Acronyms

ABN	Australian Business Number
ADT	Articulated dump truck
AHD	Australian Height Datum
AHU	Air handling units
AMAD	Measurement of Aerosol Size Distribution
ARI	Average recurrence interval
AWS	Automated weather station
BOM	Bureau of Meteorology
Bq	becquerel
CEO	Chief Executive Officer
DAWE	Department of Agriculture Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DG License	Dangerous Goods Licence
DPaW	Department of Parks and Wildlife
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
EEC	Endangered Ecological Communities
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986* (WA)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally Sensitive Areas
ESD	Environmental Scoping Document
GIS	Geographic information system
GPS	Global Positioning System
HDPE	high density polyethylene
HWREI Act	*Hazardous Waste (Regulation of Exports and Imports) Act 1989*
ICRP	International Commission on Radiological Protection
ISO	International Organization for Standardization
IWDF	Intractable Waste Disposal Facility
JORC	Joint Ore Reserves Committee
LLW	Low level radioactive waste
mbgl	meters below ground level

mg	milligram
MG Group	Marlinyu Ghoorlie Native Title Party
MNES	Matters of National Environment Significance
MS	Ministerial Statement
NORM	naturally occurring radioactive material
OSH Act	*Occupational Safety and Health Act 1984*
Pa	Pascal
PEC	Priority Ecological Communities
PER	Public Environment Review
PPE	Personal protective equipment
RMP	Radiation Management Plan
ROM	Run of mine
RS Act	*Radiation Safety Act 1975*
SEP	Stakeholder Engagement Plan
SRE	short-range endemic
TEC	Threatened Ecological Communities
TLD	Thermoluminescent Dosimeter
tpa	tonnes per annum
WA	Western Australia
WAA	Works Approval Application
WC Act	*Wildlife Conservation Act 1950*
WFDCP	Waste Facility Decommissioning and Closure Plan
WIP	Waste Immobilisation Plant

Defined terms

Terms	Definitions
Application	means this Works Approval Application
Contaminant	means a substance or object in contact or mixed with a material that presents, or has the potential to present, a risk of harm to human health, the environment or any environmental value.
Contaminated soil	means soil that has a substance in it at above background concentrations that presents, or has the potential to present, a risk of harm to human health, the environment or any environmental value.
Class IV	refer to Landfill Waste Classification and Waste Definitions 1996 (as amended 2019).
Class V	refer to Landfill Waste Classification and Waste Definitions 1996 (as amended 2019).
Discharge	has the same meaning given to that term under the EP Act.
Emission	has the same meaning given to that term under the EP Act.
Environmental harm	has the same meaning given to that term under the EP Act.
Facility	means the Sandy Ridge Facility.
Hazardous waste	means the component of the waste stream which by its characteristics poses a threat or risk to public health, safety or the environment (includes substances which are toxic, carcinogenic, and radioactive).
Intractable waste	means waste whose toxicity or chemical or physical characteristics make it difficult to dispose of or treat safely, and is not suitable for disposal in Class I, II, III and IV landfill facilities.
Material environmental harm	has the same meaning given to that term under the EP Act.
Minister	the Minister responsible for the EP Act and associated regulations.
Near surface geological repository	means the Sandy Ridge Facility capable of accepting and permanently isolating contaminated soils and intractable wastes.
On-site	means within the prescribed premises boundary.
Pollution	has the same meaning given to that term under the EP Act.
Prescribed premises	has the same meaning given to that term under the EP Act.
Proponent	refers to Tellus Holdings Ltd.
Reportable event	means an exceedance above the target limit.
Risk event	where an emission is expected, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission.
Serious environmental harm	has the same meaning given to that term under the EP Act.
Sensitive receptors and ecosystems	areas of high conservation value and special significance that may be impacted as a result of prescribed activities resulting in emissions and discharges from the Facility.
Treatment	means physical, chemical or biological processing of a waste for disposal or reuse.
Unreasonable emission	has the same meaning given to that term under the EP Act.
Works	refers to the Works described in Chapter 3, at the locations shown in Chapter 6 of this Works Approval Application to be carried out at the Premises.
Works Approval	refers to this document, which evidences the grant of the works approval by the CEO under s.54 of the EP Act, subject to the Conditions.
Waste	has the same meaning given to that term under the EP Act.
Waste Acceptance Criteria	means Tellus Waste Acceptance Criteria.

Contents

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Appendices

1. Applicant information

1.1 Applicant details

Tellus Holdings Ltd (ABN 97 138 119 829) (Tellus) owns and operates the Sandy Ridge Facility (the Facility), which acts as Australia's only commercial scale geological repository for Class IV and V wastes.

The Facility was granted approval under Part IV of the Western Australian (WA) *Environmental Protection Act 1986* (EP Act) in June 2018. The Ministerial Statement No. 1078 (MS 1078) approval permitted up to 100,000 tonnes per annum (tpa) of Class IV and Class V waste to be received at the gate, and 280,000 tpa of waste to be disposed of into the waste cells. The higher tonnage to be disposed into the cells was to allow for up to approximately 40,000 tpa of liquid waste to be immobilised with kaolin or other similar material on site prior to placement in the cell.

Tellus has been licensed to accept and store waste at the Facility since July 2020. Following construction of the Facility, the licence has been amended in stages with the most recent amendment approved in March 2021 to authorise waste disposal in Cell 1.

Tellus is currently seeking approval to align the mass of waste received at its Facility, currently approved at 100,000 tpa, to the mass of waste (including immobilised liquid waste) permitted to be permanently isolated in its approved storage cells (up to 280,000 tpa). Alignment of waste mass received and stored will improve Tellus' capacity to respond to customers requiring disposal of Class IV and V solid material.

Applicant details and contact information for Tellus are provided in Table 1.1.

[redacted]

GHD (Client Representative)

[redacted]

2. Introduction

2.1 Purpose of this document

The Facility is an open cut kaolin mine, which subsequently uses the mine voids for the secure storage and isolation of hazardous, intractable, and low-level radioactive waste in a near surface geological repository using best practice storage and isolation safety case. Tellus is proposing to develop a further three waste cells (Cells 2 to 4) at the Facility.

This document has been prepared by GHD Pty Ltd (GHD) on behalf of Tellus to support the Works Approval Application (WAA) for the Facility made in accordance with Section 54 of the EP Act. This supporting document provides information on the proposed works associated with the Project, and the impacts to the environment that may result from operations. It also describes how these impacts will be minimised or adequately controlled. This document has been reviewed and approved by Tellus.

Information requested in the WAA Form is provided throughout this supporting report. Table 2.1 describes where each requirement can be found in this document.

Table 2.1 Reference to DWER WAA application form requirements

WAA application form requirement	Supporting report location
Part 1 – Application type	Section 2.1 Purpose of this document
Part 2 – Applicant details	Section 1.1 Applicant details
Attachment 1A – Proof of occupier status	Separately provided as Attachment 1A
Attachment 1B – Company extract	Separately provided as Attachment 1B
Part 3 – Premises details	Section 3 Premises details
Part 4 – Proposed activities	Section 4 Project description
Attachment 2 – Premises maps	Figure 3.2 Proposal site layout
Attachment 3B – Proposed activities	Section 4 Project description
Part 5 - Index of Biodiversity and Marine Surveys for Assessments	N/A
Part 6 – Other DWER approvals	Section 6 Legislative framework and approvals
Part 7 – Other approvals and consultation	Section 6.9 Other approvals
Attachment 5 – details of other approvals	Section 6 Legislative framework and approvals
Part 8 – Applicant history	Section 1 Applicant information
Part 9 – Emissions, discharges, and waste	Section 8 Emissions and discharges
Attachment 6A – Emissions and discharges	Section 8 Emissions and discharges
Part 10 – Siting and location	Section 7 Existing environment and sensitive receptors
Part 11 – Submission of any other relevant information	N/A
Part 12 – Proposed fee calculation	Section 13 Proposed works approval fee
Part 13 – Submission of application	N/A
Part 14 – Declaration and signature	N/A
Attachment 10 – Request for exemption from publication	N/A

2.2 Limitations

This report has been prepared by GHD for Tellus Holdings Ltd (Tellus) and may only be used and relied on for the purpose agreed between GHD and Tellus Holdings Ltd.

GHD otherwise disclaims responsibility to any person other than Tellus Holdings Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

GHD has prepared this report on the basis of information provided by Tellus Holdings Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2.3 Key assumptions

This report has been prepared in support of a Works Approval under Part V of the EP Act and relies on information prepared by others and previously assessed by EPA pursuant to the issuing of MS 1078. GHD has assumed that such information is accurate, and where such information has been updated by or on behalf of Tellus, that the updated information is accurate and correct.

This report has been prepared by GHD on behalf of Tellus, and Tellus has reviewed and approved the content of the report.

2.4 Prescribed Premises categories

The Facility has gained approval under MS 1078 and Licence L9240/2020/1 to accept Class IV and Class V wastes for disposal and a low-level radioactive waste (LLW) Site Registration.

The Facility accepts, stores (Category 61 and 61A), processes and permanently isolates Class IV (Category 65) and Class V (Category 66) intractable wastes within a near-surface geological repository in accordance with the *Environmental Protection Regulations 1987* (EP Regulations), as detailed in Table 2.2.

Table 2.2 Prescribed Premises categories relevant to the Facility

Category Number	Description	Production or design capacity
61	Liquid waste facility	Combined total 100,000 tonnes per annual period
61A	Solid waste facility	
65	Class IV secure landfill site: premises (other than clean fill premises) on which waste of a type permitted for disposal for this category of prescribed premises, in accordance with the Landfill Waste Classification and Waste Definitions 1996, is accepted for burial	Combined total 280,000 tonnes per annual period
66	Class V intractable landfill site: premises (other than clean fill premises) on which waste of a type permitted for disposal for this category of prescribed premises, in accordance with the Landfill Waste Classification and Waste Definitions 1996, is accepted for burial.	

