

Redacted correspondence 2

From: HPA
Sent: 15 December 2011 10:45
To: SEPA
Cc:
Subject: Dalgety Bay - objectives for monitoring strategy draft 0 e (2).doc
Importance: High
Dear Both,

Following discussion with, I attach draft 0.f with an amended wording for point c, for your consideration.

█ are you able to suggest a good time for me to phone you?

Regards,

From: HPA
Sent: 22 February 2012 17:29
To: SEPA
Subject: RE: Next DB expert Gp meeting

█

I have passed this to colleagues to investigate this piece of work as it doesn't really fall within my work area. Either I or a colleague will get back to you as soon as possible.

From: SEPA
Sent: 22 February 2012 15:44
To: HPA
Subject: RE: Next DB expert Gp meeting

Hi ,

The date has not been set yet, however I will circulate a request for dates shortly – you are correct about Mid to End of March.

From: HPA
Sent: 22 February 2012 11:03
To: SEPA
Subject: Next DB expert Gp meeting
Importance: High

Do you know when the new expert meeting is likely to be. FSA mentioned mid March and my memory was end of March was mentioned. █ as well as making sure we have produced the scoping assessment report before the next meeting so would be grateful for a heads-up of likely date(s).

Thanks

From: HPA

Sent: 21 February 2012 18:53

To: FSA

Subject: RE: Dalgety Bay Initial Particle Dose Assessment

I think we have a little time to look at this over the next couple of weeks. We have estimated ingestion doses from inadvertent ingestion for beach users as part of our scoping assessment and so can compare our estimates with yours. Although very unlikely, we have estimated that quite significant doses could be received from a 1mm sized object based on the monitoring data available from last autumn (assuming activity scales with object size – very scoping assumption).

After a very quick initial glance at the spreadsheet I am a little concerned that you haven't considered the probability of encounter. I know we have very little info on numbers of objects especially in the mud flats etc where the shellfish 'live'. However, something very crude could be done (like done for Sellafield) to scope the probability of encounter. I'm not quite sure what you need to support your advice/any restrictions but I feel strongly that from a health risk point of view that we need to take the probability of consuming an object into account.

Happy to discuss if you are around tomorrow morning. If not, let me know when you are free and I will try and call.

From: FSA

Sent: 21 February 2012 13:02

To: HPA

Cc:

Subject: Dalgety Bay Initial Particle Dose Assessment

We have done an initial (albeit relatively crude) assessment of potential doses to shellfish consumers from Dalgety Bay. As you would expect there are a lot of assumptions required for such an assessment, especially as it is effectively a screening assessment. Would HPA be able to give some views on the assessment methodology; we are not expecting a full critique but a few pointers as to whether you can support the method as it stands and whether you can agree the method is fit for purpose (in as much as it is effectively a screening method).

The plan (if the method is agreed as viable) is to pass the findings to DBPAG. Their next meeting is set for mid-March - is this timescale going to be a problem (assuming you agree to look at our methodology)?

Regards and thanks in advance for any help you can offer

From: FSA

Sent: 17 February 2012 17:11

To: FSA

Cc:

Subject: Dalgety Bay Particle Dose Assessment

Hi

██████████. asked me to do some Dalgety Bay dose calculations for you.

I have attached a spreadsheet with my calculations. ██████████ originally asked me to calculate doses for the Ra-226 only, and I have done as requested. The assessment is in the tabs beginning with PT.

However, as Ra-226 is not the major contributor to dose, I decided to do a more complete assessment, which includes the Pb-214, Bi-214 and Pb-210 in each particle. The calculations and assumptions for this assessment are included in the tabs that begin AF. They are also summarised below.

I went through my approach with ██████████ and also got ██████████ to check the assessment, so hopefully it's ok. If you have any questions please let me know.

