

**RESUMED**

**[11.20 AM]**

COMMISSIONER: It being 11.20 we'll reconvene. I welcome  
10 Mr Greg Marshall and Mr Tony Ward from the Department of State  
Development and Mr Keith Baldry and Mr Graeme Palmer and Dr Artem – I'm  
going to get this wrong but, Artem, good to see you again – Borysenko from  
the Environmental Protection Authority.

15 MR JACOBI: The mining regulation division with the Department of State  
Development is responsible for regulating mine operations in South Australia,  
including environmental assessments of new mine proposals and ensuring  
compliance with conditions of tenements and achieving approved  
20 environmental outcomes over the full mine life. DSD owns the former Radium  
Hill mine and the Port Pirie Rare Earths Treatment Facility sites.  
Mr Greg Marshall, who is on the left from the far left, closest to us, is the  
director of Mining Regulation and has had significant involvement in DSD  
strategies to manage those sites. Mr Tony Ward, who is to Greg's immediate  
left, is the manager of Extracted Areas Rehabilitation Fund, EARF, and Mine  
25 Completion.

The Environment Protection Authority is the independent environment  
protection regulator in South Australia. In addition to administering legislation  
concerned with environment protection, most notably the Environment  
30 Protection Act 1993, and community safety, it provides advice on  
environmental management practices to industry and government, including in  
relation to the Radium Hill and Port Pirie sites. Mr Keith Baldry, since joining  
the EPA in 2004, has held a number of directorial roles and is currently the  
director of Mining, Radiation and Regulatory Services. Mr Graeme Palmer,  
35 who is to Mr Baldry's immediate left, was the former manager of the Radiation  
Protection Branch and Dr Artem Borysenko is the laboratory manager at the  
Radiation Protection Branch. We call all of them to the commission.

COMMISSIONER: Gentlemen, welcome and thank you very much for  
40 joining us in Port Pirie today. Mr Jacobi.

MR JACOBI: Perhaps at the outset, Mr Marshall, we can start with you.  
We've given something of an outline in terms of the department's  
responsibilities but I'm just wondering whether you could give a broad outline  
45 of DSD's current responsibilities and then we can go to the predecessor

organisations that existed prior to the Department of State Development.

MR MARSHALL: The Department of State Development's current responsibilities in relation to regulation of mines is the department, or DSD for short, has responsibility for administering the various pieces of mining legislation in the state, the principal one being the Mining Act, and also it has responsibilities for regulation of the petroleum and geothermal sector as well, but in relation to minerals the agency has responsibility for administration of mineral tenure, mining leases and the grant of those, administration of royalty and also the environmental assessment of new mining operations and ensuring ongoing compliance against legislative requirements and conditions of approval for current mining operations in the state, ensuring mines perform environmentally responsibly and close effectively. The department also has responsibilities for management of former mines in the state, particularly the ones that have defaulted to government to actually manage and remediate. There are a number of those in the state, including Radium Hill and Port Pirie.

In terms of the predecessors, so prior to the Mineral Resources Division being in the Department of State Development resources were previously in the Department of Manufacturing, Industry, Trade, Resources and Energy and then prior to that was in the Department of Primary Industries and Resources or PIRSA and then prior to that was called various other names like Minerals and Energy or the Mines Department.

MR JACOBI: Can I just pick up on the mines having – that is, the former mines – having come to be within DSD's responsibility. I'm just wondering whether you could explain how they come within DSD's ambit.

MR MARSHALL: The ones we're currently looking after actually are on land that's in the care and control of the Minister for Mineral Resources through that particular section of Crown land being assigned and in the care and control of the minister or the minister actually owning that piece of land. So an example of the minister actually owning freehold title of the land was Brukunga mine site in the Adelaide Hills, a former pyrite mine. So the minister was responsible for that property. Radium Hill and Port Pirie were on Crown land and that Crown land was assigned to the minister, I think, in 1975.

MR JACOBI: That's in addition to the fact that the state government was in part responsible for operating both the Radium Hill and Port Pirie facilities.

MR MARSHALL: Correct.

MR JACOBI: Perhaps if I can pick up with you, Mr Baldry, the EPA's responsibilities as they currently stand in relation to mining operation and sites such as the sites that we're dealing with, a broad outline of that.

MR BALDRY: The Environment Protection Authority has two principal pieces of legislation, the Environment Protection Act 1993 and the Radiation Protection and Control Act 1992. So in an operational facility usually both acts  
5 would apply and we would issue licences under the Environment Protection Act and the Radiation Protection and Control Act for uranium mining. The situation with regards to Port Pirie and Radium Hill is that we license them both under the Radiation Protection and Control Act and the Department of State Development is the licence holder for that. So we're the regulator under  
10 the Radiation Protection and Control Act of the two sites.

MR JACOBI: Now, the authority has somewhat unique status as a government entity as it's created under its own act. I'm just wondering whether you could explain the nature of its independence and how that operates.  
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MR BALDRY: The EPA has a board of environment protection authority, the authority, and that carries functions that are independent of government, including the granting of authorisations under the Environment Protection Act and enforcement actions carried out under that act. So whilst we are of  
20 government, we are independent in decision-making for some aspects.

MR JACOBI: I think the explanations you've provided is you're both regulators in one sense but I'm wondering, Mr Marshall, if you can explain the relationship of the EPA to DSD in terms of these particular two sites.  
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MR MARSHALL: In relation to Port Pirie and Radium Hill the department is responsible for managing those sites and for ensuring adequate controls and environment protection for both those sites. In the case of these two sites the EPA is the department's regulator for those sites through the registration of  
30 those sites under the Radiation Protection and Control Act.

COMMISSIONER: Can I just interrupt there, Mr Marshall, and perhaps I should know the answer to this question. Can you explain the circumstances where responsibility in 1975 was transferred back to the state government?  
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MR MARSHALL: I think the answer to that goes back further than that with the way in which those operations were first established. So in the dawn of the nuclear age in the 1950s all Australian governments saw the strategic importance of uranium deposits, both for military purposes and civilian  
40 purposes. So the government in those days sought to take control over the exportation of uranium deposits. They established schemes for encouraging uranium exploration to find deposits, and when the South Australian government sought an opportunity to export the Radium Hill deposit they established a piece of legislation called the Uranium Mining Act in 1949,  
45 which provided for the State government to actually own and operate a

uranium hill at Radium Hill and a treatment plant at Port Pirie.

5 So it's been a government operation from the very start, or from that phase of the life of Radium Hill, because as you heard from the witness, activities at Radium Hill have been occurring since 1906, but in the 1950s, given the strategic nature of uranium deposits, the government took control over there, established a government-controlled operation, and then took responsibility of the legacies of those sites.

10 MR JACOBI: And have ongoing responsibility for that.

MR MARSHALL: Correct.

15 MR JACOBI: And presumably at various other times leased out the operation to other operators.

MR MARSHALL: I don't recall Radium Hill ever being - - -

20 MR JACOBI: No. I was - - -

MR MARSHALL: But certainly the Port Pirie site has been allowed to be used for other operators.

25 MR JACOBI: Okay, and so perhaps just picking up one more thing, Mr Baldry, in terms of the predecessor bodies, in terms of the regulator, I'm just wondering if you could explain the regulation history with respect to radiation in South Australia before the creation of the EPA.

30 MR BALDRY: Okay. So the EPA started in 1995 and the Radiation Protection Branch of the EPA joined the EPA in 2002. Prior to that, it was with the Department of Health. So from 1992 until it joined the EPA, the Radiation Protection Branch existed administering the Radiation Protection Control Act, and prior to that it - there was an advisory function within the South Australian Health which didn't have regulatory powers but provided  
35 advice to government on radiation.

MR JACOBI: Could you just expand on a little on what you mean by not having regulatory powers?

40 MR BALDRY: Well, the Radiation Protection Control Act came into being in 1992 and prior to that, there was - in fact, Graeme Palmer is probably better placed. He was nearer to this.

45 MR PALMER: Prior to the Radiation Protection Control Act, radiation protection came under the Health Act. So there were provisions within Health

Act to licence people to operate x-ray machines and handle radioactive substances and also register x-ray machines and radioactive sources, but the main impetus in those days for radiation protection was protecting the health and safety of people and were mainly directed toward medical radiation, industrial radiation and so forth. So it's not until the Radiation Protection Control Act was made in 1982 that there were real provisions for controlling radiation on uranium mines and uranium treatment plants.

The Health Commission, I think - well, the Health Commission has always been a body of people, a committee. Previous to the late 1970s, the Department of Public Health was responsible for administration of the Health Act radiation protection provisions. The South Australian Health Commission was formed towards the end of the 1970s, I believe, and that became two things: a body of people, and a department. So there was the department - I don't know how many people were there, but the Radiation Protection Branch sort of came into being towards the end of - as a regulator of uranium mines and so forth, when the Radiation Protection Control Act - towards the end, 1980 and 1982, when the regulations and the Act came into being in 1982.

The regulations weren't made until 1985. So we still administered part of the Health Act, I believe, until 1985 in terms of regulating x-ray machines and things, but the real controls came into force in the early 1980s.