3. Premises details

3.1 Location

The Facility is located approximately 75 km North-East of Koolyanobbing, in the Shire of Coolgardie. The Facility is approximately 130 km North-West of Coolgardie within the Goldfields Region of WA (presented as Figure 3.1). The Facility is in a remote, geologically stable and semi-arid area.

The Facility applies world's best practice standards across its operations where long term environmental and human safety are the primary criteria for operational and post-closure risk assessments. While the Facility has not been located near large metropolitan centres, it services many industries including heavy industry, mining, oil and gas and resource markets as it is the only continuously operating Class V facility in Australia.

As shown in Figure 3.2, the Facility is accessed from the Great Eastern Highway via:

– A 95 km road to the Mount Walton East Intractable Waste Disposal Facility (IWDF) (Crown Reserve No. 44102), via the road commonly known as the 'Mt Walton Road' or 'IWDF Access Road', that extends northward from Great Eastern Highway, then
– A 9 km access road connecting the Mt Walton Road to the Facility.

The prescribed premises boundary is unchanged by this proposal to develop Cells 2-4 (presented as Figure 3.2).

The location of the Facility was chosen for its natural characteristics that meet international and national standards and requirements for a near-surface geological repository for hazardous intractable waste. These include:

– Quality kaolin mineral resource
– Lack of commercial mineral deposits (other than kaolin)
– Semi-arid climate – low erosion and water ingress risk
– Geologically stable – it has very low seismicity and no volcanic or tectonic activity
– Natural geological barriers – the kaolinised granite formation (kaolin) is approximately 70 million years old and is laterally extensive, thick, flat, and has been stable for millions of years. The kaolin has very low permeability and is capped by a natural relatively impermeable rock layer
– No regional aquifer – confirmed through hydrogeological investigations. The site is not subject to flooding, it has low rainfall (averages just over 250 millimetres (mm) of rainfall per annum) and evaporation is greater than 2,000 mm per annum. As a result, rainfall generally evaporates, limiting the volume of water that infiltrates into the soil profile
– There are no defined surface watercourses or waterbodies in the approved prescribed premises boundary
– No surface water receptors
– No flooding
– Low erosion rates
– No heritage values
– No nearby sensitive receptors – it is located in a remote area with the nearest residence being a non-permanent mine camp approximately 52 km south of the Facility
– No potential for medium to high value agriculture
– Flat topography
– Located adjacent to the IWDF facility, which has previously been recognised for its suitability for intractable wastes and has over 22 years of safe operating history.

The nearest residents to the Facility are located at the Carina Iron Ore Mine Accommodation Village (approximately 52 km to the south), which is currently in operation.

The current approved prescribed premises boundary at the Sandy Ridge Facility is on unallocated Crown land. It is not regarded as having any current or future value for mining (of minerals other than kaolin), nor is it regarded as valuable for agricultural or cultural purposes due to its semi-arid environment and absence of groundwater or surface water.

The semi-arid and remote nature of the location, absence of a nearby population, and site characteristics (discussed further in Section 7) have made the approved prescribed premises ideal for the long-term storage and permanent isolation of intractable, hazardous and low-level radioactive waste.

Figure 3.1 Regional location

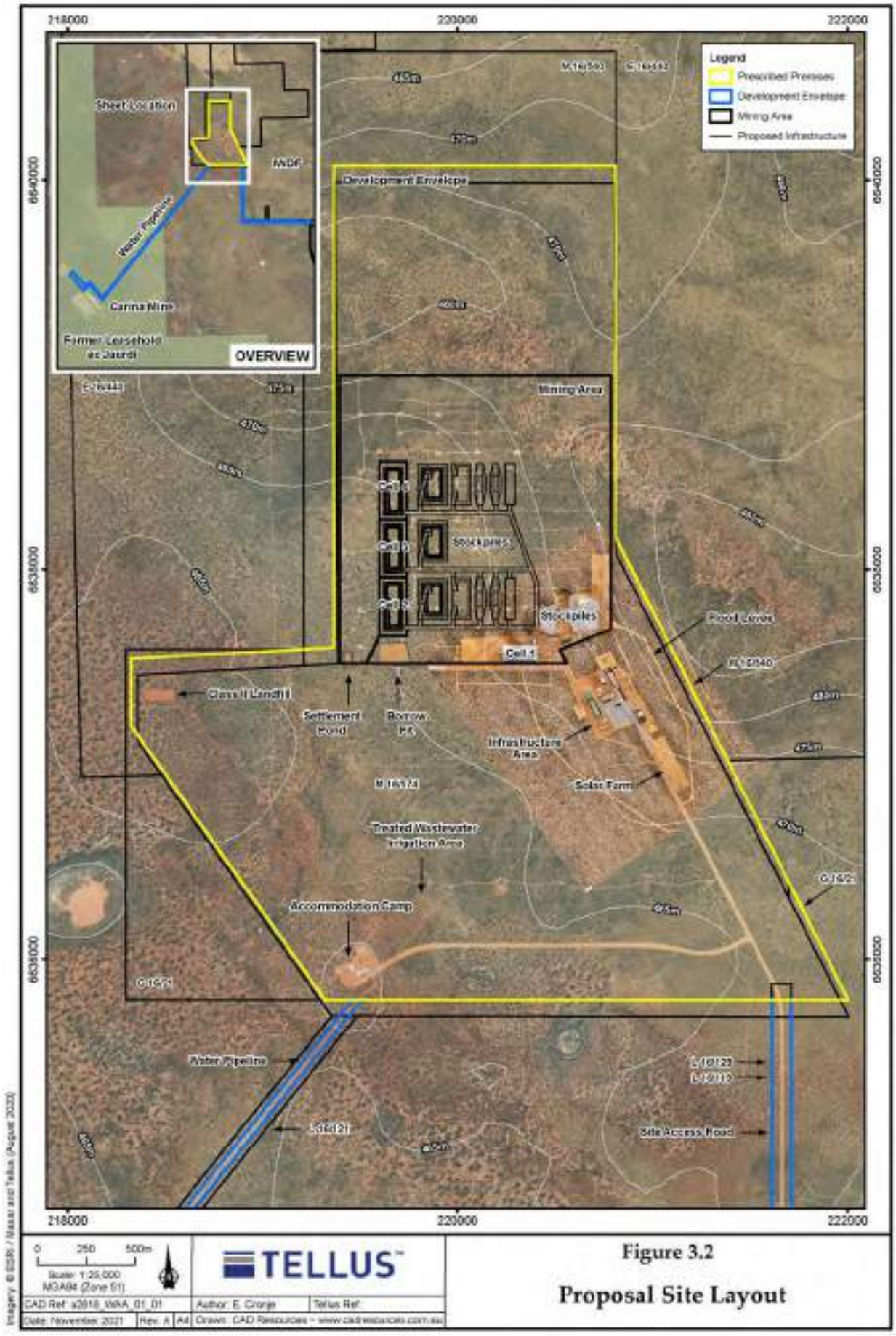


Figure 3.2 Proposal site layout

4. Project description

4.1 Overview

Tellus is proposing to construct and operate a further three waste cells at the Facility, to provide waste storage for the next 2 to 6 years. Each cell will be progressively mined and constructed as the preceding operational cell nears the end of its life, to allow for continuous waste disposal operations at the Facility. It is proposed that each cell will be constructed similar to the current cell (Cell 1), being approximately 80 m wide and up to 250 m long. The depth of each cell will be dependent on the geotechnical conditions encountered during mining activities and maintaining a 5 m buffer between either groundwater or the underlying unweathered kaolin, whichever is shallower.

Tellus intend to install an additional Air Dome cell cover structure, identical to that currently erected over Cell 1. Having two air domes will allow one cell to be mined while the current cell is still in waste placement operations.

Exploration drilling at the Facility revealed the kaolin is located beneath an average overburden thickness of 6 m, which consists of sandy clay, laterite gravel and silcrete. To construct each cell, controlled blasting using explosives is required to fracture the hard, dense silcrete layer that overlays the kaolin. During the controlled blasting, the cell will remain uncovered to prevent damage to the Air Dome. Immediately following the controlled blasting, the Air Dome will be erected over the future cell for the remainder of the cell construction (via conventional mining), waste disposal operations and cell closure.

During waste disposal operations, both solid and immobilised liquid waste will be disposed within the active cell, with spaces between incompatible waste materials backfilled with kaolin and compacted to minimise void space.

4.2 Kaolin clay mining operations

4.2.1 Mineral resource

Exploration drilling identified a Joint Ore Reserves Committee (JORC) Inferred Mineral Resource of 17.6 million tonnes (Mt) of kaolin, with 9.5 Mt classified as ceramic grade and 8.1 Mt classified as paint grade. A 17.6 Mt resource is likely to provide sufficient ore for mine life well beyond 25 years.

4.2.2 Mining operation

Mining of new cells would be carried out in campaigns on a frequency commensurate with the volume of wastes to be isolated. The frequency of mining campaigns is likely to commence at one every year, but the actual frequency will be dependent on the depth of mining in each area and the timing and frequency of waste deliveries.

Mining of waste cells could be as frequent as twice per year but in the early years of operation are typically expected to occur every 12-18 months. Depending on the depth of the mine pit and the type and form of the waste, a single waste cell could hold approximately 220,000 tonnes of waste material.

4.2.2.1 Sequence of cells

Cells would be constructed consecutively out of sequence and will follow a leapfrog pattern along a common alignment whenever possible, before moving to an adjacent alignment and returning in the opposite direction (as illustrated in Figure 4.1). The planned sequence for the development of the cells will see Cell 2 being developed first followed by Cell 4 and then Cell 3. This will ensure safe distances are maintained between operating cells and areas where drill and blasting activities are undertaken.