Assumptions:
The total dose has been calculated from Ra-226, Pb-214, Bi-214 and Pb-210 activity in each particle
The activity is spread homogenously across the particle
Three calculations of total dose have been made using different assumptions about particle solubility in the stomach / lower intestine
For two of the dose calculations, the solubility of each particle is taken as 10% or 25% in line with SEPA's assessment (it is assumed each radionuclide has the same solubility)
For the other dose calculation, lab data from a simulated stomach solubility test was used. This determined the percentage of total activity available from each radionuclide in each particle. (It should be noted that there is large uncertainty in these measurements, as seen by discrepancies between percentages of Pb-210 and Pb-214)
It is assumed that each particle can be broken into smaller fragments, to a size that would fit in a mollusc's gut.
The particle size that would fit in a mollusc's gut is taken as 1mm x 1mm (from Cefas study)
For those particles with a dimension exceeding 1mm (i.e., would not fit in a mollusc's gut), the dose has been calculated for a fragment of the particle that would fit (1mm x

1mm).
No adjustment has been made for depth of the fragment
The dose calculations are based on different aged consumers, consuming one mollusc containing the whole particle or re-sized fragment
No account is taken of overall mollusc consumption rates or probability of encounter
SUMMARY
<u>Simulated Stomach Solubility (lab test)</u>
23.3% of the particles give doses in excess of 1 mSv for at least one age group. The single highest calculated dose is 22.81 mSv to an infant.
<u>10% Stomach Solubility</u>
50% of the particles give doses in excess of 1 mSv for at least one age group. The single highest calculated dose is 22.18 mSv to an infant.
<u>25% Stomach Solubility</u>
73.3% of the particles give doses in excess of 1 mSv for at least one age group. The single highest calculated dose is 55.45 mSv to an infant.
The results suggest that doses, particularly to infants, could potentially be unacceptable if a mollusc containing a Dalgety Bay particle is consumed. However, it should be noted that there is some uncertainty over the assumptions and measurements for the solubility of particles in a person's stomach / gut. In addition, the size of fragment that can enter a molluscs gut is probably over estimated.
It should be noted that Pb-210 and not Ra-226 contributes the largest share of the dose

from a Dalgety Bay particle

Regards

From: HPA

Sent: 15 February 2012 13:28

To: SEPA

Subject: RE: Meeting between HPA and SEPA on Dalgety Bay external/skin doses

Thanks [REDACTED]. [REDACTED] has confirmed so I will assume we are going ahead. Will be in touch with [REDACTED] on his return.

From: HPA

Sent: 14 February 2012 18:02

To: SEPA

Subject: FW: Meeting between HPA and SEPA on Dalgety Bay external/skin doses

Importance: High

If you are in contact with [REDACTED] please can you get the email below to him or at least confirm that we will go ahead with a meeting on the 23rd. Thanks.

From: HPA

Sent: 14 February 2012 18:00

To: SEPA

Cc:

Subject: Meeting between HPA and SEPA on Dalgety Bay external/skin doses

Importance: High

Dear [REDACTED]

I can confirm that we are OK for a meeting (teleconference) on the morning of the 23rd February. Are you happy to organise this re the comms. We will all congregate in one room here so can do the meeting via a direct phone line if easier.

Overall objective: understanding of the various measurements and calculations made and the differences in skin and whole body doses estimated by SEPA and

HPA and agreed way forward to provide the best information we can at this time on this exposure pathway.

The things I think we need to discuss are:

Explanation of the measurements and calculations undertaken on skin doses and whole body doses (SEPA and HPA)

Discussion about the use of the various measurement techniques and instruments and their applicability for estimating skin doses (gamma and beta) and whole body doses

Contribution of alpha emissions to skin doses

Decisions on best way forward to resolve the current differences

Discussion on appropriate techniques to use to further characterise the DB objects with respect to the skin doses that could be received.

Happy to discuss this list/add anything else you want to cover.

Please can you confirm that this date is still fine with you.

Thanks

From: **SEPA**

Sent: 09 February 2012 08:59

To: **HPA**

Cc:

Subject: RE: SEPA - RADIOACTIVE BEACH RESPONSE SLAMMED

Thanks ,

I understand HPA's position completely, we were just a little confused over the statement made by the MoD that the chance of encountering a particle was small given that SEPA had not seen your calculations for skin contact etc.

From: **HPA**

Sent: 08 February 2012 18:08

To: **SEPA**

Cc:

Subject: RE: SEPA - RADIOACTIVE BEACH RESPONSE SLAMMED

Dear [REDACTED]

HPA has agreed to write a short report detailing the scoping assessment of health risks, including probability of encounter, and to make this available to SEPA. This report will provide all the details of the assumptions made and data used within the assessment. We are of the view that providing individual numbers from the assessment without the assumptions and basis for them being fully described could

potentially lead to the numbers being taken out of context and lead to further misunderstandings. We will provide written documentation of the scoping assessment by early in the week of the 20th February.