MR JACOBI: Perhaps I can pick up on that. You heard Mr Kakoschke's evidence this morning, I think, in terms of the state of the radiation protection that was in place in the 1950s and early 1960s. I'm just wondering whether you can identify, from your experience, sort of the key milestones in terms of regulation and regulation change since that time.

MR PALMER: Well, I think the main milestones might be the transition from protecting people, and the intention was that if you protected people you protected the environment, but there was more effort in terms of - and I don't really know what the Health Department did in terms of surveillance. I believe it was probably the Mines Department at the time were responsible, I guess, for the health and safety of workers on the uranium mines rather than the Health Department itself. So there was surveillance of radiation doses and surveillance of radon exposures in the mine, but that wasn't - - -

MR JACOBI: In what time period?

MR PALMER: Well, during the mining operations and during the operations at Port Pirie and Radium Hill. There was, I believe, surveillance of radiation exposure levels and of course there was a study of the outcomes of uranium miners that was published by the Health Department, their immunological department, and people from the Radiation Protection Branch contributed to

that particular study. That was really looking at data that was taken from dose rates and radon levels in the mine when it was operating, but I don't know who actually took those measurements.

5 MR JACOBI: So we have records from the 50s and 60s when mining was taking place at Radium Hill of dosage levels?

MR PALMER: Yes. Well, there was sufficient information there to actually do a study of outcomes like lung cancer rates of miners.

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MR JACOBI: Do we have that data?

MR PALMER: Well, I don't know that we've got the data. Might have to look back into the archives whether the EPA still has the specific data. It's probably within the Health Department more, and the University of Adelaide, that were conducting the actual study. So that data should be available somewhere else, but I don't believe that the EPA has that specific data on those rates and radon broader exposures.

20 MR JACOBI: I'd just like to follow that through. If we were measuring that information at that time, were we aware of the impact of uranium on personal health? Presumably that was the reason we were - - -

MR PALMER: Yes. Studies go back to, you know, the early 1900s or, say, the 1920s and 30s, there were studies of exposure levels in uranium mines. That's my understanding.

MR JACOBI: All right. We'll pick up on that data once we conclude today. I'd see like to see it. We've heard quite a bit about Radium Hill this morning already, and I'm just interested perhaps if we can deal with the Port Pirie treatment plant. Perhaps this is you, Mr Marshall and Mr Ward. But I'm just (indistinct) get a broad outline of the activities that were carried out and over which time periods they were carried out at the Port Pirie plant.

35 MR MARSHALL: Sure. So as Mr Kakoschke said in his evidence, there was uranium concentrate railed from the Radium Hill site to Port Pirie for treatment. The treatment process there involved an acid leach of the uranium concentrates to bring the uranium mineral into solution, and then there was a purification process involving iron exchange and various other sort of tanks called counter current decantation tanks to purify that solution. So they ended up with a leachate that just had the uranium mineral or the uranium oxide just in that solution, and then there was a process of precipitating out that uranium mineral into a product called yellow cake, or uranium oxide.

45 The waste produced during that process was the residue from the leaching of

the concentrates, and I think it was commonly called tailings, but it was a leached material from the acid process and that material was placed out in clay lined ponds adjacent to the treatment facility.

5 MR JACOBI: Now when was that activity carried out and when did that conclude?

MR MARSHALL: So that occurred over the life of the Radium Hill mine from the mid-fifties to 1961.

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MR JACOBI: And the activities after 1961?

MR MARSHALL: So after that the – just get the timing right here. So in 1968 there was a company called Rare Earth Corporation – actually this gets back to ownership to. So there was a period where that site was actually owned by another entity, it was owned by Rare Earth Corporation, so the government did actually sell that property to Rare Earth Corporation for a period in 1968. Their operation was centred on processing a mineral called monazite. So monazite is a radioactive mineral that is a produce produced from the mining of heavy mineral sands. The sand you find on shorelines on beaches. And monazite, I think is a – or the radioactivity in monazite is from thorium and the process that was undertaken there was called process monazite cracking to extract rare earth from the monazite. So that again, created more residue from that process and that was deposited on site too, and some other residue dams. I can't recall when that actually finished but that came to an end and the site was actually purchased back by the South Australian government after the Rare Earth Corporation finished their activities.

There was a period where there was – the site was used for recovering lead from batteries, from 79 until 86 and in 1988, there was a company called SX Holdings, planned and developed and established equipment on site for the extraction of rare earths from the existing residues in the dams on the Port Pirie site and one of the minerals that they were mainly interested in was scandium which was sourced from the radium (indistinct) and was contained in the residues of tailings left on site there. The scandium price, when that started, the scandium price was quite high but the scandium price is quite volatile and by the time they got around to commissioning the plant, I think the scandium price was at a level that wasn't economic to carry on with the plant, so the SX Holdings operation didn't actually ever get commissioned and they didn't produce.

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MR JACOBI: A key feature of the Port Pirie site are its tailings dams.

MR MARSHALL: Yes.

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MR JACOBI: And I'm just wonder in fact whether you could explain the size of those dams? What they contain?

5 MR MARSHALL: So the tailings dams, I can't recall the actual area of the site but they contained about 200,000 tonnes of tailings material and they were essentially the waste that was – or the left over from processing the concentrate from Port Pirie, sorry from Radium Hill. So it's like the invaluable minerals that were contained in the ore, that was in the ore that was mined from Radium Hill, so it would actually include some rare earth minerals and like  
10 scandium and some other rare earth minerals that I can't pronounce the name of, they're in the bottom of the periodic table. And there were some heavy metals in there as well.

MR JACOBI: And this might be a question that Mr Baldry can also address  
15 but in terms of what are considered to be the key environmental issues that arise from the operations that were conducted at the site?

MR BALDRY: The environmental issues today?

20 MR JACOBI: Yes.

MR BALDRY: Given the location, I think that the possibility of movement of materials to groundwater in to the marine environment would be the principle concern. In previous years, prior to slate being placed on top of the material  
25 there would be concerns about airborne dust being raised from the tailings and also radon emissions from the material as well.

COMMISSIONER: I assume proximity of community would be a concern because of the dust?

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MR BALDRY: Yes. I think that it's obviously not a location you'd choose today but the proximity to both the marine environment and the local population would be the concerns.

35 MR JACOBI: And putting to one side the issue of radiation, which I think is picked up in the answer then, is there also an issue arising given the nature of the other materials that are contained within the tailings?

40 MR BALDRY: Yes, from an environmental perspective that sort of heavy metal content would be the principle concern, in terms of chemical toxicity.

MR JACOBI: Coming back and Mr Marshall, in terms of the information that's now available, and I understand that some review has been done of documents that have been held by DSD, are you able to make any expression  
45 or view about the overall planning? That is, at the time that the activities were



established either at Radium Hill or Port Pirie? The sort of planning that went on to take in to account environmental considerations?

5 MR MARSHALL: We've reviewed many of the documents on record that the department still has available to it and it was difficult to find any reference to – or planning those operations, taking environmental impact in to account. So I think that was reflective of the times when the commencement of mining operations, or in the planning of mining operations there were no environmental impact statements in those days to do an assessment of impacts on the environment in the early phases of the operation. So the planning of those operations was very much focussed on having – establishing an effective well managed operation from the point of view of delivering the project objectives and doing that safely. So I think it was pretty clear that there was consideration for the safety of employees and workers during those days but we've not found any evidence that there was any sort of environmental impact assessment process undertaken. Nor was there any consideration during the planning of the operations, how the site would be closed to a point where you could say there was – the site, the project was complete from the point of view of closure – of either site.

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MR JACOBI: By closure you mean decommissioning? In terms of at the time that the projects were planned?

25 MR MARSHALL: Well, both decommissioning, in other words, in shutting down the operations but also in closing the site to a point where we would call it mine completion which is where the site would have been brought in to a state that no longer needed ongoing management and monitoring.

30 MR JACOBI: I think this might – the next one might be for you, Mr Palmer. In terms of the radiation involvement at the time that the activities were carried out, what was the extent of the radiation regulation or activity at the time that these activities were undertaken?

35 MR BALDRY: Well, I'm not aware of the Health Department at the time, or Department of Public Health being involved in radiation monitoring but - - -

MR JACOBI: Did it have regulatory power at that time?

40 MR BALDRY: It had regulatory power but those powers were mainly directed towards radioactive substances and x-ray apparatus used in the industrial or primarily in the medical area.

45 MR JACOBI: Sorry. I should have been clearer. Did it have regulatory power in relation to the activities that were being carried out on those sites?

MR BALDRY: I don't believe they did. I mean I'd have to study the – try and find a copy of the old regulations but I don't believe they – they could have extended the regulatory power that way but if, at that time, the Mines Department were basically taking responsibility for regulation in terms of doses to the workers, then the Health Department, I would – maybe took a back seat if you like, so to speak. Because I think always had regulatory powers to protect the health and safety of people from exposures to radiation but it may have been that the Mines Department at the time actually took on that responsibility.

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MR JACOBI: Is there a contrast to the position as it stands today under the Environment Protection Act and under the Radiation Protection and Control Act?