Figure 4.1 Diagrammatic example layout of mine pits at year 6

Current mine planning provides for approximately 25 pits to be constructed within the Mining Area approved in MS 1078. Each mine pit is approximately 80 m wide by up to 250 m long and maintaining 5 m above groundwater / unweathered granite, whichever is shallower. Waste disposal cell dimensions are likely to vary slightly from time to time based on the geotechnical conditions of each cell location.

New cells will be covered by a relocatable Air Dome consisting of an inflated dome-shaped fabric structure, reinforced with cables, which is larger than the cell dimensions. This allows the cell cover to be relocated from one waste cell to the next mine pit once closure activities for the waste cell have finished.

The purpose of the Air Dome is to eliminate rainfall entry into the waste cell during the waste disposal operations and prior to the cell capping layer being installed (refer to Figure 4.2), noting that the cover currently over Cell 1 will be extended from its current length of 180 m to 250 m once it is relocated to Cell 4. A geological cross section of a typical mine pit is shown in Figure 4.3.

Figure 4.2 Diagrammatic view of cell with Air Dome

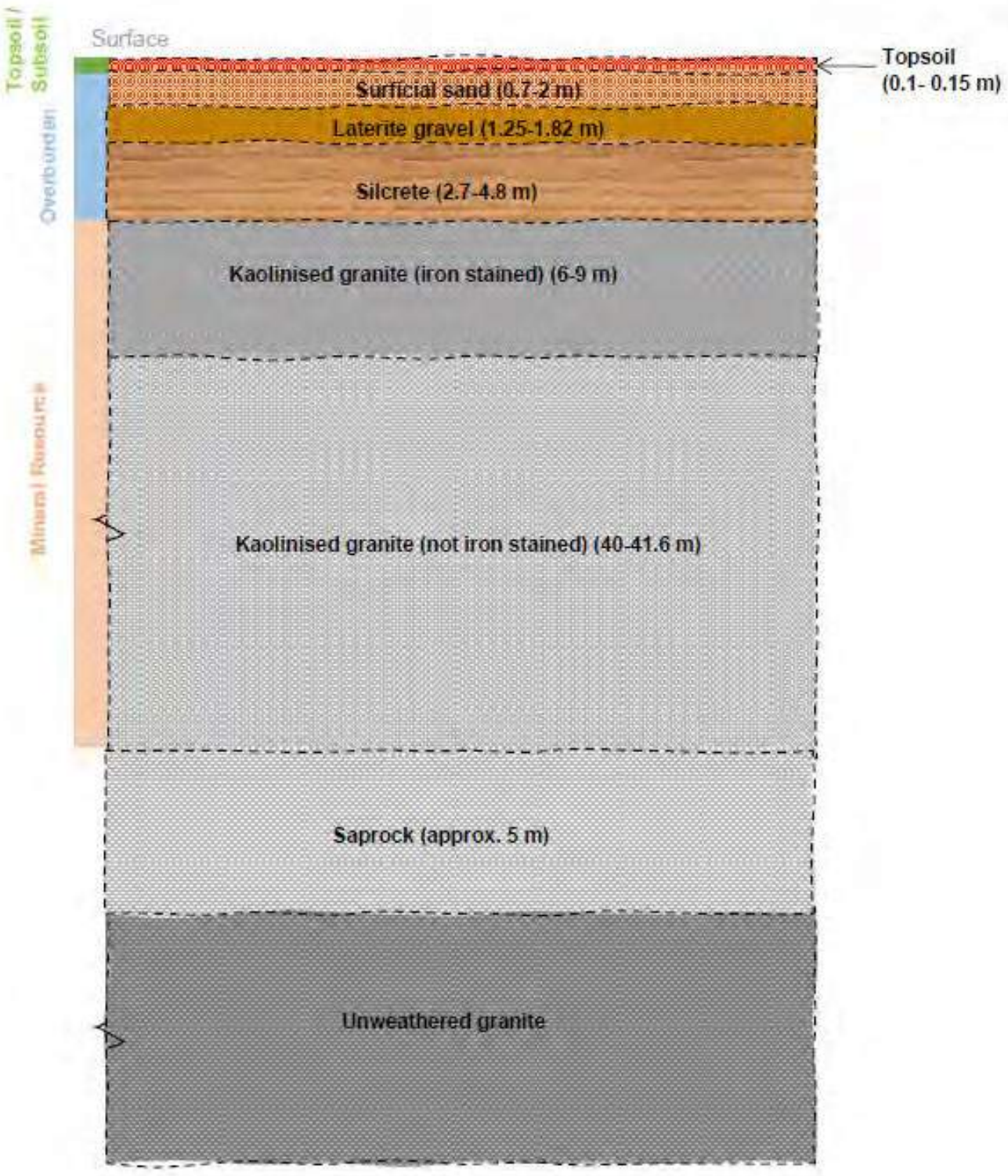


Figure 4.3 *Conceptual geological profile of a typical mine pit*

Based on exploration drilling results since early 2015, the average overburden (sandy clay, laterite gravel and silcrete) thickness is approximately 6 m. Beneath the overburden, the kaolin (i.e., the mineral resource) is on average 49 m thick (46 m to 51 m depth).

Beneath the kaolin zone is a saprock zone (kaolinite, including some incompletely weathered granite). Below the saprock zone is unweathered granite. It is noted that the transitions between geological units are gradual, and identification of boundaries is subjective.

4.2.2.2 Mining method

As per the Sandy Ridge Public Environment Review (PER) (Tellus 2016) "*Kaolin would be extracted using the open cut method of mining. The surface of each pit would be cleared of vegetation and stockpiled (for later use in rehabilitation). The pit would then be opened by excavation of the topsoil, subsurface soils. Following this there would be carefully controlled blasting using explosives or continuous mining of the hard, dense silcrete layer that overlays the kaolin, and then removal by excavator and truck. The kaolin would then be recovered by conventional earthmoving equipment (front end loader, excavator, and articulated dump trucks). Overburden would be stockpiled adjacent to the cells in readiness for backfilling. Separate stockpiles of different grades of kaolin ore would be located adjacent to each pit.*"

The PER (Tellus 2016) further states that "*Blasting would likely occur at a frequency of one event per year and would last for a matter of seconds.*"

The principal mining methods to extract overburden and kaolin ore are drill and blasting and continuous mining to achieve an open cut trapezoidal trench.

Exploration drilling at the Facility revealed the kaolin is located beneath an average overburden thickness of 6 m, which includes silcrete material. To construct each cell, controlled blasting using explosives is required to fracture the hard, dense silcrete layer that overlays the kaolin. During the controlled blasting, the cell will be uncovered to prevent damage to the Air Dome. Immediately following the controlled blasting, the blasted zone will be reformed and compacted to promote rainfall runoff into the perimeter surface water drainage system. Air Dome will be erected over the cell for the remainder of the cell construction (via continuous mining), waste placement operations and cell closure.

The following mining steps will be undertaken, with general arrangement and detail drawings provided in Appendix A:

1. The surface area of each cell is cleared of vegetation
2. Cleared vegetation is stockpiled to be re-used in cell rehabilitation
3. The cell is stripped of topsoil and subsurface soil, which is stockpiled and to be re-used in cell rehabilitation
4. General earthworks and levelling to prepare cell for drill and blasting
5. Controlled drill and blasting of the hard, dense silcrete layer that overlays the kaolin
6. Reform blasted material to promote rainfall runoff towards the surface water drainage system and establish a safe base to prepare cell for Air Dome installation
7. Install and commission Air Dome
8. Overburden above the kaolin deposit is removed by excavator and truck
9. Kaolin is recovered by conventional earthmoving equipment
10. The mining plant fleet consists of a front-end loader, excavator, continuous miner and articulated dump trucks (ADT)
11. Dump trucks deposit the mined materials in separate stockpiles in the Mining Area (Figure 4.4).