I hope that you can appreciate our position on this.
Regards

From: **SEPA**
Sent: 08 February 2012 09:18
To: **HPA**
Cc:
Subject: FW: SEPA - RADIOACTIVE BEACH RESPONSE SLAMMED
Importance: High

Please see below, could you let SEPA know what the probability of encounter (skin contact) which HPA calculated was?

Thanks

Subject: SEPA - RADIOACTIVE BEACH RESPONSE SLAMMED

RADIOACTIVE BEACH RESPONSE SLAMMED

*SCOTLAND Particles
Feb 7, 2012 6:25:47 PM
By Christine Lavelle, Press Association Scotland
(ScotFile:News special)*

Page 1

The Ministry of Defence's response plan to radioactive particles found on Scottish coastline "lacks sufficient detail", it was claimed today.

The Scottish Environment Protection Agency (Sepa) received the draft plan for Dalgety Bay, in Fife, on January 31, which was reviewed by its radioactive substances and contaminated land experts.

In a statement released today, Sepa said the MoD should provide more information on a number of areas, including: a timescale for implementing each stage of the plan, more detail relating to the proposed investigation work and an investigation of remediation options.

Sepa - which is the responsible authority under the Radioactive Contaminated Land (Scotland) Regulations 2007 - said if an acceptable plan is not provided, Dalgety Bay will become the UK's first designated

area of Radioactive Contaminated Land.

The statement said: "We are keen, and have offered, to work with the MoD during February on their draft plan, with the aim of MoD submitting an acceptable voluntary remediation plan by the end of the month.

"However, if an acceptable plan is not provided it remains our intention to proceed with designation of the area as Radioactive Contaminated Land.

"We have requested that the MOD shares with us any evidence they hold regarding the origin, nature and movements of the contamination."

Former prime minister Gordon Brown, MP for Kirkcaldy and Cowdenbeath, said the development of a remediation plan for Dalgety Bay, which is within his constituency, was "urgent".

He said: "I welcome the work done by Sepa. They have told me that these recent developments are cause for concern.

"They say that, even before these finds, there was a pre-existing need for robust survey, radioactive material assessment and recovery, and deployment of a credible remediation plan with appropriate public reassurance measures.

"Further, they say that in the absence of visible and credible effort from MoD, Sepa has had to intervene and deliver some of these steps urgently itself, on a purely protective interim basis.

"Radiation materials have come from the airfield. Sepa say they would hope that the ownership issue can quickly be settled with attention then given to establishing and implementing a remediation plan.

"The development of a sound remediation plan is now urgent."

A spokesman for the MoD said: "The points raised by Sepa in their press announcement is part of Sepa's feedback provided to the MoD. We have welcomed their feedback including direction on the level of detail required to support the work of Sepa and the Expert Group in resolving the level of risk.

"MoD continues to assist Sepa discharge their statutory duties on a voluntary basis and without prejudice.

"MoD left Dalgety Bay in 1959. Since that time there has been a large amount of development at the site, including the creation of a new town and two industrial estates. It is necessary to look at all the activities at Dalgety Bay that may have led to the contamination and we are awaiting further information from Sepa about these.

"The advice of the Health Protection Agency remains that the risk to health is likely to be low and there is no health reason for individuals to stop using the beach. The chance to come into contact with contaminated objects is small."

end

From: HPA

Sent: 08 February 2012 17:17

To: SEPA

Subject: RE: Radon meters and skin doses

As agreed, we are happy to deploy some radon detectors at the sailing club. I will liaise with people here and find out if they need to know anything more about the basement etc in order to decide on how many are needed. I will be back in touch as soon as I can re timescales and any other information we need.

23rd of Feb is fine for me for a telecom but I need to gain access to other diaries here at HPA to make sure we get the relevant experts together. Again, will try and get back to you ASAP.

From: SEPA

Sent: 08 February 2012 16:16

To: HPA

Cc:

Subject: Radon meters and skin doses

Hello

Radon meters

I asked the Sailing Club about radon meters and they said that they would like to have some deployed. I am happy to act as courier (as there is often nobody present at the Sailing Club during the day and I can leave them in an agreed place for the Sailing Club to pick up and deploy)

Re: skin doses

I have checked with [REDACTED] diary and he and I are available on the morning of the 23rd February to discuss skin doses – is this any use for HPA?