MR PALMER: Well, under the Radiation Protection and Control Act I guess there certainly is a contrast because we have specific regulations and provisions in the act for regulating uranium mines. I don't believe that there were licences, for example, for uranium mining under the Health Act. Licences were only for people, basically, and for registering either x-ray machines or radioactive sources – sealed sources, we call them – and capsulated sources used in industry, or also registering premises which are places like universities or health departments where radioactive chemicals or radioactive agents are used for diagnosis or treatment of patients, that sort of thing. So the short answer is not until the Radiation Protection and Control Act was made do I believe the Health Department or South Australian Health Commission have specific powers for regulating uranium mining or mineral processing activities.

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MR JACOBI: Perhaps back to you, Mr Marshall. I want to come now to the practical management of the circumstances that would have presented environmental risk. Perhaps we can come to Radium Hill first. I'm just interested to understand how – we've heard a little bit from Mr Kakoschke this morning about how tailings were managed. I'm just wondering whether you can give any insight, based on work the department has since done, about how tailings were managed at the Radium Hill site.

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MR MARSHALL: The operation of the tailings dam was pretty much as Mr Kakoschke described it. The tailings impoundment was actually constructed of tailings as it was deposited. I think the initial starter wall – there would have been an initial starter wall created to contain the first lot of tailings deposited which were deposited through a pipe that went around the circumference of the tailings impoundment and the tailings deposited through what we call spigots or holes in those pipes to create a beach of tailings where the water and the tailings then separated from the tailings, like waves on a beach, and then the water recovered for going back into the process.

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As the tailings were deposited it would make the facility higher and then there would be an ongoing process of making the tailings wall or the impoundment by winning tailings material and then constructing the wall. I think the  
5 technical term for that is upstream construction. So the method of depositing or storing tailings would be very consistent with many other operations around Australia and the world.

MR JACOBI: I think Mr Kakoschke explained that as at the time of closure  
10 the tailings dam was essentially left. Is that consistent with your understanding?

MR MARSHALL: Yes, it is.

15 MR JACOBI: Stepping aside from tailings, we also heard some evidence about the fact that the rock was used for other purposes. I'm just wondering whether you could explain where you understand that rock might also have been used.

20 MR MARSHALL: I don't really have any more information to add to what Mr Kakoschke mentioned about the use of the waste rock. The other term used was the heavy-medium reject which was that conical pile at the end of the plant used for road-making material and railway ballast.

25 MR JACOBI: We've seen some evidence with respect to work that was done in the early 1980s with respect to the tailings dam. I'm just interested to understand, perhaps from both you and Mr Baldry, in terms of getting a bit of an understanding about what was done in the early 1980s with respect to securing the tailings dam.

30 MR MARSHALL: I think it was recognised by that time that the dispersion of the tailings was occurring through primarily wind erosion but some water erosion as well during rain events. You can see that dispersion of the tailings from aerial photographs that show the plume or the hue of grey tailings  
35 downwind of prevailing wind of the tailings facility. So the department, a former version of the Mines Department, undertook to win soil material from the immediate area surrounding the tailings dam to place a cover over the walls and a cover over the top of the tailings dam to contain the tailings material from further dispersing through wind and erosion.

40 MR JACOBI: Are either of you able to speak to the design of the nature of what was then done at that time in terms of securing the sailings dam?

45 MR WARD: Well, I understand that it was covered. The decision was made to cover the sides with three metres of that material and one metre across the

top. There was a suggestion of using rock armour but that was found to be beyond the budget and it was not used. So what's left there today is what was really done in that period of 1981. Where there's approximately three metres, less some erosion, on the sides and one metre across the top, that pretty well  
5 encased the remaining tailings there and has prevented further wind erosion of that tailings.

MR JACOBI: What's the significance of rock armour?

10 MR WARD: Rock armour would stop the wind from eroding the sides of it. The sides are naturally very steep. They're normally at what we call an angle of repose which is about 37 degrees. At that steepness there is the difficulty of vegetation growing. Some does but it's difficult. There is a tendency for it to erode under the influence of water and/or wind. Rock armouring would  
15 prevent that erosion or substantially reduce it. If you were going to have something sitting up high then you need some sort of rock armour or a different type of soil. In today's climate a tailings dam will be designed and constructed with a clay wall and rock armour and, in many mines, there is a combination of waste rock and the tailings that were contained within that to ensure that there  
20 is no erosion of the sides of that.

MR JACOBI: Is there a difference in terms of the angle of repose to that?

MR WARD: Well, it can be sometimes but if you've got rock armour at  
25 37 degrees it will generally remain stable. The disperse of soils will not necessarily remain stable.

MR JACOBI: Perhaps just in terms of Port Pirie briefly, we've heard some evidence about the environmental risks. I'm just wondering whether there's a  
30 distinction between the risks that are presented by the plant site and by the tailings site and whether there's a distinction that we need to bear in mind with respect to that site.

MR MARSHALL: I think the main risk associated with the plant site is just  
35 remnant radioactive material that could be dispersed or creates an exposure risk. I guess my colleagues at the EPA can talk about that. Just focusing on the plant, in the mid-2000s we recognised that there were still buildings from the former operation there (indistinct) operation and the water tower was still on site and there was quite a bit of material there that encouraged vandalism  
40 and pilfering on site which meant that it was just attracting people to go on site and, therefore, creating exposure. So we undertook to demolish all those buildings and remove all that basically to remove the attraction of unauthorised entry on that site.

45 There's some areas on site there in the plant area where slag has been placed to

5 minimise the risk of dispersion or pathways from radioactive material in the former plant area. On the tailings dam itself or on the tailings facilities at Port Pirie, as Keith has already mentioned, the risk there is associated with the risk of affecting groundwater through base seepage in the tailings facility and then also the risk of exposure to radioactive materials through airborne wind dispersion or radon.

10 MR JACOBI: I'm wondering whether anyone is able to speak to the expansion or development of the tailings facilities at Port Pirie.

MR MARSHALL: Sorry, in what - - -

15 MR JACOBI: As I understand it, there were initially tailings facilities developed for the uranium treatment plant and then there was an alteration to those tailings dams or there was additional tailings dams added - - -

MR MARSHALL: Yes, there were additional tailings dams added to the area during the Rare Earth Corporation's project for taking the residue from their monazite cracking project.

20 MR JACOBI: Are there key differences with respect to the risks that presented between the tailings dams used for one purpose and used for the other?

25 MR WARD: One risk or one event did occur on the Rare Earth's tailings dams. They were to the north of the plant and adjacent to the other six dams from the uranium. They were actually constructed at a lower level of the wall which was in fact inundated in the 80s from a king tide/storm surge. So those walls were raised up to the same level as the other six dams and I believe they were then covered as well in that process of covering it with the lead slag.

30 MR JACOBI: So I'm right in understanding that the buns around all the tailings dams are now consistent? Is that right?

35 MR WARD: Are now consistent, at the same level.

40 MR JACOBI: Can I just deal with the topic of decommissioning in a systematic way in terms of perhaps Radium Hill first. We've heard some evidence this morning about the way that decommissioning was managed in the 60s. I'm just wondering whether you've got anything that you want to add, Mr Marshall, to the way that the Radium Hill site was decommissioned and closed.

45 MR MARSHALL: I think Mr Kakoschke's description of the process of decommissioning is – we would agree with that. So it was very much about

removal of useful plant and equipment from the mine and the mineral processing site for later use on other operations which is common amongst mining operations. Our understanding of what happened in the town is consistent with Mr Kakoschke's evidence. Clearly, from later events it was clear that the controls necessary for ensuring that the site remained safe and stable weren't completed during that early decommissioning stage.

MR JACOBI: I'm interested in that. In terms of the regulations that stood in the early 1960s with respect to decommissioning was there any requirement that required consideration be given to the way that a mine site would be decommissioned?

MR MARSHALL: None that we're aware of.

MR JACOBI: From the EPA and the radiation point of view, are you aware of there being any requirement that existed at that time in terms of the way those materials were handled?

MR MARSHALL: I'm not, no.

MR WARD: I may be speaking a little out of school but I'm not sure that – we tend now to demand a lot more and we also tend to look back at some of these earlier operations through the lenses of today's understanding. I've said amongst people that I suspect the people involved in the formation of Radium Hill and Port Pirie wouldn't be able to spell the word "environment" and I'm not being facetious there. It was never a subject at school in the 60s. The whole emphasis that I have seen in looking at this process is one of – we have four governments involved, Great Britain, America, the Commonwealth, the State. This is really an imperative. We have the Cold War atmosphere. We have an importance to get this job done. All the pictures indicate that that mine and the process work was run in a workmanship-like manner. In fact, it's neater than some of the mines today.

But the focus was technical excellence, getting the job done and the environment, the decommissioning was not something – it seems strange to us today but it actually just wasn't considered. I mean, this came as a shock to the miners that it would end, but it did. So the whole environment of looking at this mining process both at Radium Hill and Port Pirie is from a vastly different perspective when it was constructed. I think that's just something that perhaps adds a way of looking at this and as to why some of these things weren't taken into account.

MR JACOBI: I understand that Port Pirie has a somewhat more recent history than Radium Hill itself has in view of what has been explained.

MR WARD: Yes.

MR JACOBI: I'm interested to understand just in practical terms what was done when it was decommissioned both at the end of 1961, as I understand it, and also when the Rare Earth Corporation's activities ceased and the land was sold back to the state government. This is in practical terms.