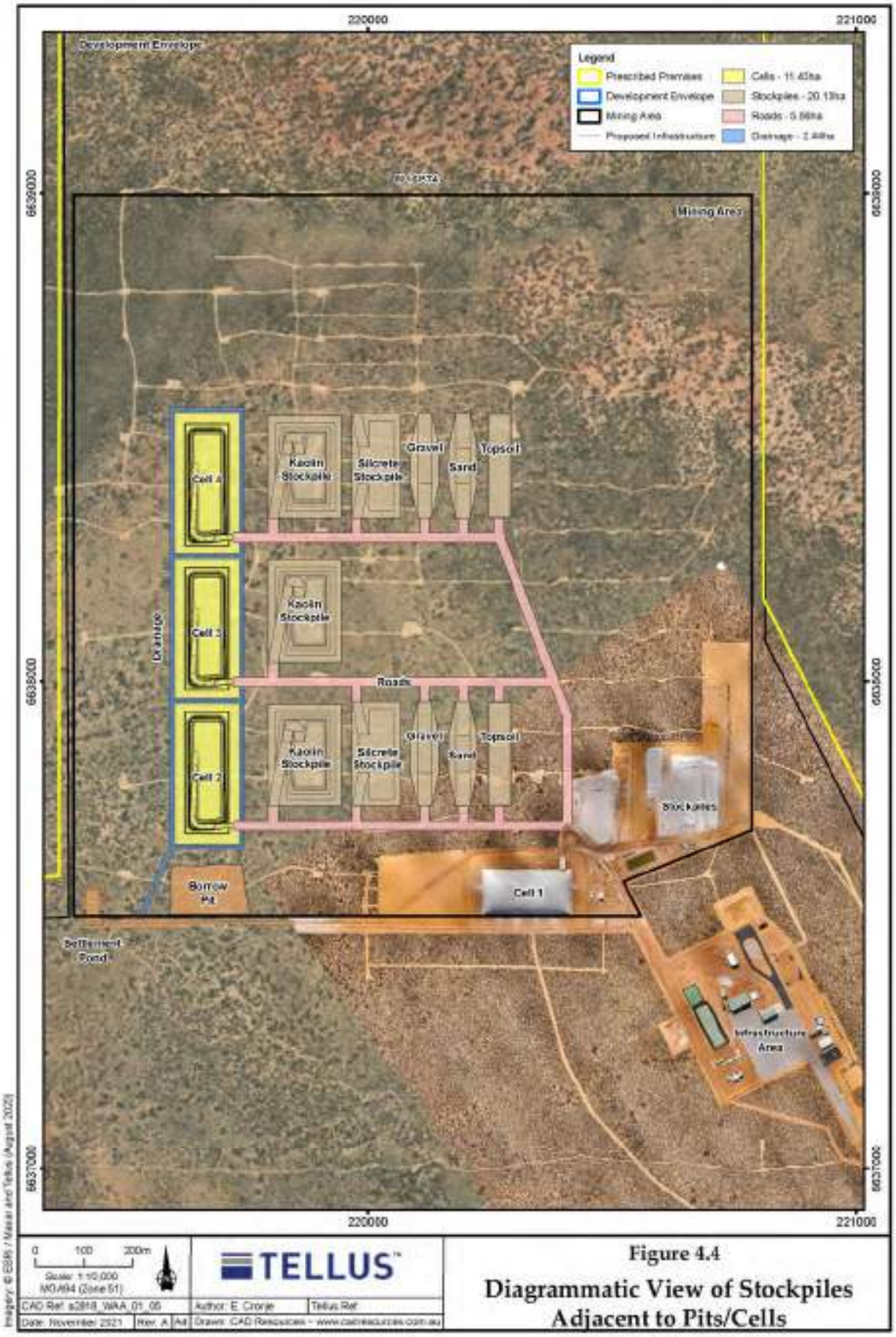


Figure 4.4 Diagrammatic view of stockpiles adjacent to pits/cells

4.3 Transition from mine pit into waste cell

During mining, the excavation is termed a 'pit' once it is completed. When the 'pit' is ready for waste storage and isolation activities, it is termed a 'cell'.

In a typical cycle, one new mining pit would be excavated with the mining activities being scheduled to finish just prior to the previous pit (now a waste cell) being completely filled (refer to Figure 4.5). This approach minimises the disruption to waste disposal activities, with the addition of time limited operations (see Section 5).

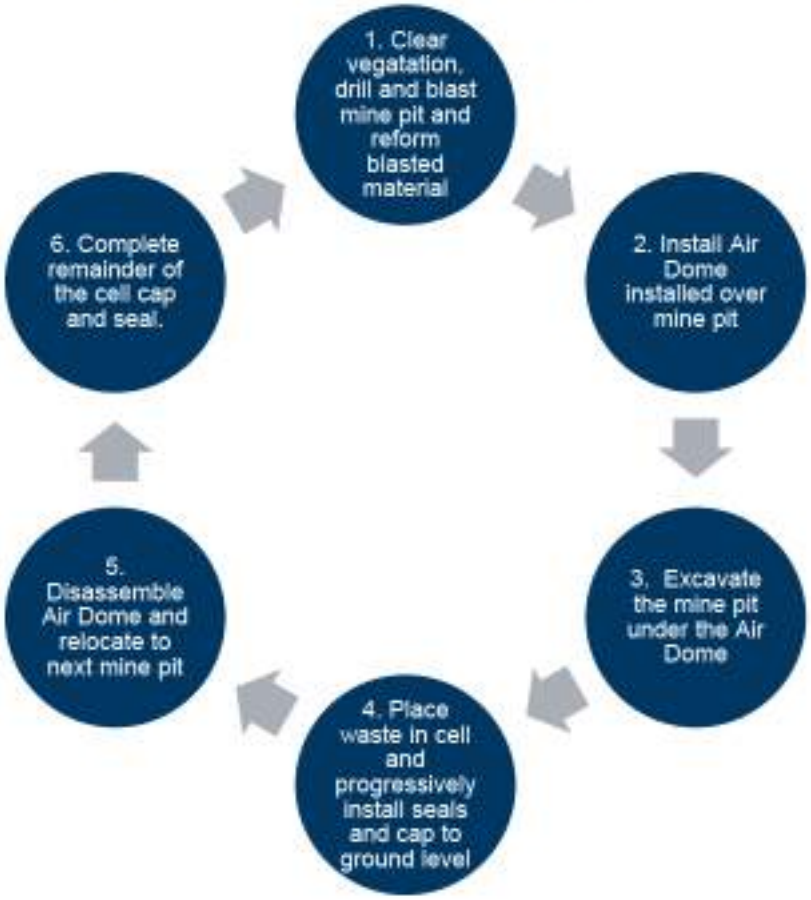


Figure 4.5 Normal sequence of mining and waste isolation

Following the completion of waste disposal within the active cell, approximately 7 m below the ground surface, a seal is constructed from the top of waste to ground level, consisting of a 3 m thick kaolin layer followed by 4 m thick layer of compacted crushed silcrete and laterite material. It is at this stage that the Air Dome is removed from the cell to allow for the construction of a compacted kaolin clay dome cap, which extends beyond the footprint of the cell and cell cover footprint, as illustrated in Figure 4.2. The clay dome cap is graded, characterised with a 1:20 gradient and an approximate thickness of 2 m in the middle, thinning as it slopes to integrate into the landscape, to shed stormwater from the structure into perimeter V drains, which flow to a sump.

The above-described cycle repeats as required. As the scale of the production and waste disposal activities increases due to market demand, the frequency of this cycle will similarly increase.

4.4 Air Dome cell cover

Apart from the vegetation stripping and topsoil removal, all of the pit excavation/mining and waste disposal operations are undertaken under a pre-inflated Air Dome cover. The Air Dome has an airlock door for entry and egress and spans the width and length of one cell.

The purpose of the Air Dome is to exclude water from the cell until it is capped, to avoid the generation of leachate within the cell and avoid any potential structural impacts that may affect the integrity of the cell walls.

The Air Dome measures up to 250 m long by 90 m wide and has been made with a water-proof fire-retardant fabric which is held in place by a network of structural steel galvanised cables anchored to buried concrete blocks. Inflation of the Air Dome is performed by a number of Air Handling Units (AHU) to maintain the inflated pressure. The internal pressure is regulated by automated louver vents on each wall.

Both the Air Dome and concrete block foundations can be relocatable from one cell to another and can have the length and width of the structure adjusted according to the dimensions of the next cell.

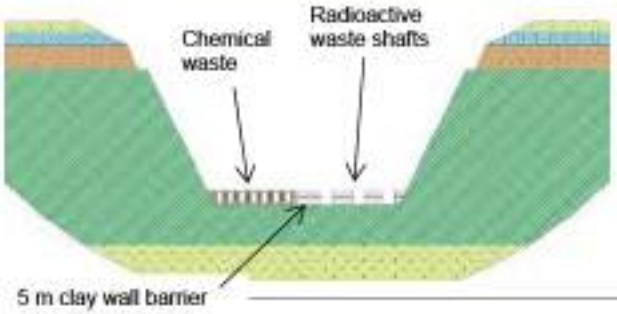
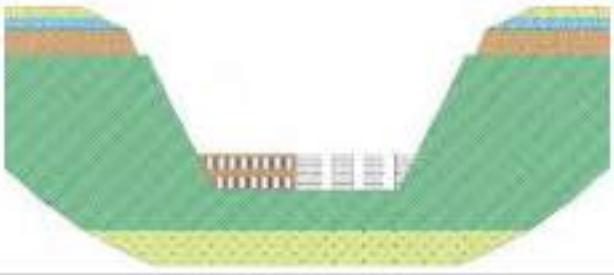
Drawings relating to the positioning and details of the Air Dome are included as Appendix A.

4.5 Waste disposal and capping process

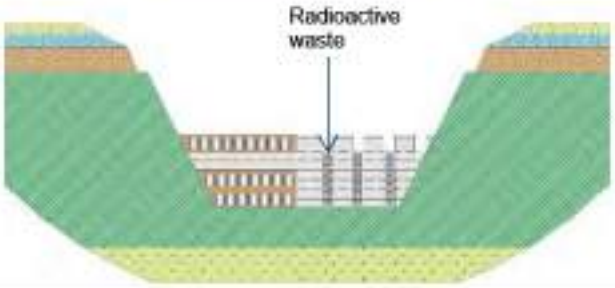
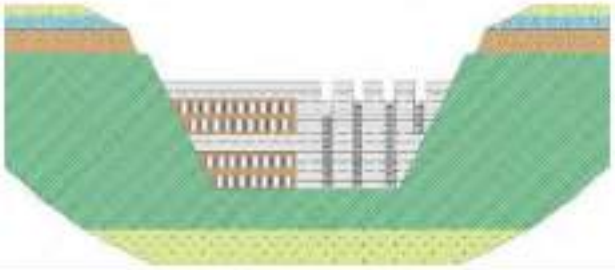
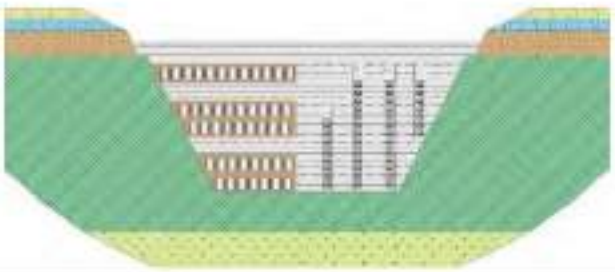
The encapsulation of wastes within each cell is subject to engineering design and compaction testing to ensure the properties of the constructed cell is a close analogue of the existing geological and hydrogeological conditions at the Facility, which naturally excludes water from the kaolin located beneath the silcrete layer. A survey of the cell would be conducted to confirm the cell is constructed in accordance with the engineering design.