From: HPA

Sent: 02 February 2012 18:12

To: FSA

Subject: Sampling plan for DB

Only looked at the headlines of this as on my Blackberry between PRAG and DB meetings! I think main focus should be on content in flesh from consumption point of view but may be interest/concern about contact with shells so suggest maybe the best course of action is that the shell and flesh are analysed separately for a few

samples of each species. This should provide info on any shell content without escalating the costs too much.

From: HPA

Sent: 31 January 2012 11:28

To: SEPA

Subject: RE: Ra-226 PARTICLE DOSE RATE ESTIMATES (27-01-12) (2).xlsx

Thanks. [REDACTED] is documenting his calculations and results and we will send this later with any questions on your spreadsheet.

From: SEPA

Sent: 31 January 2012 08:59

To: HPA

Cc:

Subject: : Ra-226 PARTICLE DOSE RATE ESTIMATES (27-01-12) (2).xlsx

Attached are the skin dose rate measurements, primarily made using a 'redeye' but backed up with air kerma measurements and TLD's. The doses for 'contact' have been estimated from 10cm as there is significant uncertainty in the precision of the closer (distance) measurements which could cause significant effects. Ten cm also largely negates the geometry effects from the sources.

Happy to discuss

From: SEPA

Sent: 16 December 2011 17:34

To: [REDACTED]
[REDACTED]

Cc: HPA

Subject: Dalgety Bay Advisory Group - Agenda & Papers for Tuesday 20 December

Dear Members & Observers,

Dalgety Bay Advisory Group – Papers for 1st Meeting: Tuesday 20 December

Please find attached Agenda and Papers for the first meeting to be held at Dalgety Bay Sailing Club next Tuesday.

The contact details of the Sailing Club are:

[REDACTED]

[REDACTED]

[REDACTED]

██████████
████████████████████

From: SEPA

Sent: 30 January 2012 11:33

To: HPA

Subject: DBPAG

Hi

The agenda for the DBPAG meeting is just being prepared, and I'll sort out the old papers from the last meeting to send to you and ██████████. The distribution list has been sorted and you both should receive everything from now on.

Best wishes,

From: HPA

Sent: 27 January 2012 14:39

To: SEPA

Cc:

Subject: RE: Dalgety Bay skin doses

Hi ██████████

Thanks for your prompt reply. Would you be able to get us something to see re method/assumptions etc before Wednesday as I think discussions will be more productive if we have assimilated the different facts first.

██████████
From: SEPA

Sent: 27 January 2012 13:33

To: HPA

Cc:

Subject: RE: Dalgety Bay skin doses

Hello ██████████

Yes we do need to discuss and to get the data validated before anything goes into the public domain. Early flag was simply to make you aware of this potential issue prior to finalising HPA's updated advice.

Wednesday would be better for me

From: HPA

Sent: 27 January 2012 13:20

To: SEPA
Cc:
Subject: Dalgety Bay skin doses

Dear [REDACTED]

An early comparison of the estimated skin doses HPA external dose experts have made (comparable with the earlier radiochromic dye film measurements) and the values you sent by email yesterday are showing large discrepancies, with your values being substantially higher. This is a complex problem and will need careful consideration of all the contributions to the doses to the skin, including any potential contribution from high energy alpha emissions that could reach the sensitive layers of skin, and time to obtain a considered position with more measurements/calculations needed. Before your results are to be presented/distributed in a public forum, our view is that it is very important that an account of the methods and assumptions you have made to obtain these measurements is provided so we can start to discuss and resolve these differences.

As you are aware HPA has committed to providing an interim scoping assessment based on which it is providing up-dated interim advice to Scottish Government, NHS Fife and others by the end of January. With objects being of a size that can be trapped close to the skin, we need to have as realistic an estimate of skin dose rates as possible at the current time. We therefore need to know exactly what has been included in your dose-rate measurements/estimates as details of the methods and assumptions made have been provided; this is not clear to us from your emails.

I appreciate that you are very busy but it would be extremely beneficial if we could have a teleconference next week to start these discussions, possibly also to include [REDACTED], having seen an account of the methods etc you have used,. Tuesday would give us time to look at any documentation and we can share our calculations with you as well. Is this possible for you? I look forward to hearing from you.

