



Memorandum

To: K Gibson, T Colton

From: S Grimes, G Edwards

Date: 9 October 2020

Subject: **Applicability of the EPBC Act and Regulations for the future Atlas site of Image Resources NL**

Dear Kalon and Todd,

This document describes the Environment Protection and Biodiversity Conservation (EPBC) Act (1999) and Regulations (2000) and their potential applicability to the future Atlas mining and processing site of Image Resources NL.

EPBC Act and Regulations and ARPANSA regulatory documents

1. General notes on EPBC Act and Regulations

It should be noted that the EPBC Act is currently under review and I have participated in the relevant discussions and provided detailed comments on the proposed amendments through the Chamber of Minerals and Energy of WA.

In the new version of the Act, the “Nuclear Actions” definition (that is potentially applicable and is discussed below) has been drafted to align with the Codes of Practice and Safety Guides issued by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).

This is considered to be acceptable, as:

- The Licences issued by the Radiological Council of Western Australia for Mining and Milling of Radioactive Ores are, for some years now, contain the following condition: “*The registrant is directed to comply with the requirements stipulated in the Australian Radiation Protection and Nuclear Safety Agency Code of Practice and Safety Guide for Radiation protection and radioactive waste management in mining and mineral processing (2005)*”;
- The draft WA Mines Safety and Inspection Regulations are also based on the same ARPANSA Code of Practice RPS-9 (2005)

The universal application of ARPANSA Code of Practice (RPS-9, 2005) will ensure that a clear and agreed definition of radioactive material is available, both to the mining and mineral processing industry and to the regulatory authorities.

2. Detailed description of EPBC Act and Regulations and their applicability to the Atlas site

EPBC Act (in Chapter 8 – Definitions, Part 23 – Definitions, Division 2 – General list of definitions) contains the following:

nuclear action has the meaning given by subsection 22(1).

nuclear installation has the meaning given by subsection 22(1).

Subsection 22(1) states, **22 What is a nuclear action?**

(1) In this Act:

nuclear installation means any of the following:

- a) a nuclear reactor for research or production of nuclear materials for industrial or medical use (including critical and sub-critical assemblies);
- b) a plant for preparing or storing fuel for use in a nuclear reactor as described in paragraph (a);
- c) a nuclear waste storage or disposal facility with an activity that is greater than the activity level prescribed by regulations made for the purposes of this section;
- d) a facility for production of radioisotopes with an activity that is greater than the activity level prescribed by regulations made for the purposes of this section.

It is clear from the above section of the EPBC ACT that the Atlas mining and processing site does not fall under the definition of “nuclear installation”.

The same section 22(1) of the EPBC Act contains a definition of “nuclear action” as follows:

nuclear action means any of the following:

- a) establishing or significantly modifying a nuclear installation;
- b) transporting spent nuclear fuel or radioactive waste products arising from reprocessing;
- c) establishing or significantly modifying a facility for storing radioactive waste products arising from reprocessing;
- d) mining or milling uranium ore;
- e) establishing or significantly modifying a large-scale disposal facility for radioactive waste;
- f) de-commissioning or rehabilitating any facility or area in which an activity described in paragraph (a), (b), (c), (d) or (e) has been undertaken;
- g) any other action prescribed by the regulations.

It is concluded that the only possible means the mining and processing of naturally occurring radioactive materials (NORM) can be classified as nuclear action is the application of the following two subsections:

- 22(1)(d), if the ore that is mined and/or processed contains significant concentrations of uranium (i.e. some tantalum, rare earth and phosphate minerals), or
- 22(1)(e), if in the course of mining and/or processing of minerals the radioactive waste is generated in quantities exceeding those prescribed in the EPBC Regulations and concentrations stipulated in other Regulations referred to in the EPBC Act and Regulations.

The discussion of the applicability of these two subsections to the Atlas mining and processing site is provided below and it is important to note that the official Internet site of the Australian Department of Agriculture, Water and the Environment provides additional comments on the applicability of these two subsections, <https://www.environment.gov.au/epbc/what-is-protected/nuclear-actions>.

These are reproduced below, with additional information highlighted:

- d) mining or milling uranium ore, **excluding operations for recovering mineral sands or rare earths;**
- e) establishing or significantly modifying a large-scale disposal facility for radioactive waste. **A decision about whether a disposal facility is large scale will depend on factors including:**
 - o **the activity of the radioisotopes to be disposed of,**
 - o **the half-life of the material,**
 - o **the form of the radioisotopes,**
 - o **the quantity of isotopes handled.**

3. Applicability of subsection (d) to the Atlas site

It is concluded that subsection 22(1)(d) is not applicable to the Atlas site, as it is the “operation for recovery mineral sands”.

4. Applicability of subsection (e) to the Atlas site

In regards to the subsection 22(1)(e), two criteria need to be met for the EPBC Act and Regulations to apply:

1. The waste should be classified as “radioactive material”, and
2. The criteria detailed in the EPBC Regulation 2.02 *Nuclear activity level (Act s 22(1))* (Part 2 – Matters of national environmental significance, Division 2.1 – Nuclear action) are met:

(1) ...For paragraphs (c) and (d) of the definition of **nuclear installation** in subsection 22(1) of the Act, the activity level is:

- b) if the installation contains only 1 type of nuclide and all sources of that nuclide at or above the activity concentration value mentioned for the nuclide in Part 1 of Schedule 1 to the Australian Radiation Protection and Nuclear Safety Regulations 2018 are unsealed sources— 10^6 times the activity value for the nuclide set out in that Part; or
- c) in any other case—a level for which a mixture of sealed and unsealed sources of nuclides is excessive.