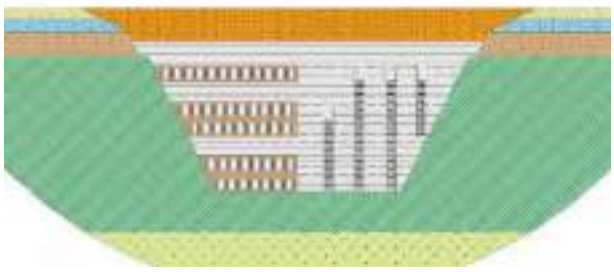
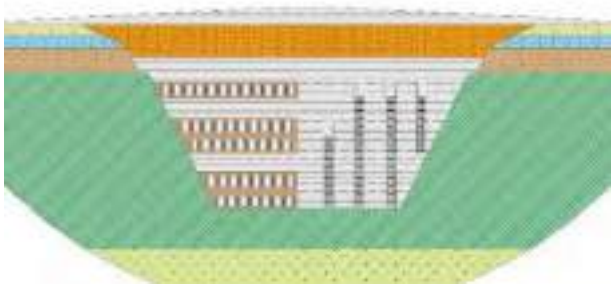
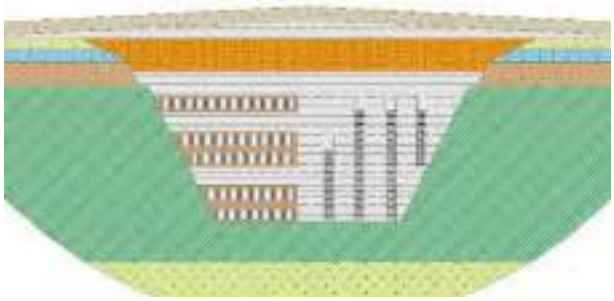
Table 4.1 illustrates how wastes will be contained within the Cells. Waste cells will be closed progressively, with one cell being capped and closed while the next cell is being constructed/mined.

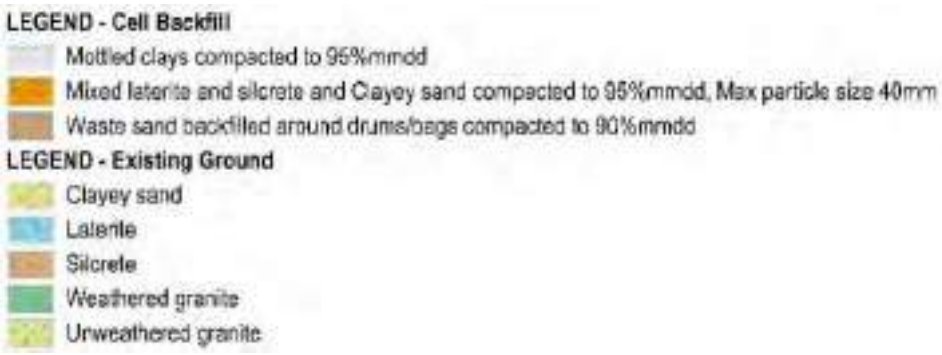
Table 4.1 Cell containment of Class IV and Class V intractable waste materials

Description	Illustration
The bottom of the mine void is at a minimum safe distance above the unweathered/fresh granite bedrock. This safe distance is determined from the reported drilling logs, hydrogeologic strata and groundwater monitoring data.	
A base layer of waste is placed on one side of the floor of the mine void. Wastes of different types are segregated by internal compacted kaolin walls which are 5 m wide. The height of each waste layer and barrier wall is the equivalent of the height of a waste package, typically 0.9 m. Waste packages are placed tightly next to each other in a row. Granular material is backfilled between and around the waste packages to fill any air spaces. The shafts for radioactive waste are constructed approximately 3 m apart from each other and with a 5 m barrier between the shafts and the chemical waste layer.	
A thin (300 mm minimum) layer of compacted granular material is placed over the chemical waste layer. Compaction testing would be carried out in accordance with *AS1289.5.8.1*[1] to confirm material is compacted to the density required by the engineering design. The next layer of chemical waste packages is placed on the kaolin compacted layer along with the 5 m wide kaolin separation barrier. The shafts for radioactive waste will continue to be constructed.	

[1] *Australian Standard for testing soils for engineering.*

Description	Illustration
A 3 m thick capping layer of kaolin is compacted onto the second waste layer if waste of an incompatible type is to be placed immediately above.	
The next layer of waste packages is tightly placed on the thick capping layer and backfilled with granular material to exclude air pockets and voids. The separation barrier is maintained in the middle of the cell. The radioactive waste is lowered into the shafts. Between each radioactive waste package, a 200 mm layer of kaolin is compacted into place.	
A thin (300 mm minimum) layer of compacted granular material is placed over the chemical waste layer. Compaction testing is carried out in accordance with *AS1289.5.8.1* to confirm material is compacted to the density required by the engineering design. The next layer of chemical waste packages is placed on the kaolin compacted layer along with the 5 m wide kaolin separation barrier. Radioactive waste continues to be lowered into the shafts. Between each radioactive waste package, a 200 mm layer of kaolin is compacted into place.	
A 3 m thick capping layer of kaolin is compacted onto the fourth waste layer. Radioactive waste continues to be lowered into the shafts. Between each radioactive waste package, a 200 mm layer of kaolin is compacted into place.	
A fifth layer of waste is placed in the cell. Concrete lids are fitted into each radioactive shaft. A 3 m thick kaolin cap is placed on the waste packages and concrete lids and is keyed into the surrounding clay.	

Description	Illustration
A 4 m-thick layer of compacted crushed silcrete and laterite material, with some kaolin or clayey sand is placed between the kaolin cap and the natural ground surface.	
The compacted kaolin clay dome cap is placed over the cell. The final capping layer is formed of compacted kaolin material (permeability approximately 6.0 x 10^{-8} m/s (Douglas Partners, 2015)) and placed in the form of a dome, so as to shed stormwater from the structure into perimeter V drains, which flow to a sump. The cap would have a 1:20 gradient and be an approximate thickness of 2 m in the middle, thinning as it slopes to integrate into the landscape. Subsidence monitoring of the cap would commence.	
Subsoil and topsoil are replaced on the cap after the cessation of subsidence monitoring.	



Waste cells will be filled in layers with multiple sections in each layer containing wastes of similar characteristics. Chemical waste types will be placed ‘like-with-like’ for safety reasons and for potential future recovery (if identified as potentially valuable). LLW materials will be permanently isolated in accordance with the Radiation Management Plan and Site Registration issued by the WA Radiological Council.

The location of wastes placed in the cell are recorded using the following method:

– “Lift” GPS surveys, completed at regular intervals during the filling of a cell. These are conducted to pick and record the top surface of each layer of fill within the cell, and the surface of a previous layer is used as the base of the subsequent layer
– Individual package or grouped package GPS surveys. These are conducted on a discretionary basis and are used to identify the location of wastes which are deemed by the site management to be unusual or particularly high risk. For example, packaged radioactive materials (excluding bulk)

– Daily photographs of the cell, which will provide evidence of where wastes are being placed within a lift. The exact coordinates will not be known for each waste package, but general location within the cell will be identifiable.

Spaces between waste packages will be backfilled with select fill and compacted to minimise air or void space. The fill material will be moisture conditioned if required, to aid compaction. If this approach is not taken it may result in settlement which could impair the performance of the cell seal and cap. Each layer will be compacted, until the final waste profile is reached at approximately 7 m below the ground surface, where a thick capping layer of low permeability clay (referred to as a 'seal') will be installed to prevent water ingress into the cell.

After a low permeability seal is installed to ground level, the Air Dome will be removed, to allow for the construction of the clay domed cap on the top of the cell, to shed rainfall.

4.6 Stormwater management

Localised drainage infrastructure around each cell, in addition to the establishment of the Air Dome, will prevent ingress of water to the cell during waste operations. Surface drainage infrastructure will typically be graded away from the cells to the catchment / settlement ponds in the southwest corner of the mining area (refer to Figure 3.2).

In addition, an earth bund/levee has been constructed on the eastern perimeter of the Facility to prevent surface water ingress into the waste infrastructure area and cells.

The current surface water management in the above-ground waste handling and storage areas is unchanged by the proposal to develop Cells 2 to 4.

5. Time limited operations

Tellus is requesting time limited operations (TLO) to be included in this works approval, consistent with DWER's Industry Regulation Guide to Licensing (DWER 2019).

The key controls for the TLO will be as follows:

– Use of certified, suitably accredited and experienced Mining Engineer for cell design
– Appropriate methods to be used for the determination of impacts of blasting
– Air Dome installation prior to excavation commencement
– Hiring certified, suitably accredited and experienced Mining Contractor for cell development and construction
– Use of third-party specialist geotechnical engineer to inspect and report on as-constructed Cells, to verify compliance with the approved designs
– DWER Compliance team to be invited to inspect cell prior to use
– Restriction of waste disposal to base layer of the Cell during TLO
– Monitoring soil moisture probe at the base of Cell, and groundwater monitoring bores (including four bores around each Cell)
– Defining and implementing adequate contingency measures, in case something goes wrong or if DWER identifies an issue with construction compliance report.

Once a cell has been fully developed / constructed, a construction environmental compliance report in line with the issued Works Approval conditions will be submitted to DWER for approval at the same time as a licence amendment application to add that Cell to the operating licence. This report will include a 3D map from the survey of the as-constructed Cells.

While awaiting confirmation of acceptance of the construction compliance report, and amendment of the Licence, Tellus proposes to commence placement of the base layer of waste disposal within Cell 2. It is proposed that these works would be carried out under the Air Dome pursuant to time limited operations to be provisioned under the Works Approval.

In the instance that the construction compliance report is rejected, the base layer of waste can be extracted to action any necessary rectifications.