Regards

From: HPA
Sent: 26 January 2012 18:17
To: SEPA
Cc:
Subject: RE: skin doses - preliminary information

Thank you for the up-date. We are looking at doses to the skin from direct contact as well as getting objects in close contact to the skin in shoes, clothing and under finger and toe nails. We are also considering whole body external gamma doses from being in close proximity to an object(s). I have revisited the experimental radiochromic dye film work that [REDACTED] did on earlier finds. It is rather surprising that the dose-rates measured are significantly different for objects of similar sizes and nuclide composition, although I appreciate the physical appearance and composition appear to be different. It is important that between us we explore

the approaches and calculations that are being used to understand these differences so we giving the best picture we can of the situation.

It would be good to talk next week, hopefully before the 3rd, about what our external dose experts at HPA have been doing and understand more about the measurements you have been making.

Regards

From: **SEPA**
Sent: 26 January 2012 15:15
To: **HPA**
Cc:
Subject: skin doses - preliinary information

Hello

We have just come back from a visit to try and analyse the dose rates from the High activity and some other sources recovered from Dalgety Bay. Although the data is preliminary and needs careful checking it looks as if a source of around 40 kBq Ra-226 will deliver a dose of around 10 Sv/Hr to 100 micron skin (contact). It is notable that we have recovered both before and after Christmas high numbers of sources of this activity and many of these are small and could be trapped under fingernails etc. This provides further evidence to suggest that the nature of contamination has changed since SEPA's 2008 work.

The calculated contact dose rate for the high (76MBq source) was many times greater and we were unable to obtain a gamma spec result due to total saturation of the detector.

We are hoping for draft data on recent solubility work at the end of this week or the beginning of next.

I am unwilling to ask for any further work to be undertaken, on these high sources at this time due to the extremely high dose rates.

From: **HPA**
Sent: 25 January 2012 18:09
To: **SEPA**
Cc:
Subject: RE: DBPAG - Note of first meeting

Dear [REDACTED]

[REDACTED] and I have not received any of the documents that it was agreed would be circulated to the expert gp at the meeting. It may be that these have not been circulated yet but I would like to check what the position is with providing the observers to the group with the documents that it has been agreed will be distributed to group members. Will we get to see them? It would be really helpful if HPA could have sight of these documents as they will provide valuable information to support the work that we are doing on health risks.

See you both next week.
Best wishes

From: SEPA
Sent: Mon 16/01/2012 16:24
To: [REDACTED]
[REDACTED] HPA
Subject: DBPAG - Note of first meeting

Dear all,

Please find attached a draft note of the first meeting of the Dalgety Bay Particles Advisory Group.

If you have any comments, please send them to me prior to the 26 January, in order that a revised version may be produced prior to the meeting on 3 February. The meeting is likely to be held at the Dalgety Bay Sailing Club; however this is yet to be confirmed by the venue.

Kind regards,

From: HPA
Sent: 25 January 2012 18:09
To: SEPA
Cc:
Subject: RE: DBPAG - Note of first meeting

Dear [REDACTED]

[REDACTED] and I have not received any of the documents that it was agreed would be circulated to the expert gp at the meeting. It may be that these have not been circulated yet but I would like to check what the position is with providing the observers to the group with the documents that it has been agreed will be distributed to group members. Will we get to see them? It would be really helpful if HPA could have sight of these documents as they will provide valuable information to support the work that we are doing on health risks.

See you both next week.

Best wishes

From: SEPA
Sent: 18 January 2012 17:07
To: HPA
Cc:
Subject: RE: Questions on the SEPA monitoring data to 6 December 2011

██████████

Further the ██████████ emails, following AMEC's monitoring of the area (we still do not have data on the number/activities of sources recovered) SEPA re-monitored about ½ of the affected area and recovered 228 sources from that area (240 in total) some of which have activities in the E5 range. Thus, given the limitation of our detector and the area we have covered I would suggest that the re-population rate for the area is at least in the high 100's since November, although when the AMEC data is added this will be even higher.

Some of the sources are very very small (to be confirmed when lab data on dimensions are available). The area where some of these have been recovered from is also very dry and drains rapidly following tides, thus I think there may be a need to consider the inhalation pathway.

From: SEPA

Sent: 18 January 2012 12:03

To: HPA

Cc:

Subject: RE: Questions on the SEPA monitoring data to 6 December 2011

Dear ██████████

Please find attached a response to your queries – this includes a response from ██████████

It is clear that there are some data entry typo's with respect to the grid references, however these should be viewed with caution anyway as the GPS error is about +/-5 m in any direction. It is not always possible to collect data for each particle due to environmental factors (e.g. failing light, incoming tides etc).