MR MARSHALL: I don't have a huge amount of detail on that other than it seems that there was a desire to keep much of the plant there because of the potential for ongoing use and for recovery of materials from the tailings dam. So the history of that site suggests that there was – rather than sort of planning to remove and completely close the site, there was always the suggestion that this site could be used for something else. Therefore, many of the facilities were kept for an after use. One of the useful purposes that site performed in recent times is there was one particular large shed that was used on site for storing what was a waste product that – at that time was Pasminco, now Nyrstar – was stored. It was a waste product that came in from their operations in Hobart at the Risdon smelter called paragoethite. It was stored on site there in one of the big sheds and was for reprocessing in the Port Pirie smelter. So there has been this history of leaving equipment there for the benefit of such purposes.

MR JACOBI: I think your evidence is that, as the position stands now, that's no longer the case. That (indistinct) has been stripped away.

MR MARSHALL: Yes. So one of the things that we did in recent times was we got ANSTO to undertake an economic study of the potential for reprocessing the tailings at the Port Pirie site and to determine the likelihood of an economic operation establishing there. That was determined to be unlikely.

MR JACOBI: You mentioned in the evidence the coverage of parts of the slag from the operations nearby. I'm just interested in understanding when that occurred and what the primary purpose of doing that was.

MR MARSHALL: So the date of when that occurred - - -

MR WARD: It occurred in the mid-80s, 1980s. I don't have the exact year but it occurred in the mid-80s and the purpose of that was twofold. One is to prevent dust from being blown off the tailings and, two, to reduce the radiation level to anyone walking over that. So it's quite effectively in actually reducing that radiation level and it's effective in reducing the dust because it's quite a coarse, granular material. So those are the purposes of doing that in the 80s. There were some other rehabilitation efforts with clay and dirt on some of the areas but it was mainly the slag was used to cover those areas, dams 2 to 5 and a bit of 5 and 6 and there were two openings left at dams 1 and 6 for water that

flows in, rainwater as such, to evaporate, because if we covered everything then it may become saturated. So it was left to those two areas to drain, to evaporate.

5 MR JACOBI: I want to come to deal with the legacies as the position stands.

COMMISSIONER: Can I just finish with the decommissioning. It seems to me that the state has had to pick up responsibility for rehabilitation in the mines when ownership is transferred. Is there requirement in the current legislation  
10 for some sort of surety for mining operations for decommission? Is that part of the licence today? Do you keep some sort of bank guarantee so that there is confidence when mining operations complete that the state doesn't have to pick up responsibility when entities close?

15 MR MARSHALL: I'll answer that. It's a requirement under the Mining Act. Section 62 of the Mining Act gives the minister authority to require from a tenement holder where a mining operation has occurred, required to lodge a rehabilitation bond to provide financial assurance to the state government  
20 against the rehabilitation liability for the mine. So the policy principles against which that section of the Act is administered is that the bond amount requested from the tenement holder is the amount that's been assessed as the estimated rehabilitation liability for those operations. That is actually reviewed during the life of the operations.

25 COMMISSIONER: When a mine is given approval then, is the manner in which it's to be decommissioned covered in that initial mining approval? Or is the decommissioning something that's considered later on in the operation of the mine?

30 MR MARSHALL: So the current legislation under the Mining Act requires that the mine completion arrangements to be sort of outlined at least in the conceptual level for the – during the assessment of a new mine operation, before the decision is made to grant a mineral tenure for that operation. During that assessment the impact both during the operation and the impacts at closure  
35 are assessed. The plans presented by the proponent on closure are assessed and conditions are put around that. Then if that operation is approved and a mineral tenure is granted for that project the operator for that project is required to submit a programme for environmental protection and rehabilitation and that programme has requirements in place for during  
40 operations for the protection of the environment and also requirements and therefore how the site will be decommissioned and closed. As the operation, mining operations change over their life, operations are extended, the processes are improved, those operations – the closure aspects of that are – there is ongoing opportunity for reviewing those plans.

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COMMISSIONER: Is it public knowledge, the extent of the bond required to rehabilitate a mine after it has finished its life?

5 MR MARSHALL: Well, the requirements for the bonds are – I guess they’re public by virtue of the requirements of the Act. Did you mean the - - -

COMMISSIONER: The dollar amount?

10 MR MARSHALL: The actual rehabilitation liability estimates are included in the programmes for environment protection and rehabilitation and that’s required through the guidance material or the – what we call determinations that set out the mandatory requirements for all those people. The actual – any member of the public, in terms of the actual bonding arrangement, any member of the public can inquire that information through inquiring with the  
15 department through the mining registrar and for a particular operation, the bond requirements can actually be – the advice on that can be got through that pathway as well.

20 COMMISSIONER: Thank you.

MR JACOBI: Before we get to the position as it stands today and in terms of what studies and other works have been done, I’m just interested to understand what monitoring was done in the period from the sixties to present day at the Radium Hill site, of the condition of that site?

25 MR WARD: I can’t answer that directly as to the extent, I haven’t been able to determine that but the information – sort of the picture I have is that very little information, very little monitoring was done, formal monitoring was done during that period from the time it closed. Obviously, we do have inspectors that do look and during the seventies the condition of the tailings dam became an issue. Some of the other things that were done was to fill in the openings and the shafts and that’s not something you do once, you generally have to come back to make sure that they haven’t subsided, so that’s an ongoing inspection level. There’s little evidence I have of ongoing or any radiation  
30 monitoring during that period. So the principle inspections was, is it safe? And when we saw the tailings blowing around, blowing in the breeze, then it was time to do something about that, at that stage.

40 MR MARSHALL: I think from what we’ve been able to establish, the actual monitoring of the site, from the point of view of public safety in relation to the mine workings, became more routine once the radioactive waste repository was established on the tailings facility and the tailings had actually been covered with soil, so there was a need to monitor the erosion on the soil and monitor the security around the low-level radioactive waste repository that had been  
45 established on the tailings facility.

MR JACOBI: In practical terms, how was that monitoring done in terms of once the capping work had been done?

5 MR MARSHALL: Through visitation and site inspection from department personnel.

MR WARD: Visually, to look. Secondly, there are some stakes in there, very rudimentary but measured whether there's been an erosion around the stakes.  
10 But primarily it's a visual inspection, can I see anything eroding? So it is rudimentary in that sense but nevertheless that's quite valuable, if you look and see and can't see anything, reasonably comfortable that not much is occurring.

MR JACOBI: The shift to Port Pirie facility - - -  
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MR MARSHALL: I'll just finish off on the Radium Hill too, so there have been various radiation surveys done over the site there to measure radon, gamma and dust over the period of time. The most recent exercise was as part of the process for the department developing a management plan for the site and characterising the site. So in between 2004 and 2009, there were radiological risk assessments done on Radium Hill and Port Pirie where the previous data for radiation - - -  
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MR JACOBI: I will come to that.  
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MR MARSHALL: Yes.

MR JACOBI: (indistinct) in a minute.

30 MR MARSHALL: Okay.

MR JACOBI: Can I just – can I come to just deal with Port Pirie in the same way in terms of the way that the Port Pirie site was monitored after perhaps – during the 1970s and thereafter?  
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MR WARD: There were some more, because we had people working there during some of that time, there was a greater involvement in looking, viewing that site. But there wasn't a lot of radiological monitoring to my knowledge but there was monitoring of the operation. I think the fence eventually was put up in 1978, if my memory is correct, and that fenced off the area to provide security. Prior to that it hadn't been fenced. So that was done to try and limit the access to people. And then it was just ongoing monitoring. A lot of the rehabilitation work, by that I mean the spreading of the slag, was done in the eighties and that was an ongoing monitoring operation of that site and then that dropped off but reviewed in 2004, 2010 when the ACOM did a far more  
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complete study.

MR JACOBI: Perhaps we can pick up and deal with that intense (indistinct) studies done and perhaps Mr Baldry, what was the motivating force behind the studies that were done during the period from 2004 to 2010?

MR BALDRY: Australia signed the joint convention on the management of radioactive waste in – it was ratified in 2003.

MR PALMER: Yes, about 2001 or two, we signed the joint convention on spent fuel management and radioactive waste management. The signing of that convention then required some time shortly after there for Australia to report to the joint convention in respect to Australia's compliance with that joint convention and each state radiation authority was asked to contribute to the national report that was prepared by the Australian Radiation Protection and Nuclear Safety Agency. In preparing that report, it was asked, were there any legacies – well, we had to address whether there were legacy sites and states and territories needed to demonstrate how they were complying with the joint convention, particularly one of the articles, article 12 of the convention that required states to look at legacy sites and determine whether remedial action should be required and so forth. So with that being said, it identified that Radium Hill and Port Pirie, while the EPA, and previous to that, the Health Department or - it was actually the Department of Human Services just before when we referred to the transfer to the EPA. While we did occasional monitoring and checks to determine any radiation risks, if you like, there was also - it hasn't been mentioned so far - a scrap dealer who occupied the site for some time and was basically wandering around the site breaking up batteries and causing a mess by himself, but he was evicted from the site under the provisions of the Radiation Protection Control Act where it was considered that it was a dangerous situation, that he could expose himself. But to move on - what was I?

MR JACOBI: We were at the point of explaining the link between the joint convention - - -

MR PALMER: Yes.