Tellus considers that TLO poses a low risk to the environment due to passive barriers couple with additional controls described above. However, an Environmental Risk Assessment will be undertaken for the activities proposed to be conducted during TLO.

6. Legislative framework and approvals

On 29 July 2020, the Facility received a Licence to Operate; Licence No. L9240/2020/1, under Part V of the EP Act. Following that, the Licence was amended on 10 September 2020, 1 December 2020 and 19 March 2021. The Facility is currently approved to accept 100,000 tpa (combined) of liquid and solid waste (Category 61 and 61A) and approved to dispose of 280,000 tpa of Class IV and Class V intractable waste (combined) inside Cell 1 at the Facility (Category 65 and 66).

Table 6.1 summarises approvals that have been achieved and are relevant to the Facility, which are detailed further in the following sub sections.

Table 6.1 Key legislation relevant to the approvals for the Sandy Ridge Facility

Legislation	Approval	Status
EPBC Act (Australian)	Approval for the Proposal under Section 133.	Granted
EP Act (WA) – Part IV	Statement that a Proposal may be implemented under Section 38.	Granted
EP Act (WA) – Part V	Works Approval (under Section 54) and Licence (under Section 57) for the construction and operation of screening plant, sewage facility and putrescible landfill.	Granted
EP Act (WA) – Part V	Works Approval (under Section 54) and Licence (under Section 57) for the construction and operation of liquid and solid waste facility and Class IV/V landfill.	Granted
***Mining Act 1978* (WA)**	Mining leases under Section 71. Grant of a general purpose lease in favour of Tellus under Section 86. Miscellaneous licences under Section 91. Mining Proposal and Mine Closure Plan under Section 82A(2).	Granted
Land Administration Act 1997	Crown Lease and Crown Easements	Granted
Native Title Act 1993	Native Title Agreement	Granted
***Radiation Safety Act 1975* (WA)**	Registration (under Section 28) Disposal Permit (under Section 34).	Granted (Update for disposal under assessment)
***Mines Safety and Inspection Regulations 1995* (WA)**	Approval of the Radiation Management Plan under Part 16.	Approved
***Mines Safety and Inspection Regulations 1995* (WA)**	Approval of the Project Management Plan under Regulation 3.13.	Approved
***Rights in Water and Irrigation Act 1914* (WA)**	Grant of a Licence to Construct or Alter a Well under Section 26D and a Licence to Take Water under Section 5C.	Granted
***Dangerous Goods Safety Act 2004* (WA)**	Grant of a Dangerous Goods Site Licence under Part 4.	Granted
***Planning and Development Act 2005* (WA)**	Grant of a Development Approval under Section 162.	Granted

6.1 Environment Protection Biodiversity Conservation (EPBC) Act 1999

Australian Government approval under the EPBC Act for the original 2015 proposed Facility (as outlined in the 2016 PER) was granted in January 2019 (EPBC 2015/7478).

In June 2021, the Environmental Assessments and Post Approvals Division within the Australian Government Department of Agriculture, Water and Environmental Regulation (DAWE) reviewed this 2021 Proposal against the 2019 approval (2015/7478). The Division confirmed that this Proposal, that was outlined in the consultation letter from Tellus, did not trigger any further assessment under the EPBC Act, provided Tellus continues to comply with their WA approval, including as amended.

6.2 Part IV of the EP Act

The EP Act and its subsidiary legislation provides for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement, and management of the environment.

The WA Environmental Impact Assessment process is triggered by a referral under Part IV (Section 38) of the EP Act.

The Environmental Protection Authority (EPA) implements the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2012* in conducting assessments of Proposals and its effects on the environment. The EPA is tasked with the assessment of proposals to ensure environmental protection and to prevent, control and abate pollution and environmental harm. DWER's EPA Services administers and operates under the EP Act and its regulations. It is responsible for overseeing implementation of proposals under Part IV Division 2 of the Act. The Office of the Appeals Convenor (OAC) has responsibility for managing and reporting on appeals in respect of levels of assessment of, and reports on, proposals and conditions of implementation under Part VII of the Act.

6.3 Ministerial Statement 1078

Ministerial Station (MS) 1078 applies to the Premises. Several environmental and compliance conditions apply to the Facility, which are summarised below:

– Condition 4-1 requires Tellus to maintain a Compliance Assessment Plan
– Condition 4-6 requires Tellus to submit annual Compliance Assessment Reports
– Condition 8-2 requires Tellus to engage an independent waste expert to undertake annual audits of the waste disposal operations
– Condition 9-4 requires Tellus to implement the approved Leachate Monitoring and Management Plan
– Condition 10-7 requires Tellus to implement the approved Flora and Vegetation Management Plan
– Condition 11-4 requires Tellus to implement the approved Construction Environmental Management Plan to ensure impacts to terrestrial fauna are minimised
– Condition 12-3 requires Tellus to implement the approved Waste Facility Decommissioning and Closure Plan.

6.4 Contaminated sites

DWER's contaminated sites branch advised Tellus in 2017 that the Facility would likely be classified as "contaminated – restricted use" or "contaminated – remediated" when waste disposal started. Upon commencement of waste disposal to Cell 1, Tellus lodged a Form 1 notification to DWER's Contaminated Sites Branch (May 2021). At the time of preparing this application, the Premises is not recorded as a Contaminated Site.

Tellus understands that DWER will decide on the classification and level of remediation required (if any) at the appropriate time.

6.5 Application regulations, standards and guidelines

In preparing this Application, Tellus has considered the following guidance statements within the WA legislative framework under the EP Act and EP Regulations. They are*:*

- Guidance Statement: Regulatory Principles (July 2015)
- Guidance Statement: Setting Conditions (October 2015)
- Guidance Statement: Risk Assessments (February 2017)
- Guidance Statement: Environmental Siting (November 2016).

6.6 Reporting of incidents

Under Section 72 of the EP Act, Tellus will report all discharges of waste that have caused or are likely to cause pollution, material harm or serious environmental harm.

6.7 Offences and defences

The EP Act and its regulations set out several offences including:

- Offence of emitting an Unreasonable Emission from any Premises under s.49
- Offence of causing Pollution under s.49
- Offence of dumping Waste under s.49A
- Offence of discharging Waste in circumstances likely to cause Pollution under s.50
- Offence of causing Serious Environmental Harm (s.50A) or Material Environmental Harm (s.50B)
- Offence of causing Emissions which do not comply with prescribed standards (s.51)
- Offences relating to Emissions or Discharges under regulations prescribed under the EP Act, including materials discharged under the *Environmental Protection (Unauthorised Discharges) Regulations 2004 (WA)*
- Offences relating to noise under the *Environmental Protection (Noise) Regulations 1997 (WA).*

Under Section 53 of the EP Act, it is an offence, for a holder of a Works Approval, if emissions are caused, or altered, from a Prescribed Premises unless done in accordance with a Works Approval, Licence or the requirements of a closure notice or an environmental protection notice. Therefore, this Application seeks the approval to lawfully emit and discharge contaminants within the Facility within limits and conditions set by DWER.

6.8 Radiation Safety Act 1975

This WAA provides high level information about the management, handling and treatment of LLW for context only. The management and disposal of LLW is regulated under the *WA Radiation Safety Act 1975* (RS Act) by way of a Site Registration. In October 2019, Tellus was granted a Site Registration (RS 210/2018 30289) for storing radioactive substances in the form of NORM at the Facility. In March 2021, the Site Registration was amended to include DSRS up to LLW level of activity.

Tellus is in the process of amending the Site Registration to include permanent isolation of LLW under the RS Act. The WA Radiological Council, supported by the Radiation Health Unit, is the responsible decision-making authority for the RMP, Facility Radiological Safety Case and Site Registration.

The Registration amendment application for permanent isolation (disposal) of LLW is supported by a Radiation Management Plan (RMP) and a Facility Radiological Safety Case.

Both documents detail the potential environmental and human health hazards associated with that prescribed activity and, describe control measures to avoid and reduce radiation exposure.

6.9 Other approvals

Commonwealth and State legislation that has been achieved for the Facility and therefore applicable to this Proposal is listed in Table 6.1. Other legislation that may be applicable to this Proposal is provided in Table 6.2.

Table 6.2 Other relevant legislation

Legislation	Application	Status/Comment
Commonwealth legislation		
***Hazardous Waste (Regulation of Exports and Imports) Act 1989* (HWREI Act)**	Part 2, Division 3 of the HWREI Act regulates export and transit permits and, the grant of Basel Convention permits. The key provisions of the HWREI Act are: • s. 17(1) - Minister must grant a permit in certain circumstances. Where an applicant seeks a Basel export permit, subject to the provisions below the Minister must grant an export permit if the Minister is satisfied of all the criteria under s 17(1). • s. 17(2A)-(5) – Minister has discretion not to grant an export permit. Subsections 17(2A)-(5) set out circumstances in which the Minister may decide not to grant an export permit. • s. 18A - export permits for final disposal may be granted only in exceptional circumstances	Environmentally sound management' is defined in s. 4E of the HWREI Act to mean *'taking all practicable steps to ensure that the waste is managed in a manner that will protect human health, and the environment, against the adverse effects that may result from the waste'.* The availability of Tellus' Sandy Ridge facility means that it is no longer sufficient proponents to export hazardous waste without considering domestic alternatives as this does not satisfy the test of taking 'all practicable steps' as provided in s. 4E.
Western Australian legislation		
Bush Fires Act 1954	Wildfire control.	The Facility has implemented an approved Bushfire Management Plan in accordance with *State Planning Policy 3.7 Planning in Bushfire Prone Areas.*
Nuclear Waste Storage and Transportation (Prohibition) Act 1999	Prohibits the storage, disposal, or transportation of certain nuclear material.	Tellus has approval to accept LLW only. It has no intention of accepting nuclear waste or nuclear material at the Facility.
Occupational Safety and Health Act 1984 (OSH Act)	Radiation safety.	Tellus operates within an approved Safety Management Plan and Radiation Management Plan which address key requirements of the OSH Act.
Soil and Land Conservation Act 1945	Protection of soil resources.	Tellus has undertaken multiple baseline soil sampling programs within the approved prescribed premises boundary and, approved miscellaneous tenure associated with the Facility.
Biodiversity Conservation Act 2016	Protection of threatened, rare or endangered species.	Tellus operates in accordance with approved flora and fauna environmental management plans under MS 1078.