For AMEC data SEPA does not have any information on the system used to provide a conversion between the cps record and an activity. SEPA understands that AMEC do not fully isolate the particle in the field, so the recorded cps value is given for the sample as recovered, which is likely to be surrounded by sediment/stones etc. It is extremely likely that the actual cps (and therefore activity if a conversion figure is provided) is much higher.

I also understand that the AMEC system has been modified in light of SEPA's finds. This is likely to change the alarming criteria, action level and monitoring coverage, however SEPA do not have any information on the set up of the modified system. We are also aware that MOD's contractors were on the beach for approximately 2 ½ weeks surveying in response to the recent storms. We have not yet been provided with any information on the items recovered or area monitored. This has been requested by SEPA and also through the Expert group.

Please come back to us if your have other queries.

Thanks,

██████

From: HPA

Sent: 16 January 2012 17:08

To: SEPA

Cc:

Subject: Questions on the SEPA monitoring data to 6 December 2011

Importance: High

Dear ██████████

Having looked at the data as input to the scoping risk assessment we have agreed to do for Scottish Government by the end of January, a number of questions have arisen which are listed in the attached document. Some are potential omissions but there are a couple of possible errors which you may want to alert others in the expert group to. I would be grateful if you could look at these queries as soon as possible.

One option is that I could possibly discuss with ████████ when I see him on Friday!

From: SEPA

Sent: 18 January 2012 11:56

To: HPA

Subject: RE: DBPAG - Request for Information

Hi ██████, I'm just emailing you our response to your queries. I will not be in the office this afternoon or tomorrow, but perhaps we could have a quick chat on Friday at FSA?

From: HPA

Sent: 18 January 2012 11:51

To: SEPA

Cc:

Subject: RE: DBPAG - Request for Information

██████

I have discussed this with ██████████ and explained what our current advise was based on and also discussed how we are planning to interpret the monitoring data

for the scoping assessment we are doing to support interim to advice to Scottish Government that we have agreed to do by end of January. [REDACTED] and I agreed a robust way forward for using the 'Estimated activity' values where there are no gamma spec measurements.

From: SEPA

Sent: 16 January 2012 15:53

To: HPA

Subject: DBPAG - Request for Information

Dear [REDACTED],

I have been asked by [REDACTED] to request information from the HPA for his work with the Dalgety Bay Particles Advisory Group.

[REDACTED] has asked the following question of HPA:

What is the estimated number of particles and activities used within the HPA's risk assessment for Dalgety Bay?

I would be grateful if you would be able to provide this information as soon as possible, ideally by 26 January (or earlier), to allow [REDACTED] time to consider the response prior to the next meeting of the Forum.

Thanks,

From: HPA

Sent: 16 January 2012 17:08

To: SEPA

Cc:

Subject: Questions on the SEPA monitoring data to 6 December 2011

Importance: High

Dear [REDACTED] and [REDACTED]

Having looked at the data as input to the scoping risk assessment we have agreed to do for Scottish Government by the end of January, a number of questions have arisen which are listed in the attached document. Some are potential omissions but there are a couple of possible errors which you may want to alert others in the expert group to. I would be grateful if you could look at these queries as soon as possible.

One option is that I could possibly discuss with [REDACTED] when I see him on Friday!

Many thanks.

**Comments and Questions on the SEPA monitoring data for Dalgety Bay
provided by Paul Dale on 23rd December 2012**

File: Dalgety Bay SEPA finds to 6 Dec 2011 12-12-11

General:

A lot of measurements are not reported with a depth (for example those in DBP-03 and DBP-04). [In this case we assume that the information isn't available. Please confirm. That is correct](#)

There are many measurements where no find location is given (for example DBP-10, DBP-17). [Do these data exist? No](#)

Most of the objects do not have a size estimated for them. [Please can you confirm, as I suspect, that these data do not currently exist? The data does not currently exist](#)

Where dimensions are given they are often only for 2 dimensions (1mm X 1 mm for example). [Has any estimate been made of the third dimension or can you give any guidance as to typical shape? The largest dimensions were measured \(where practicable\) thus the third dimension is generally smaller than that of the first two.](#)

