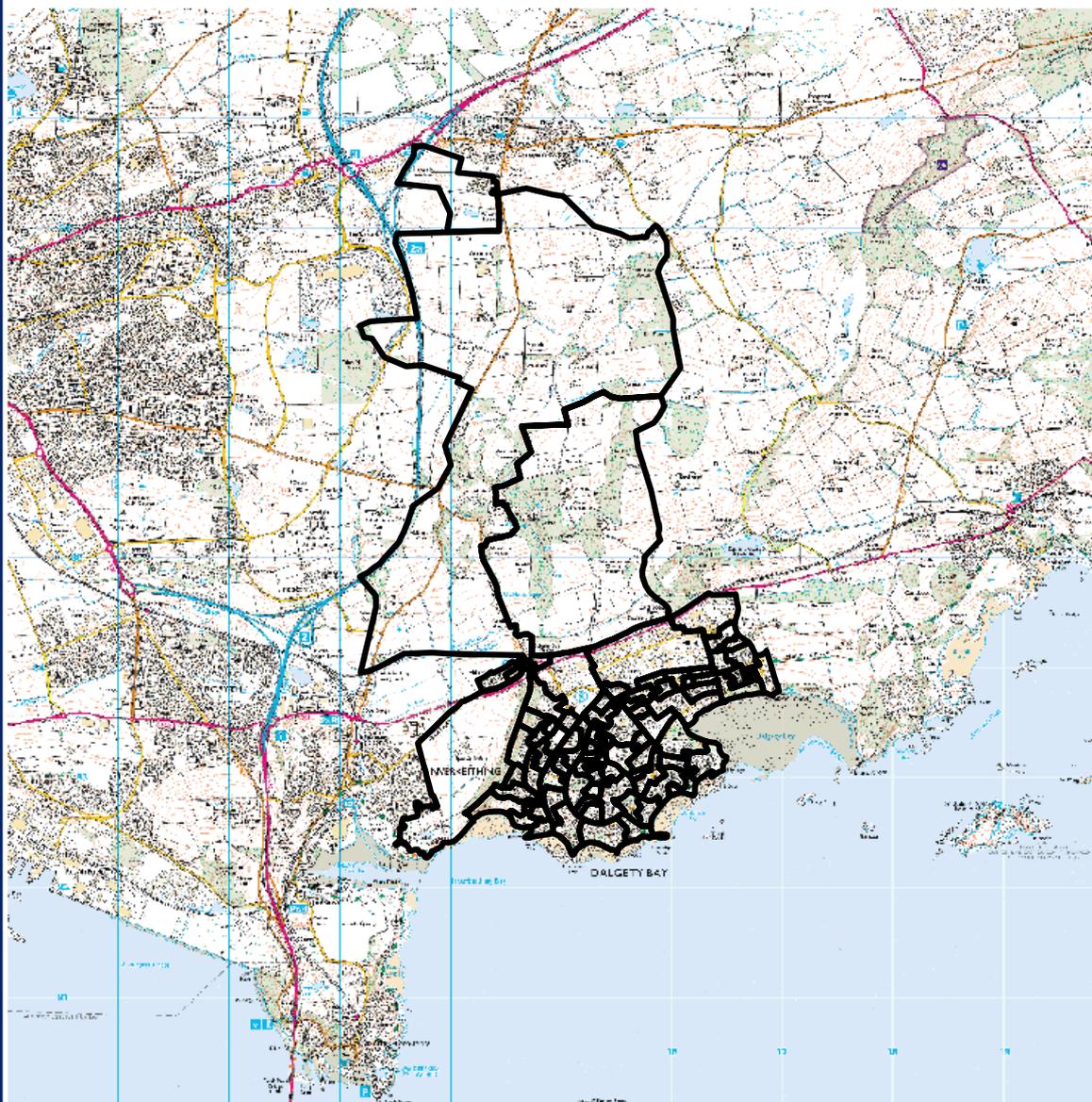
source: ISD Scotland
date of creation 16/11/2005
author: Cheryl Heeley

GIS Programme
1st Floor
Gyle Square
1 South Gyle Crescent
Edinburgh
EH12 9EB



NHS
National
Services
Scotland

Appendix 3: Area defined as Dalgety Bay using 2001 Output Areas



Legend

 2001 Output Areas

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source: ISD Scotland
date of creation 16/11/2005
author: Cheryl Heeley

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EH12 9EB



NHS
National
Services
Scotland

Appendix 4: List of 1971/1981 Census Enumeration Districts and 1991/2001 Census Output Areas Used to define Dalgety Bay, Fife

1971 ED's	1981 ED's	1991 OA's	2001 OA's
12AR17	12AR17	12AR17A	60QR000006
12AR18	12AR18	12AR17B	60QR000007
12AR19	12AR19	12AR17C	60QR000127
12AR20	12AR20	12AR17D	60QR000128
12AR21	12AR21	12AR17E	60QR000129
12AR22	12AR22	12AR17F	60QR000130
12AR23	12AR23	12AR18A	60QR000131
12AR24	12AR24	12AR18B	60QR000132
12AR25	12AR25	12AR19A	60QR000133
12AR26	12AR26	12AR19B	60QR000134
12AR27	12AR27	12AR19C	60QR000135
12AR28	12AR28	12AR19D	60QR000136
12AR29	12AR29	12AR20A	60QR000137
12AR30	12AR30	12AR20B	60QR000138
12AR31	12AR31	12AR20C	60QR000139
12AR32	12AR32	12AR20D	60QR000140
12AR33	12AR33	12AR20E	60QR000141
12AR34	12AR34	12AR21A	60QR000142
		12AR21B	60QR000143
		12AR22A	60QR000144
		12AR22B	60QR000145
		12AR22C	60QR000146
		12AR23A	60QR000147
		12AR23B	60QR000148
		12AR23C	60QR000149
		12AR24A	60QR000150
		12AR24B	60QR000151
		12AR25A	60QR000152
		12AR25B	60QR000153
		12AR25C	60QR000154
		12AR25D	60QR000155
		12AR26A	60QR000156
		12AR26B	60QR000157
		12AR27A	60QR000158
		12AR27B	60QR000159
		12AR27C	60QR000160
		12AR28A	60QR000161
		12AR28B	60QR000162
		12AR28C	60QR000163
		12AR28D	60QR000164
		12AR28E	60QR000165
		12AR29A	60QR000282
		12AR29B	60QR000691
		12AR30	60QR002387
		12AR33A	60QR002388
		12AR33B	60QR002389
		12AR33C	60QR002390
		12AR33D	60QR002428
		12AR33E	60QR002429
		12AR33F	60QR002430
		12AR33G	60QR002431
		12AR34A	60QR002547
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