7. Existing environment and sensitive receptors

Extensive investigations have been undertaken to describe the existing (baseline) environment and to assess the potential environmental impacts during construction, operation, decommissioning and closure of the Facility. These included specialist studies of flora and vegetation, geological evolution, soils and landform, fauna, hydrology and hydrogeology, infiltration and seepage, heritage, and radiation. Environmental mitigation and management measures have been identified to avoid and minimise potential impacts and to protect the environment. A summary of the environmental assessment included in the PER (Tellus 2016) is provided in the following sub sections.

7.1 Climate

The climate of the Facility is characterised as semi-arid, with annual average rainfall of approximately 250 mm, and evaporation exceeding 2,400 mm/annum. The mean annual rainfall is low and occurs mainly from January to July with the driest months being late spring to early summer. The winter months are cool with very hot summers.

Sporadic rainfall events (which may be intense) result in local runoff, and infiltration of rainfall into surface soils. However, during subsequent dry periods, evaporation, and evapotranspiration removes this rainfall infiltration from the top few metres of soil, which results in little, if any, net recharge.

The closest Bureau of Meteorology (BOM) weather station to the proposed prescribed premises boundary is located at Menzies, approximately 110 km to the northeast. An Automated Weather Station (AWS) has been installed within the prescribed premises boundary to record wind speed, wind direction, relative humidity, air temperature and precipitation.

7.2 Topography

The Facility falls within the Norseman (266) soil landscape mapping zone (Tille 2006). The landforms of the area consist of very low relief undulating plains and low rises. Small rocky hills and ridges can be found on the granitic terrain. The plains can host salt lakes, claypans, and some silcrete duricrusts.

The Facility location is typical of the landscape which occurs over deeply weathered granite rocks. The topography ranges from about 460 m above sea level to 490 m above sea level and generally rises slightly from west to east. The prescribed premises boundary falls within the Kalgoorlie Province defined by Tille (2006). The Kalgoorlie Province is described as consisting of an extensive plateau of low relief that includes:

– Flat to undulating plains with small valleys (occasionally broken by low narrow rocky hills, ridges, tors, and bosses) mostly found on granitic terrain
– Broad, flat to undulating, shallow valley plains are below these undulating plains and are formed on Quaternary alluvium and colluvium
– Gently sloping to undulating plateau areas on granites and gneisses are situated higher in the landscape. These have long gentle slopes and, in places, abrupt erosional scarps
– Rocky ranges, hills and ridges on the greenstone, along with some undulating to low hilly country
– Level to gently undulating sandplains and gravelly sandplains are mostly found over lateritic residuals and granitic basement
– The Yendilberin Hills which fall within the rocky ranges, hills and ridges of the greenstone category comprise a narrow, approximately northwest to southwest-trending rocky ridge to the west of the proposed prescribed premises boundary, with a maximum elevation of 523 mAHD at Mount Walton (approximately 16 km south of the prescribed premises boundary (i.e., mining tenement), and approximately 8 km southeast of the Carina Pit and water pipeline route).

The prescribed premises boundary predominantly consists of flat to gently undulating sand plains and over weathered granite. There are no salt lakes in the proposed prescribed premises boundary and the southern end of the water pipeline route near Carina Pit enters the Yendilberin Hills.

7.3 Existing land use

The Facility is an open-cut kaolin mine and near-surface geological facility, which is Australia's only commercial-scale geological repository for Class IV and Class V hazardous and intractable wastes.

Land surrounding the prescribed premises boundary is unallocated Crown land and is managed by the WA Department of Planning, Lands and Heritage (DPLH). Approximately 5 km to the east is the Mount Walton East Intractable Waste Disposal Facility (IWDF), owned and operated by the Western Australian government. The IWDF is operated on a campaign-basis, so is uninhabited.

The nearest population is a mining camp, 52 km south of the Facility. The proponent holds an exploration licence (E16/440) over 5,930 ha of land which has been explored since 2013. The approved prescribed premises boundary covers 1,061 ha (17%) of the exploration lease (refer to Figure 3.2). Tellus was granted a second exploration licence (E16/530) in July 2020, over 4,900 ha to the north of the Facility.

At the Facility, kaolin clay is mined for later use (i.e., backfilling around Class IV and Class V waste, for capping each waste cell, for potential export to Asia or supply to the domestic ceramics and paint markets). The void spaces created by mining are backfilled with Class IV and V wastes.

The key infrastructure areas at the Facility are detailed in Table 7.1 and identified on Figure 3.2.

Table 7.1 Existing land use

Infrastructure	Details
Mine infrastructure	• Cell 1 for permanent isolation of waste • Stockpile area • Geotechnical laboratory • Mining offices • Workshop and laydown yard
Waste infrastructure	• Relocatable waste cell roof canopy, Air Dome • Liquid waste unloading area • Waste inspection bays • Mixed store – main yard • East yard • Flammable risk store • Low level radioactive waste warehouse and packaging building • Chemical laboratory • Radioactive laboratory • Waste Immobilisation Plant • PFAS storage area
Stormwater catchment and retention system	• Yard containment pond • Service water pond • Brine pond • Stormwater tanks (for LLW area) • Stormwater retention pond – East Yard • Stormwater pond – west • Mining Area V-drain to Settlement sump

Infrastructure	Details
Raw water supply and treatment system	• Production Bore (Carina) • Reverse-osmosis water treatment facility
Miscellaneous infrastructure	• Accommodation camp • Wastewater treatment plant and sprayfield • Access roads • Water pipelines • Class II putrescible landfill

7.4 Geology and soils

The Facility lies within the Archean Yilgarn Craton, which forms one of the largest intact segments of the Archaean crust on earth and has been tectonically stable for approximately 2,500 million years. The topography of the prescribed premises boundary consists of flat to gently undulating plains and low rises and is typical of landscapes over deeply weathered granite rock.

The main soil type is a deep yellow sand that is associated with the higher relief areas in the northeast of the prescribed premises boundary and the greater exploration tenement. The other soil type is a red sandy duplex, which is associated with the shallow southwestern section of the prescribed premises boundary. Drilling data shows a granite weathering profile consisting of the following hydrogeological units, which are described from the surface to depth (refer to Figure 4.3):

– Colluvial sand and gravel with mottled zone laterite – comprising mostly yellow brown quartz sand overlying pisolitic-ironstone gravel and/or nodular red-brown clayey sand (lateritic mottled zone)
– Silcrete – comprising kaolinitic clay and silica to form a hard cap over underlying lithologies. The base of the silcrete generally merges gradationally into the underlying kaolinitic clay profile and as a result the silcrete can be quite variable in terms of overall thickness. The silcrete has most likely been hardened as the result of a secondary chemical process that effectively has re-cemented the kaolinitic clay profile from its upper surface
– Kaolinitic clay – comprises soft white kaolin weathered from pre-existing granitoids. Drilling indicates the clay profile may be absent in certain areas where silcrete stretches to the granitoid basement, but generally is more than 15 m thick and up to a maximum of nearly 40 m thick. The clay is quite uniformly white with little fracturing and only exhibits minor iron staining in the few fracture zones present
– Granitoid basement – comprises a fine to medium grained light-coloured granite containing pegmatite and quartz veins. The basement topography varies widely to less than 5 m from the surface to greater than 45 m below the surface.

Plausible permeability values ranging between $1x10^{-6}$ m/s (0.08 m/day) and $1x10^{-5}$ m/s (0.8 m/day), are suggested for the slightly silty sand, sandy gravel and weakly cemented sand. The underlying clayey sand, sandy clay and silcrete are assumed as impervious for drainage purposes, with presumptive permeability values of less than $1x10^{-7}$ m/s (0.008 m/day).

The clay formation is laterally extensive (80 km long and 40 km wide) and has been stable for approximately 20 million years and is up to 36 m thick at the Facility. The average overburden thickness, above the clay bed in the prescribed premises boundary, is 9 m, which includes a relatively impermeable 5 m thick caprock comprised of laterite and silcrete. Beneath the overburden, the kaolin zone is on average 20 m thick (9 to 40 m depth). Beneath the kaolin zone is a saprolite zone (kaolinitic, including some incompletely weathered granite). Below the saprolitic zone is thick granite. The in-situ clay formation has very low permeability at around 1×10^{-9} m/s. When combined with the thickness and extent of the clay, it will not transmit waste off-site, even if a solute (water) was present.

7.5 Reserves, conservation areas and environmentally sensitive areas (ESA)

No bush forever sites are listed in the area, given the Facility is not within the metropolitan area or other conservation reserves. The development area does not contain any Environmentally Sensitive Areas or Matters of National Environment Significance (MNES).

The closest natural reserve is the Mount Manning Range Nature Reserve, located approximately 9.8 km to the northwest, which is managed by the Department of Biodiversity, Conservation and Attractions (DBCA).

7.5.1 Heritage

There are no known records of heritage items (Aboriginal or European) within or in proximity to the prescribed premises boundary as confirmed via online database searches (WA Department of Aboriginal Affairs Site Register, State Heritage Register [inHerit], World Heritage Register, National Heritage Register, Commonwealth Heritage Register and the Australian Heritage Database). In addition, a search of the Land, Approvals and Native Title Unit indicated there are no registered native title claims over the proposed prescribed premises boundary (Government of Western Australia 2015).