(2) A mixture is excessive if:

- b) the unsealed source activity value is greater than 10^6 and the unsealed source activity concentration value is greater than 1; or
- c) both:
 - (i) the sum of the sealed source activity value divided by 10^9 and the unsealed source activity value divided by 10^6 is greater than 1; and
 - (ii) the unsealed source activity concentration value is greater than 1.

(3) In this regulation:

unsealed source activity concentration value means the sum of the fractions calculated for each nuclide by dividing the activity concentration for each nuclide in the mixture by the activity concentration value for the nuclide set out in Part 1 of Schedule 1 to the Australian Radiation Protection and Nuclear Safety Regulations 2018.

unsealed source activity value means the sum of the fractions calculated for each nuclide by dividing the activity of each nuclide in the mixture in unsealed sources by the activity value for the nuclide set out in Part 1 of Schedule 1 to the Australian Radiation Protection and Nuclear Safety Regulations 2018.

The unsealed source activity concentration and activity values for thorium and uranium set out in the Part 1 of Schedule 1 to the Australian Radiation Protection and Nuclear Safety Regulations 2018 referred to in the EPBC Regulations are 1 Bq/g and 1000 Bq are the same as in:

- *Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing* (ARPANSA, RPS-9, 2005), activity concentration value;
- *Safety Guide on Management of Naturally Occurring Radioactive Material (NORM)* (ARPANSA, RPS-15, 2008), activity concentration value; and
- *National Directory for Radiation Protection* (ARPANSA, RPS-6, 2017), both activity concentration and source activity values;

The activity concentration values of 1 Bq/g for uranium and thorium in “bulk materials” are also confirmed in:

- *Controlling NORM – management of radioactive waste, Managing naturally occurring radioactive material (NORM) in mining and mineral processing – Guideline NORM-4.2* (Department of Mines and Petroleum of WA, now Department of Mines, Industry Regulation and Safety, DMIRS, 2010);
- *Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards* (International Atomic Energy Agency (IAEA), GSR Part 3, 2014); and
- *Application of the Concepts of Exclusion, Exemption and Clearance* (International Atomic Energy Agency (IAEA), RS-G-1.7, 2004) and in its revision that is expected to be published in 2021.

It should be noted that the “source activity” value of 1000 Bq would always be exceeded at all mining and processing sites, irrelevant of the type of mineral. For example in a typical building sand/rock quarry where all

materials contain only 4 parts per million (ppm) of uranium and 2 ppm of thorium, approximately 0.07 Becquerel per gram (Bq/g), the value of 1000 Bq for “source activity” is exceeded when the volume of material exceeds 15 tons. Therefore, the important and relevant parameter is the “activity concentration value” of 1 Bq/g.

The current Atlas Ore Reserve contains 8.1% heavy mineral, including 10.6% zircon, 50.7% ilmenite, 4.5% leucosene and 7.5% rutile. The naturally occurring radionuclides, thorium, uranium and their decay products in secular equilibrium (as no chemical or thermal processing of minerals will take place), will be concentrated in the product and the expected activity concentration of the heavy mineral concentrate (HMC) is 4.11 Bq/g (800 ppm of thorium and 70 ppm of uranium). Similar to the existing Boonanarring Operation all produced HMC will be exported and there will be areas on site where the materials with elevated concentrations of naturally occurring radionuclides will be deposited.

The only tailings that will be generated on site in the course of mining and processing of the heavy mineral sands ore will be (a) sand, (b) clay fines (slimes), and (c) oversize.

The data on expected, measured and typical activity concentration in these tailings streams has been obtained from different sources and is summarised in the Table below.

Activity concentrations in tailing generated during mining and primary separation of heavy mineral sands

Source of information	Activity concentration (Bq/g)		
	Sand tailings	Clay Fines (slimes)	Oversize
Boonanarring, measured	0.03	0.01	0.04
WA CME Guideline ¹	< 0.16 – < 0.33	< 0.25	< 0.16 – < 0.33
IAEA Safety Report ²	< 0.40	< 0.24	< 0.32

1 – *Best Practice: Radioactive Waste Management Guidelines in the Western Australian Mineral Sands Industry, The Chamber of Minerals and Energy of WA, 1999;*

2 – *Radiation Protection and NORM Residue Management in the Production of Rare Earths from Thorium Containing Minerals, International Atomic Energy Agency (IAEA), Safety Report No.68, 2011.*

It is not known for any of these three tailing streams to contain thorium and uranium in concentrations exceeding the primary activity concentration criterion of 1 Bq/g.

As the mining and processing operation at the Atlas site will be the same as the Boonanarring site, the approximate radionuclide ‘deportment’ is also expected to be the same as at Boonanarring:

- The ore with the activity concentration of 0.44 Bq/g is mined,
- Thorium and uranium are concentrated in the HMC (at 4.54 Bq/g),
- The activity concentration of the tailings deposited in the mined out pits is at least ten times less than the mined ore contains.

It is, therefore, concluded that subsection 22(1)(e) is also not applicable to the Atlas site.

5. Conclusion

The mining and processing of the mineral sands ore at the Atlas site of Image Resources NL should not be classified as “nuclear action”, as none of the criteria stipulated in the EPBC Act and Regulations are met.

Kind regards and please let me know if any additional information will be required.

Nick Tsurikov