MR JACOBI: and (indistinct)

MR PALMER: So it then highlighted the fact that while the EPA regulated in respect to keeping some surveillance of what was happening at Radium Hill and Port Pirie, there wasn't an actual licence put on the site. At that stage, our Act didn't actually provide for licencing that sort of facility, so we registered the facility under the Radiation Protection Control Act. The only interesting distinction is that registration is normally applied to nuclear medicine

departments or university laboratories, however it covers any site where unsealed radioactive material is contained or used.

5 So under that particular provision of the Act, section 29, which allows us to register a premises, we registered the premises of both Port Pirie and Radium Hill in the name of the minister at that time, and by registering them at that time, we placed conditions on the registration that initially required them to assess the sites, if any immediate things could be done, but also then to determine what steps might need to be taken, if any, to rehabilitate the sites.

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MR JACOBI: I'm right in understanding, aren't I, that the licence conditions required a series of studies to be undertaken over a period of time?

15 MR PALMER: That's right, and the purser produced initial reports that were presented under that registration to the EPA. A little while after then - I'm not quite sure what year it was, probably 2012 - the Radiation Protection Control Act was revised, so we had a provision within the Act that we could licence places like Port Pirie and Radium Hill, or any other facility that didn't specifically fall into the category of a uranium mine, for example. Uranium mine provisions have been in the Act since 1982, but they didn't actually contain provisions, for example, to licence a facility like the Port Pirie facility, but we could have when it was operating. In fact, the rare earth's plant was registered as a premises.

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25 So that provision was there, and there was really no difference in terms of how we regulated Radium Hill and Port Pirie when it changed from a registration of premises to a licence for past practices. That's basically how we express it.

30 MR JACOBI: Now, in terms of the studies that were done, what were the broad areas that were covered in terms of what was analysed?

35 MR PALMER: Basically the containment of existing structures and surveys of the radiation levels around the sites. I'd have to refer to the conditions on the licence, but certainly the available reports on the purser website (indistinct) for Port Pirie and Radium Hill report - the first phase reports, which basically complied with the EPA's requirement under the licence to provide those reports, they contain all of that information that's relevant.

40 MR BALDRY: I think the two aspects they provide is the radiological conditions of the site, and that's in terms of the various methods by which you could be exposed to radiation, the gamma radiation or the inhalation of dust, or for the Port Pirie site, the potential for groundwater to contain radioactive materials to get into the environment and then people to be exposed that way, to actually assess the levels, and then make an assessment based on how people live in both areas, what the potential exposure in terms of a radiation dose

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might be for a representative person or a worker, a member of the public.

MR JACOBI: Can we come to those issues of radiological risk, and perhaps we can deal with Radium Hill first and we'll deal with Port Pirie in a minute.  
5 I'm just interested in terms of studies that are undertaken, what the results were, in broad terms, with respect to the nature of the radiological risks that would be presented to what you described as these characteristic scenarios.

MR BALDRY: The broad conclusion is that there's no risk presented to either  
10 the public or to a worker who might be on the Radium Hill for a particular reason, and that's based on the radiation levels that are and the amount of time you could expect someone to reside in the area. The longer you stay there, the higher dose would be from any residual activity.

15 COMMISSIONER: Are there warning signs at the site?

MR BALDRY: There are at the tailings facility. I guess principally that would be to explain it's not an area you want to be digging into. There's  
20 certainly no requirement based on the usage of the site to actually warn people to stay away because there's controlled access to the pastoral leases anyway.

MR JACOBI: In terms of what was assessed for its potential radiological impact, are you able to explain what was assessed in those States? Was it just  
25 the mine sites or was it other areas?

MR BALDRY: Certainly around the mine site and the roads, and I think the former township there as well.

MR JACOBI: Perhaps we could come to the Port Pirie site, the same issue in  
30 terms of what were the assessments with respect to the radiological risks that will be presented by the Port Pirie site.

MR BALDRY: The broad conclusions are the same in that there's no risk to  
35 any member of the public or any worker who was in the Act. It does identify that there are elevated areas of dose rate where if you spent all your time on the tailings dams you could exceed some of the reference level which would make us take action, but given that nobody is going to do that, the conclusion is that no reference level is going to be exceeded and therefore it's safe to the public and anybody accessing the area under reasonable circumstances.

40 MR JACOBI: Could you explain what you mean by a reference level?

MR BALDRY: Okay. We base radiation protection standards on intentional  
45 requirements and these are set by the International Atomic Energy Agency, and what they basically say is that if you've got a legacy site, such as Port Pirie or

Radium Hill, you should make an assessment of what the exposures are likely to be, and this was done, and then you should set a reference level between 1 and 20 millisieverts, and to put that into context, the average background radiation dose that we all get is between about 1 and 5 millisieverts, and so - - -

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COMMISSIONER: Per year?

MR BALDRY: Per year, yes. So if any of the assessment showed that a person could exceed 1 millisievert, then we'd be required to set a reference level based on what could be done with the site to reduce those levels or manage that. Because there's no circumstance where that will happen, there's no requirement for us to set a reference level and no requirement for us to intervene to further protect the public or workers.

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15 COMMISSIONER: I think it would be useful for everybody if you would walk through the basis of that reference level, the background, the additional activities and how they are location specific. That sort of general explanation, I think, would be useful.

20 MR BALDRY: Okay. Well, background radiation comes from different places. You get cosmic radiation, you get radioactive materials in everyday foodstuffs and you also get the radioactive material that's naturally in the ground and naturally occurring radioactive material both gives a gamma radiation – that's sort of gamma rays coming from the ground – but also it produces radon gas and other radiological decay processes that creates material that you can breathe in and also gives an exposure. When you add all of these different sources up, depending on where you are, you get probably between one and five because there are different places where the – the levels are different in different areas. The reason that uranium miners go to particular places is because there's more uranium in that place but it generally is everywhere.

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COMMISSIONER: Can certain locations in the world be higher than five?

35 MR BALDRY: It can go up to 250 millisieverts per year in some locations, for example in India, and it's very typical to go up to 10 millisieverts. So there's a huge range of natural background radiation. So the levels we're looking down to one millisievert are pretty low. We know that there's no effect of background radiation on human health. So we can confidently say that looking at radiation exposures in this range is safe for the public and the workers. '

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45 What has happened at Port Pirie and Radium Hill is due to the nature of the activity. We've gathered up this naturally occurred radioactive material and put more of it in one place. So the radiation levels are elevated at both the

tailings dams in particular at Port Pirie and the areas where the tailings and some of the waste rock was at Radium Hill, but even if you took that away, particularly at Radium Hill because it's a higher level of uranium near the surface, you'd still be left with higher levels of natural background radiation at that location than you would in other places.

MR JACOBI: I'm just interested to understand the significance of the slag that has been placed on the site with respect to radiation protection.

MR BALDRY: One of the sources of radiation, because it's only an issue if it – if it just sat there on its own it wouldn't be a problem. It's when you've got radiation and people in the same place. The emission of radon gas from the surface could potentially be windblown to where people are. We've seen that if you have tailings that dry out, dust can be blown. So the advantage of putting the slag from the lead smelter on top is that it contains it, stops it being dust blown. Trial and experiment showed that it significantly decreased the amount of radon that was being emitted, probably because it kept the tailings in a moister condition than would otherwise be the case.

MR JACOBI: I want to come to, with respect to both sites, the issue of the possible to mobilise materials through surface water. Perhaps we can deal first with Radium Hill. We've heard this morning about the nature of the rainfall around the Radium Hill area. I'm just interested to understand how that is thought to present a risk with respect to the movement of materials and, if it is, how is that managed.

MR MARSHALL: I guess the obvious risk in relation to rain events at Radium Hill is the impact of the rain events on the soil cover over the tailings dam through erosion. So clearly when the soil cover was designed at the time in the 80s when that project was undertaken there was a compromise about how much money was spent on it, to the extent that there was soil placed on it which meant that, rather than it just being a measure that could be just left there and not monitored forever and maintained forever, there was going to be ongoing need for maintenance and monitoring to account for the risk of things like rain events and erosion. So the way that is managed from our perspective is to actually go and inspect the site and monitor the condition of that soil cover. If there is erosion there's maintenance necessary to maintain its integrity.

MR JACOBI: Has there been research done with respect to groundwater near the tailings dams at Radium Hill?

MR MARSHALL: Yes. There was a groundwater risk assessment that was done as part of the studies that you asked Graeme Palmer about. So there are a number of monitor wells around the site where the groundwater is being

monitored, both in terms of levels and in terms of quality. As we understand it, apart from the fact there are no users on site anyway so that the groundwater is not useful for pastoral use, from that perspective there is no pathway to people that might be affected by any mobilisation of contaminants. I'm just trying to recall whether actually – I don't think that there was any sort of – I don't think there was any evidence of there being an effect on groundwater from - - -

MR WARD: I don't think groundwater was an issue at Radium Hill because of the very high evaporation rates and generally lack of rainfall. If it does rain very heavily, as we've been told, it doesn't necessarily soak right through. It just flows off. So there's this mass runoff but it's not an area that you get a lot of rain that simply soaks through the tailings. So there has been little evidence. I can't recall exactly what the timings were but I don't recall there being an issue with groundwater movement or transposition from the Radium Hill site but I'd have to check that to be absolutely sure but I don't believe there is.