The 76 MBq, 4.5 MBq and 3.6 MBq object retrieved on the 20th November do not appear on the spreadsheet. We have the following information verbally from Paul Dale:

76 MBq estimated in field, friable, size 60 x 50 x 35 mm

4.5 MBq 8 X 5 X 5 mm

3.6 MBq in half teaspoon material (object small). Depth about 70 cm

[Please confirm that this information is correct. Please provide location of finds. Grid ref 16446 83254, Yes this is the information we have at present.](#)

DBP-14 and DBP-15

Some of the coordinates given are in a different format to the others (6 digits compared to the usual 5 digit format). The northing and easting appear to be wrong way round. [We have made the assumption that these are correct after swapping N and E. Is this correct? Checking](#)

DBP-14-27 We think the 'Northing' has a typo and should be 638231 should be 68323. [Please confirm. It looks like there are typo's in the Northing and Easting – will check & confirm, however looking at similar finds above and below the data entry it might suggest that the entry should be NT 16445 83275.](#)

DBP-10-04B

Several measurements have reported activities of Pb-214 that are greater than the activity reported for Ra-226. In most cases the ratio is 1.1 so could be rounding. However, two cases are significantly higher than this (DBP-10-04B ratio 7.6 and DBP-07-01 ratio 1.8). Please can you confirm the PB-214 activities.

This is a relatively low activity particle and our operating software (Gamma Vision) has returned a below detection limit value of 15 Bq (no uncertainty quoted). I agree that the particle is highly unlikely to have a Ra-226 activity below this value, given the Bi-214 and Pb-214 indicate an activity of around 150 Bq activity at a distance from the detector. However, this becomes an academic problem related to counting statistics (low activity source at a distance from the detector) and background interference.

Note on DBP-07-01

This is a very important particle (~10MBq), yielding a high dead time. We have counted this particle twice in different orientations – yielding slightly different 214Pb/226Ra ratios (1.5 and 1.8). This is clearly a function of deviation of geometry and self-absorption from the calibration standard (a disk) and the uncertainty quoted takes into account deviation in geometry down to a very small particles (point sources). If you look at the output for Bi-214 (generally dependent on higher energy gamma photons – including 609keV & 1764 keV), Pb-214 (including 351 keV and 295 keV), Ra-226 (186 keV) and Pb-210 (46 keV), the activity estimate is systematically diminished. This is because the sample (of complex geometry) is generally thicker than the calibration disk and the mass attenuation coefficient becomes increasingly important below 200 keV as sample composition deviates from the standard (due to the photo electric effect). If you break down the activity estimate derived from individual gamma photon lines, then at relatively high energy (Bi-214-1764 keV; arguably least affected by geometry and self-absorption) the activity estimate is about 10 MBq.

So these numbers should be treated cautiously and the ratios can be driven by shape and sample self-absorption in addition to disequilibrium. For reasons described above, I would recommend that the Bi-214 value be used as a more robust estimate of particle activity.

DBP-12-06

Ra-226 activity is 6.4 times greater than the total activity estimated. This appears to be an error. Please confirm. We believe this is an entry issue. The RT30 count rate quoted as 1800 cps in the field should have been 18000 cps. The number written on the container lid was not clear.

The Amec measurements have not been converted from cps to Bq. Is the conversion given in the spreadsheet suitable for the Amec results to? No, AMEC do not currently fully isolate any of the sources it recovers thus the count rate is likely to be an underestimate and SEPA has no conversion factors for AMEC sources

DBP-07 and DBP-08 and others

Only activities (Bq) for individual nuclides have been presented, no corresponding cps or estimated total activity data are given. For consistency and comparison, do you have the cps and estimated total activity data? (as we note that the ratio between the total activity from summing the individual nuclides and the estimated total from the cps is not constant). Data not currently available

DBP-05-01

This has the highest activity recorded within the spreadsheet However, this activity appears to have been estimated rather than based on measurement due to saturation of the detector. How reliable is this estimate? It is from a gamma spec

DBP-05-14

This measurement is also high but no find location is given. Please can we have the find location. Will confirm, however notes and 5 day of survey was concentrated on east of the slipways at the boat area. Approx location will be NT 1650 8315

DBP-02-04 05/07/08/09/11

The easting is given as 80XXX. Is this a typo and should it be 83XXX ? 83xxx would seem right.