MR JACOBI: In terms of the surface water mobilisation, I think you might have already covered it in terms of the capping but has there been monitoring of the way that surface water might mobilise or potentially mobilise?

MR WARD: No, I can't say we've done that. Again, I can't recall anything on that. It wasn't seen as an issue to my knowledge, going through the documents.

MR MARSHALL: The focus is on the soil cover being the main control there. So if that control is in place and the integrity of that is okay, well, it's seen that surface water won't mobilise the tailings.

MR JACOBI: Perhaps coming to Port Pirie, again the same issues. In terms of groundwater at Port Pirie – and this is for you, Mr Baldry – is there evidence that there was mobilisation of either the metals or the other materials into groundwater at Port Pirie?

MR BALDRY: Yes, there was evidence of mobilisation to groundwaters. It's not clear what will then happen to these heavy metals that are in the groundwater, as to whether they will then make it to the marine environment. One of the complicating issues is the fact that you've got a lead smelter that's next door and has been operating for a very long time and dominates the heavy metal content in the local environment. So the contribution from seepage through from tailings to groundwater is almost certainly not significant in comparison to the context that's in a lead smelter.

MR JACOBI: Is there evidence of the potential to use those groundwaters in any event? Are they groundwaters that are accessible and useful to humans?



MR PALMER: I don't believe so. I think there's evidence that the contents of the groundwater, if you wanted to use it, it's so salty and it's not – it isn't useful water. However, if you wanted to use it you'd probably need to put it through an osmosis system or something like that to purify it in any case and that would  
5 target the radionuclides or heavy metals that might be there. It isn't envisaged that somebody would really want to use that water but it could be used if it was treated.

COMMISSIONER: Has it been seen necessary to dig some monitoring wells  
10 to track if any of this contaminated groundwater is going into the marine environment from the tailings dam itself?

MR PALMER: I'm not sure; I need to look at the - - -

15 MR MARSHALL: Yes, there were - - -

MR PALMER: I think in the reports that were done by AECOM - - -

MR MARSHALL: So there are some monitor wells that are actually off site so  
20 the monitoring that was done as part of the groundwater risk assessment both looked at migration of – in to groundwater on site and off site, so it was an attempt to determine whether there had been any off site migration and the monitoring didn't provide any conclusive evidence where you could sort of conclude that there had been off site migration. So there wasn't like an  
25 anomaly that sort of made it obvious, yes this was happening off site. But there was quite a lot of effort to try and determine that. The evidence from the monitoring was sort of inconclusive as to whether there was any off site migration of contaminants from the site in to groundwater off site.

30 COMMISSIONER: When was that last conducted?

MR MARSHALL: That was in the mid-2000s.

COMMISSIONER: And is there a view that it might need to be done again, if  
35 the first conclusion was that it was inconclusive?

MR MARSHALL: Yes, that would be part of an ongoing monitoring programme.

40 MR PALMER: There are also several aquifers.

COMMISSIONER: Yes.

MR PALMER: So it's not just between one going that way, it's also vertical -  
45 - -

COMMISSIONER: Yes.

5 MR PALMER: - - - movement as well. The area that the tailings are constructed on is quite a heavy marine clay, so that the tendency for any rapid movement is non-existent. It's a very slow process and certainly as Greg has said, that will be part of that ongoing monitoring.

10 COMMISSIONER: In terms of the ongoing monitoring, do you have a standard operating procedures in terms of what monitoring should be conducted, or is this something that's left up to the individual who is given the responsibility to do the assessment report?

15 MR WARD: What I was going to say was that we do have a series of ACOM reports that we will be using as the basis for determining the risk and therefore on the basis of that we will then establish what the further ongoing monitoring may be. There has probably been a pause, if I'm realistic about it, because the initial report was there's no immediate risk to people. So therefore it hasn't had necessarily the urgency. But nevertheless it is very clearly on our agenda  
20 to take those reports, determine which is the high-risk areas and then to determine a plan. So there is no procedure but there is a format within the reports of what we need to look at. That will then be discussed with the regulators, the EPA and by agreement we will come up with a programme for monitoring that both in the short, medium and longer term.

25 COMMISSIONER: So what is the EPA view on this?

MR BALDRY: The human health risk assessment done in the ACOM reports assumed – let's say in the worst case the highest levels found were migrating  
30 off site. So even if there was no evidence of it, let's say if that happened then what is the most exposed individual and it's probably somebody who would be fishing and catching a lot of fish, consuming a lot of fish caught in that environment. That showed that even under the worst-case conservative assumptions, that there was no human health risk.

35 COMMISSIONER: Right.

40 MR BALDRY: So that gives the EPA confidence that DSD does not need to take immediate action in order to further quantify what the actual levels in groundwater are and how they're changing over time. However, DSD is correct, like over time that would form part of the long-term monitoring plan.

45 COMMISSIONER: So you don't have a view in mind about when this might need to be done again? Because as you, point out, you don't believe there's a risk to human?

MR BALDRY: I mean you can pick a figure to say, well it's the sort of thing that might be done every five years but - - -

5 COMMISSIONER: That's what I was trying to get at.

MR BALDRY: Yes.

MR PALMER: Yes. All I was going to add was that the licensed person or  
10 licensed organisation would prepare a radiation management plan and that's  
the stage that while we have got data on the stage of the environment and there  
are uncertainties, that information that DSD has, at this stage, which we have a  
lot of that information as well, would be used to formulate their radiation  
15 management plan. And then the EPA would assess the radiation management  
plan and if there were areas where the EPA considered more work needed to be  
done or greater monitoring, then we would talk to the licensee and they would  
normally modify their plan, or argue against it, if we were out on a limb by  
some extent and it was unnecessary. But I can't see that happening. But the  
20 normal process for uranium mines or other – these are legacy sites, but normal  
process is that companies submit a radiation management plan, or radiation  
management radioactive waste management plan and the EPA assesses it. But  
if there are difficulties or we see deficiencies at all in that plan then we ask for  
those things to be reviewed.

25 COMMISSIONER: Those sorts of plans would be for instance available for  
Olympic Dam tailing ponds?

MR PALMER: Yes. Yes. They are.

30 COMMISSIONER: Okay.

MR JACOBI: I think just might be one more question before we break, and  
that is in terms of the reports that we've been discussing and in terms of – what  
is the nature in terms of their public accessibility?

35 MR MARSHALL: So the process we've been going through is in accordance  
with the licence conditions, as a phase process, and the initial phase or phase  
one of the projects was to do, I guess, issues identification phase. Those  
reports from that phase one exercise are on the DSD website. Those reports  
40 led to the scope of works for doing the risk assessment data, a gap analysis  
phase of the project, or we'll call it phase two. Those projects – those reports  
are currently not publicly available so we haven't put them on our website  
because we're still going through this process of developing management  
plans. But hope, as we go through that process, they will ultimately become  
45 publicly available.

COMMISSIONER: We will adjourn until 1.45, thank you gentlemen.

**ADJOURNED**

**[12.47 PM]**

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**RESUMED**

**[1.47 PM]**

COMMISSIONER: We'll reconvene, 1.47. I remind the witnesses they are still under oath. Mr Jacobi.

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MR JACOBI: I thought we might pick up this afternoon, from the perspective of everything we discussed this morning, in addressing what are the lessons that have been learned from the activities carried out by the sites. I just wonder whether perhaps we could start (indistinct) perhaps you, Mr Baldry, in terms of what you think are the key lessons that emerge from the Radium Hill and Port Pirie sites.

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MR BALDRY: I mean, the main lesson is to have an actual regulatory framework that covers activities and covers the human health and environmental impacts. It's something that's developed over a considerable time, since the time of the Radium Hill and Port Pirie activities, and I think having a regulator that has responsibilities for overseeing the actions and holding the operator or licensee to a certain standard is - that would be the main thing that we have in place now. Once you have that in place, once you have a legislative system that gives a regulator powers, they can make the assessment and put things in place and hold operators to account.

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MR JACOBI: Do you think that there's a unique distinction, perhaps with respect to these sites, in terms of the fact that they were, in essence, operated by the government and that represents a distinction perhaps to other activities that might be carried out today?

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MR BALDRY: Well, yes, in general most activities in the mining space would certainly be a private - it would be a private or publicly owned company rather than a government operation, but there's no reason you can't effectively regulate government so long as there's a clear distinction between the regulator and the licence holder. For example, I feel quite confident in being independent. Even though both the EPA and DSD are of government, then we are - in separate departments we're reporting to different ministers. We've got our own accountabilities. It is possible to have an arrangement where you can effectively regulate government entities, but in all other circumstances, in all operational situations in South Australia now, yes, we'd be regulating non-government companies.

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MR JACOBI: Mr Ward, I think that might pick up a theme that you picked up

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this morning in your evidence about the fact that there was a social and political context associated with the operation of Radium Hill in particular. I'm just wondering about whether DSD has a view with respect to that issue of separation between regulatory control and the operators at the sites.

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MR WARD: Yes. Having sort of an independent regulator, I think, is essential in ensuring that there's accountability and for ensuring environmental standards are actually set and there's a regulator to ensure those standards are being adhered to during the life of the operation, which wasn't the case during the Radium Hill and Port Pirie operations.

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COMMISSIONER: Can I just go back to Mr Baldry? Can you explain to me the process by which you are independent?

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MR BALDRY: The Radiation Protection Control Act is administered by the Environment Protection Authority and we have clear responsibilities in that. We have responsibilities set out as public servants to administer that Act and that requires us to have the public interest in mind when we are discharging our responsibilities under that Act.

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COMMISSIONER: And you report through the minister?

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MR BALDRY: Yes. So the minister delegates responsibility for administration of the Act to the chief executive of the Environment Protection Authority, and that's onwardly delegated to myself and the radiation protection team.

COMMISSIONER: And your reporting is through the minister?

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MR BALDRY: Yes. On an annual basis we will report, as all government departments have to do, have to produce an annual report. So that report is publicly available and is one of the things that we provide the minister.

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COMMISSIONER: And that's your report to the minister, not the minister's version of what he or she thinks issue going on?

MR BALDRY: Yes. That's signed off by the chief executive of the EPA.

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COMMISSIONER: Okay. And I just follow that up with, how do you keep the regulatory environment best practice? How do you keep yourself up with what's happening in the world?

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MR BALDRY: The most effective way, we find, is sort of benchmarking nationally and internationally. So there are a number of - well, all the jurisdictions in Australia have radiation protection regulatory bodies within

governments, and we will meet four times a year to discuss nationally consistent approaches. For issues such as uranium mining, we find we have to look a bit further afield because there aren't too many other uranium mines in Australia. So we will benchmark ourselves internationally with countries such as  
5 Canada who are held in similarly high esteem as Australia as international best practice.

We're quite concerned that we are regulating as best practice regulators and that the operators in South Australia are operating to best practice international  
10 standards. Part of my job is to actually understand what those standards are and to make sure that we're meeting them.

COMMISSIONER: So you would be familiar with what the Saskatchewan equivalent of the EPA does in terms of monitoring uranium mining in that  
15 State?

MR BALDRY: Yes. Clearly their government structure is slightly different from ours, but in terms of the best practice approaches to surveillance of operations and control of operations and standards that need to be met, then,  
20 yes, we'll ensure that we're at least as good as they are.

COMMISSIONER: And that's something you do regularly?

MR BALDRY: Yes. I personally will contact people in the Canadian Nuclear  
25 Regulatory Commission through contacts with the International Atomic Energy Agency, and we also look at international publications and latest developments in uranium mining. We actually work with DSD in terms of what constitutes best mining engineering practice and come to the conclusion that if - we should be able to demonstrate best practice in Australia and in South Australia for  
30 uranium mining, and that's the main objective - - -

COMMISSIONER: Everyone else is doing it, so I would hope so.

MR BALDRY: Yes.  
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COMMISSIONER: Yes. Okay.

MR JACOBI: I'm just wondering whether, Mr Marshall, you've got a comment to make in terms of your position as a regulator in terms of ensuring  
40 that DSD standards are consistent with those that are applied in other jurisdictions.

MR MARSHALL: Sure. As I mentioned in my introduction this morning, the Department of State Development is responsible for administering the Mining Act, and the Mining Act, I guess, is the principal bit of legislation for  
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5 regulating the industry. It's under the Mining Act that new mine operations are assessed from an environmental impact point of view. And then there's the regulatory framework for ongoing compliance of any approved operations is administered through the Act, and as I talked about before, the provision of rehabilitation bonds is done under that Act, and closure arrangements.

10 So in relation to keeping up with best practice regulatory principles, the South Australian government has a memorandum of understanding with the province of Saskatchewan for exchange, both, of geoscience information. That's about understanding the geology that uranium deposits can be found in, and also for exchange of regulatory information or keeping up with best practice regulation. So we had a recent exchange last year to explore that and came to the conclusion we're very aligned with the regulatory processes in Saskatchewan, notwithstanding the jurisdiction arrangement, departmental arrangement in 15 Saskatchewan are a little bit different than in Australia, but we'll have an ongoing arrangement with Saskatchewan for exchange of regulatory information.

20 We also initiated some exchange with the Nuclear Regulatory Commission in the US, because we'd been using standards that had been developed through the USNRC for the regulation and monitoring of in situ recovery operations, because they have quite extensive experience in that, and some of the standards that they've developed through their experience we've adopted for South Australian operations.

25 MR JACOBI: You mentioned closure requirements and I'm just interested to understand, we (indistinct) this morning that there was no plan for decommission with respect to either of the facilities that we've been discussing. I'm just interested to understand the extent to which it's now a requirement to 30 have such planning for decommissioning both with respect to a facility such as that undertaken at Port Pirie and with respect to a mine that would be similar to that conducted at Radium Hill.

35 MR MARSHALL: So you probably need to deal with those both separately. So if there was a new uranium mine commenced in the State, in (indistinct) there's a requirement for the planning and design for all aspects of closure to be included in the program for environment protection and rehabilitation and for those aspects to be updated during the life of the operation, and that's a requirement of the Mining Act and the regulations, including what we call 40 completion outcomes and completion criteria for determine whether those completion outcomes have actually been achieved.

45 MR JACOBI: Are the criteria themselves required to be updated as knowledge changes?

MR MARSHALL: Yes. They are reviewed, yes, but the standards - and this is probably (indistinct) relationship between that regulatory process and EPA that - many of the standards that form the basis for those criteria for determining whether a particular standard has been achieved, a lot of those standards are derived from EPA environment protection policies and radiation protection standards for uranium mines.

MR JACOBI: What I was interested to understand is, if at the time that the mine commences it's thought that only a particular state of affairs can be achieved but it's subsequently realised over the next 20 year perhaps that certain other outcomes could be achieved, can they be added to or changed by the regulator?

MR MARSHALL: So if there's opportunity to improve environmental performance on a site, yes, we would be pursuing those opportunities to achieve a better environmental outcome.

COMMISSIONER: I've asked this question before, but I'd really some more specific information. Perhaps I didn't phrase the question - so let me blunt. In terms of Olympic Dam, what surety does the government have that there is sufficient funding available to remediate the mine? You could use any example. What is the level of confidence that funding exists in good times and bad for the activities to be remediated and the state not to have that responsibility?

MR MARSHALL: I'll start with Olympic Dam. Olympic Dam has been developed under its own piece of legislation called the Roxby Downs (Indenture Ratification) Act and that act in itself provides for environmental regulation in there. In that particular case the Mining Act doesn't apply. All other uranium mines in the state are being developed and approved under the Mining Act. So the provisions for bonds under the Mining Act apply for those mines that are under the Mining Act. The current indenture for the Olympic Dam operation does not include provisions for bonds.

You might recall there was an assessment of the expansion of Olympic Dam and during that time there was a new indenture developed and passed through parliament. The environmental regulation aspects for Olympic Dam were - there were extra provisions put in that new indenture, including a provision for providing for rehabilitation bonds. Whilst that indenture has gone through parliament, that has not yet commenced because of BHP not proceeding with the expansion plans that were assessed at the time.

COMMISSIONER: Understood. So the bonds, explains the structure of the bonds. This is physical cash?

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MR MARSHALL: So once the amount has been determined the department or DSD request the tenement holder to lodge a bond and that can be in the form of cash or a bank guarantee.

5 MR JACOBI: I think we separated out dealing with the Radium Hill mine from the Port Pirie facilities. I just want to come back to dealing with how we ensure that there's a provision for rehabilitation with a facility such as Port Pirie.

10 MR MARSHALL: The other way a facility like that could be established would be through an application under the Development Act. There is another pathway there because it's not a mine. There have been some facilities in the past that have been established under the Mining Act under a tenure called a  
15 Miscellaneous Purpose Licence where activities are directly related to a mining operation. The other pathway for development for that sort of processing facility would be under the Development Act. The Development Act has its own provisions and therefore an environmental impact assessment and development of guidelines for what is required for assessment of a facility like that, and that would be the opportunity to make sure the standards for closure  
20 were incorporated in that assessment and then subsequent for the ongoing approval.

MR JACOBI: Mr Baldry, do you have anything you'd add from the EPA's perspective?

25 MR BALDRY: If you had an operation such as occurred at Port Pirie then that would require a licence under the Environment Protection Act. The Environment Protection Act also has a provision for financial assurances in the way as the Mining Act. So if you had an operation that for some reason didn't  
30 fall under the provisions of the Mining Act we still have an opportunity under the Environment Protection Act to make sure that financial assurances are in place for rehabilitation.

MR JACOBI: Would it have been sought if somebody had come forward and sought to develop a facility such as that at Port Pirie? Are financial assurances routinely sought?

MR BALDRY: They would be applied only in the high-risk situations. The EPA has thousands of licences. So it's only on specific rare occasions that we  
40 would think the risk is high enough to warrant a financial assurance, but in a case such as Port Pirie where you're creating a longer-term legacy then that might be one of those occasions.

MR JACOBI: I direct this to both of you. How is the value of those  
45 assurances set?

MR MARSHALL: The scope of what needs to be done for closure is set out in the detail in the program from Environment Protection and Rehabilitation and through an understanding from DSD what the miner needs to do to do the rehabilitation. So that forms the scope of the works. That needs to be costed. The cost of doing those works is then estimated by using unit cost rates that the government would be most likely to have to pay to actually do those works. So the department, they've gone through a process of getting independent information about those unit cost rates from quantity surveyors and other consultancies to incorporate into a rehabilitation liability estimator or calculator, spreadsheet, that cover every aspect of the mine that would be rehabilitated.

MR JACOBI: Putting to one side Radium Hill and thinking about Port Pirie, are you of the view that if one applied modern standards that the Port Pirie wouldn't be sited where it is if that application was made now?

MR MARSHALL: If you were assessing an application now through an impact assessment process you'd be identifying all the environmental values that need to be protected from the proposed development. You'd be assessing potential – and you'd be assessing the risk of that operation having an impact on those values, both during operations and at closure. Given, I guess, the proximity to a town and to the marine environment, the likelihood of an application successfully going through that process would probably – I personally say it'd be unlikely.

MR BALDRY: It wouldn't happen.

MR MARSHALL: No, it wouldn't.

MR JACOBI: Sorry, Mr Baldry, do you want to expand on that?

MR MARSHALL: Mr Baldry being more blunt than I am.

MR BALDRY: It's quite obvious that the potential environmental impacts in a marine tidal environment right next to a residential population would mean that you would not approve the siting of such a facility in the location that it is now. There are legacy sites that can be managed but the objective when approving operations is always that you don't end up with a legacy site. So it must be possible to operate and rehabilitate and close without leaving the situation that Port Pirie tailings now finds itself in.

MR PALMER: There are also operational aspects. So with a uranium mine, for example, Roxby Downs township is quite a way away from the mine and it's demonstrated that there's no risk to the community there but you wouldn't

put a chemical plant as close to places occupied by the public. Even though you will control the emissions from the area, they become a more critical group the closer you place the mines or treatment plants to a populated area. So for operational reasons you wouldn't want to place it – even in terms of the slight  
5 increase in exposure to the public. It might be marginal but a plant could add an extra .5 millisieverts to the public if you had them right next to a facility that was operating.

10 COMMISSIONER: Could I ask a general question. We heard in earlier evidence today how important it was to open the Radium Hill mine and the pressure – perhaps the pressure or the willingness of the government to assist in that. How should we be confident that the same level of encouragement to get more mining activity won't produce a similar outcome in the future? How  
15 confident are we that pressure isn't put on organisations such as yours to short-circuit activity to encourage future mining activity and growth with a view to the short term rather than the longer term? Now, I appreciate there's a different level of knowledge now than the 50s but we keep talking about independence. Explain to me how we would – you would – resist that  
20 temptation to look at the short-term activity at the long-term environmental impact? Don't rush. Anyone would be good.

MR MARSHALL: Just wondering who you were looking at.

25 COMMISSIONER: Walk me through the steps. This is not an accusation; I just want to get a sense of how we protect ourselves in the longer term?

30 MR MARSHALL: Yes. So apart from the point of view of just making sure from Department of State Development's point of view, making sure that the environment is protected for any new operation, it's recognised that the environmental performance and closure of mines - and that will influence  
35 public acceptance of mining being a legitimate activity in the state. So Department of State Development, being an economic development agency, is interested in the economic development of mines and the exploitation of the state's mineral resources for the benefit of the state, from a social and economic and environmental point of view. But in order to achieve that and  
40 the community has to have acceptance of those – of mines and for the community to be – have that acceptance, they have to be confident in the environmental performance and the regulation of those operations. So - - -

40 COMMISSIONER: So would that logically mean that those documents might be available to the community to look at?

45 MR MARSHALL: Well, that is – yes, thank you for that. A necessary part of making sure that the community is confident, or the broader community is confident in what is happening in the mining industry, transparency is

absolutely mandatory. So the decision-making and the documents related to the regulation of mines in the state are all publicly available. So all the programmes for environment protection are on the DSD website for the uranium mines in the state and the other major mines. Compliance reporting is made publicly available, so that the public can see how mines are complying with their regulatory obligations.

COMMISSIONER: Mr Baldry, do you have a view?

MR BALDRY: Yes, I think that – well, clearly the objects of both Acts that we administer state that we are to have the economically sustainable development in mind when we're making these approvals but – yes, I would repeat that point that the transparency is something that is different now. It's an expectation from the community that government's transparent in its decision-making and they are quite right in that, and it's something that we tend to be limited, only by technology, in terms of making things available. It is certainly a desire to make the basis of our decision making clear and open to critique and question. And so we've got the approvals process where all documents are made publicly available and in fact for the more significant developments, there's a requirement for public involvement in the decision making process. All those documents are available and then when you're looking at the operation of the facility, there is routine reporting required. Those reports are all made public. So for example, for a uranium mine, all of the annual and other reports that we require under the licence, will be made available. We require people to publish on their websites and in terms of the closure, that would be the same. We would expect that all the documents will be available for scrutiny.

I also think that in terms of pressure, there is recognition now that there's no point in unsustainable development. There's no point in the short term approval of things which give longer term problems because it devalues – you look at uranium mining in South Australia and hold it up as an example, if it ceased to be that example then we would find it very difficult, quite rightly, to get public acceptance of further uranium mining. So it's in the interests of everybody to not cut the corners and not bow to the short term pressures but to make sure that we only approve sustainable mining operations. That applies to other approvals as well. There's no point in having financially or environmentally unsustainable businesses operating in South Australia. Doesn't add benefit to anybody.

MR PALMER: In fact under radiation protection legislation, it's the responsibility of everybody up to the minister, to ensure protection of people and the environment from the harmful effects of radiation. The ALARA principle to keep doses as low as reasonably achievable is one of the cornerstones of our legislation. So we all have responsibility not to approve

something if it's going to affect the health and safety of the people and the environment.

COMMISSIONER: Thank you.

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MR JACOBI: We've heard this morning about the waste management disposal techniques that were used at both sites and I'm just interested whether you could identify what you consider to be the key lessons in terms of waste management and disposal that emerge and then how those particular waste management techniques would be applied now?

MR WARD: I was going to say, particularly around the tailings issue, the tailings dams are now – have a much greater focus, not just because of radioactivity but because of the potential for acid mine drainage, which is a long term issue far beyond the life of the mine. So an assessment of that particular characteristic of the ore and the tailings needs to be made and the design of the dam, or the design of any waste storage facility needs to take those things in to account. For some things, that means it has to be fully sealed up. For others it needs to be under water. So there's a combination of those depending on the ore. So this goes far beyond just radioactive mines. So there's a need to construct properly designed, engineered structures to hold tailings and they are generally of a pervious clay layer, sometimes lined, similarly with the walls and rock armouring to hold them together, or some other form, so that they can last the long term. So there's quite a substantial difference in to what we've seen both here in Port Pirie treatment works and in the Radium Hill tailings disposal.

MR JACOBI: Is what you've described, would that also be required at a processing facility? That is a facility similar to that that was carried out at Port Pirie?

MR WARD: Well - - -

MR JACOBI: Just in terms of the design of the tailings?

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MR WARD: probably haven't had a lot that have been separate from the mine, mining and processing operation but yes, it would be required. Generally the tailings come from a processing facility and they have to be constructed as such. So if that were to arise again, where there's a separation of the mining and/or treatment, then you would require exactly the same at both sites.

MR JACOBI: I think one last specific issue, and that is in terms of operational environmental management. I think what we've heard, certainly from Mr Kakoschke in terms of the way that it was operationally managed, this is both the – particularly at Radium Hill, I'm just interested to understand how

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the operational environmental management, that is not decommissioning, not start up, how that's now managed under state law?

MR MARSHALL: For tailings management?

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MR JACOBI: Yes, particularly for tailings but also for other aspects of the mine's operation?

MR WARD: Well, perhaps I'll address that. There are requirements – we  
10 have requirements for dust monitoring, so understand that we have the whole  
spectrum, somewhere in the middle of nowhere and it probably doesn't get the  
severe attention. But for critical and large sites, there's the requirement for  
dust monitoring, for taking steps to minimise the dust generation and that can  
15 mean anything up to real time, dust monitoring with alerts occurring, SMSs,  
right through to static monitors and in fact a combination of that. And then an  
assessment of what the dust load that that particular mine is actually  
contributing to the environment as opposed to the general atmosphere.  
Because in summer most of our dust comes from elsewhere but determining  
20 how that – so that's the dust aspect. The monitoring of the tailings would be –  
need to be monitored, how they're going, any water issues. Another key  
aspect, erosion, so they're all key aspects that are now monitored and complied  
with and that's part of the compliance reports for many mines.

MR MARSHALL: I will just add to that, so for all the tailings dams in the  
25 state, we would expect that the proponent would present a design for the  
tailings dam. It would demonstrate long-term stability, including under  
earthquake loading. That that design would be independently certified. That  
the construction of that tailings dam wall, during the life of the operation,  
would be independently audited and monitored to ensure that it was being  
30 constructed in accordance with the design and that those audit reports be  
provided to the department.

COMMISSIONER: Gentlemen, thank you for your evidence. I realise you  
are busy men and I appreciate taking a day to join us in Port Pirie. We will  
35 now adjourn until 2.45 when Dr Paul Ashley will give evidence.

**ADJOURNED**

**[2.20 PM]**