Field surveys did not record any heritage items (registered or previously unrecorded) or ethnographic values within the proposed prescribed premises boundary. Field surveys were conducted in consultation with representatives of the Kapam Native Title Group, Kelamaia Kabu(d)n and Widji Group and more recently with the Marlinyu Ghoorlie Claim Group.

7.6 Contaminated sites

A search of DWER's contaminated sites database (2015, 2019 and 2021) confirmed there are no records of contamination (refer also to Section 6.4).

7.7 Hydrology

The Facility has a semi-arid desert Mediterranean climate with just over 250 mm of average rainfall per annum (Tellus 2016) and more than 2,400 mm per annum of evaporation. No channels or creeks occur in the proposed prescribed premises boundary (Rockwater 2015).

There are no major flow paths in the area of the proposed cells, and surface water runoff would only be generated from very infrequent high rainfall events (Rockwater 2015). These flows would be from small local catchments which drain residual runoff after infiltration losses, to low-lying depressions. Generally surface water would only be retained for short periods in the depressions due to continual infiltration. In addition, there would be evaporation of water in clay pans, which would typically begin three days after a major rainfall event once clouds have lifted. Water may drain into the cell area, prior to the placement of the Air Dome, from the north and east because it has a slighter higher elevation but only in the event of infrequent, very high rainfall events.

Geo9 (2019) undertook geophysical investigations in 2019 to characterise the lithology and hydrogeology of the Facility, with the results presented below:

– The granite basement is irregular, with ridges and depressions evident that naturally control the location (spatial distribution) of groundwater at the Facility
– Groundwater has been recorded in basement lows where a natural basin structure has developed where the weathered granite meets the unweathered granite
– No regional aquifer – confirmed through hydrogeological investigations. The site is not subject to flooding due to its low rainfall and very high evaporation (refer to Section 7.1) that limits infiltration into the soil profile.
– There is potential for an ephemeral perched aquifer in heavy rainfall periods which saturate soils above the silcrete layer (i.e., located below surface soils and above the kaolin layer).

7.7.1 Groundwater

The Facility lies in an area that does not have a regional water table. This is because any rain falling in the region is either evaporated, evapo-transpirated or runs off at the surface. It is also due to the thickness and permeability of the geologic profile, which includes 5 m of relatively impermeable silcrete and up to 40 m of low permeability clay.

There is no developed aquifer within the Facility's prescribed premises boundary. Where groundwater has been encountered, it occurs in natural traps in the deepest parts of the basement surface.

Extensive desktop and field research undertaken between 2014 and 2021 indicates there is no surface recharge of groundwater in the survey area combined with a significant horizon of low permeability in the kaolinite and saprock horizons (Geo9 2019, CyMod 2021). The distance to the nearest groundwater and/or water sources is listed in Table 7.2

Table 7.2 Distances to regional groundwater and other water sources from the site activity boundary

Groundwater and water sources	Distance from prescribed activity	Environmental value
Carina bore	Approximately 13 km to the southwest of the Facility.	Hypersaline groundwater
Boorabbin paleochannel	Approximately 30 km to the east of the Facility.	Hypersaline groundwater
Walleroo paleochannel	Approximately 30 km to the east of the Facility.	Hypersaline groundwater
Lake Deborah	Approximately 75 km to the south-east of the Facility.	Salt Lake
Lake Giles	Approximately 80 km to the north-west of the Facility	Salt Lake system (associated with Lake Barlee)
Perth to Kalgoorlie water pipeline	Approximately 110 km to the south of the Facility.	Potable water supply

There are no groundwater users (or bores) in the local area, with the exception of bores for monitoring purposes at the Intractable Waste Disposal Facility at Mount Walton East, approximately 5.5 km east of the prescribed premises boundary. Water supply bores are located at the Mount Dimer gold mine, 23 km west of the prescribed premises boundary.

As reported in the PER (Tellus 2016), the Cell 1 Works Approval Application (Tellus 2020) and s38 Referral supporting documentation (Tellus 2021), approximately 370 drill holes drilled in the area indicate the groundwater is restricted to a pocket in the western portion of the site (Geo9 2019). Further, the groundwater is held in 70-million-year-old weathered kaolin with low permeability. Therefore, groundwater at the Facility is unlikely to be affected by seasonality, or change with time and, is slow moving from its existing location.

In the event of seepage from a storage cell, it is estimated that resident time in the unsaturated zone is on the order of 400,000 years. However, given the volume of seepage from a cell, as estimated from a simulation, the hydraulic conductivity of the kaolin, the inferred depth to the water table, and the in-situ saturation of the unsaturated zone below the repository, it is considered unlikely that any groundwater mounding or lateral flow of seepage will occur in the vicinity of a cell, as seepage will be stored in the unsaturated zone or enter the water table at depth and flow laterally to the northwest (CyMod 2021).

7.7.2 Surface water

The Facility does not occur within a surface water area and irrigation districts proclaimed under the *Rights in Water and Irrigation Act 1914*.

A desktop review of GEODATA waterbodies (Geoscience Australia 2019) and multiple field inspections confirmed that there are no natural or artificial surface water bodies within the approved Facility prescribed premises boundary.

Fourteen catchments were identified in the prescribed premises boundary. If water does not infiltrate over the flow path, it would pool in a depression until it infiltrates or evaporates. Five depressions were identified in the vicinity of the prescribed premises boundary. A further two depressions occurred outside of the prescribed premises boundary. The estimated peak flows over the access road range from approximately 10 m^3/s to 35 m^3/s for the 100-year ARI event, and 40 m^3/s to 130 m^3/s for the probable maximum flood (2,000-year event) (Tellus 2016).

The access road lacks vegetation which is likely to increase the speed of surface water flows. Peak flows would typically occur approximately 20 minutes after the start of a rainfall event, and flow depth and widths would be the same speed with or without infiltration, but flow depths and widths would reduce by the end of a rainfall event. Flow durations would be short. For example, peak flows in the vicinity of the proposed cell and infrastructure area range from approximately 1.6 m^3/s to 5.5 m^3/s, and for the probable maximum flood 2,000-year event from 7 m^3/s to 20 m^3/s (Tellus 2016).

If surface water flows are generated within the proposed prescribed premises boundary, they would likely follow the natural topography until they evaporate (within 12 hours) or infiltrate (at a rate of up to 500 mm/day).

The Facility has artificial stormwater retention ponds to drain the mine infrastructure and administration buildings.

7.8 Vegetation and flora

As noted in the PER (Tellus 2016), a flora and vegetation assessment was undertaken to assess the potential impacts to flora and vegetation during construction and operation of the Facility. The flora and vegetation assessment included a review of previous flora and vegetation surveys in the region, review of aerial photography and contour maps, a review of publicly available databases for conservation significant flora and vegetation communities that may be affected, and a field survey. A range of different vegetation associations and vegetation types were recorded within the proposed prescribed premises boundary and vicinity.

The site is within the Jackson Vegetation System (Beard 1972) which comprises *Acacia allocasuarina* thickets, mixed Proteaceae-Myrtaceae scrub heaths and Eucalyptus Woodlands. Four regional vegetation associations were found to occur within the prescribed premises boundary. These vegetation associations have greater than 97% of their pre-European extent remaining outside of the prescribed premises boundary and are considered well represented.

The prescribed premises boundary consists of open woodland and shrublands dominated by Acacia and Eucalyptus spp. Open heaths were dominated by *Leptospermum sp.* All of the vegetation types are considered common and widespread within the region. Most of the vegetation within the prescribed premises boundary is considered to be in excellent condition except where it is directly impacted by clearing for developing the Facility.

There are no Threatened Ecological Communities (TECs), or Endangered Ecological Communities (EECs) listed under the *Wildlife Conservation Act 1950* (WC Act) or TECs listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) that have been recorded or that are predicted to occur within or near the development envelope as listed under the BC Act and/or EPBC Act.

One Priority Ecological Community (PEC) has been recorded as occurring within the groundwater abstraction area and vicinity (adjacent to Carina Iron Ore Mine) – the 'Finnerty Range/Mt Dimer/Yendilberin Hills vegetation complexes (banded ironstone formation)' PEC listed at Priority 1 by the DBCA. Disturbance to this vegetation association was minimised in the design and construction of the water abstraction infrastructure.

Table 7.3 lists flora species of conservation significant within 20 km of the Facility. Species in bold type have been recorded in the prescribed premises boundary.

Table 7.3 List of flora species within 20 km of the Facility

Species	Common name	Conservation status in WA	Status under EPBC Act 1999
Cryptandra polyclada subsp. aequabilis		Priority 1	
Cyathostemon sp. Mt Dimer (C. McChesney TRL 4/72) PN		Priority 1	

Species	Common name	Conservation status in WA	Status under EPBC Act 1999
Dampiera sp. Jaurdi (D. Angus DA 268) PN		Priority 1	
Lepidosperma lyonsii		**Priority 1**	
Phebalium appressum		Priority 1	
Baeckea sp. Jaurdi Station (L.W. Sage & F. Hort 2229)		Priority 2	
Daviesia sarissa subsp. *redacta*		Priority 2	
Goodenia jaurdiensis		Priority 2	
Hakea rigida		Priority 2	
Hemigenia tenelliflora		Priority 2	
Acacia cylindrica		Priority 3	
Acacia desertorum var. nudipes		Priority 3	
Banksia lullfitzii		Priority 3	
Bossiaea celata		Priority 3	
Eucalyptus exigua		Priority 3	
Gastrolobium semiteres		Priority 3	
Gompholobium cinereum		Priority 3	
Grevillea georgeana		Priority 3	
Hibbertia lepidocalyx subsp. tuberculata		Priority 3	
Homalocalyx grandifloras		Priority 3	
Lepidium genistoides		Priority 3	
Melichrus sp.		**Priority 3**	
Mirbelia ferricola		Priority 3	
Stenanthemum newbeyi		Priority 3	
Stylidium choreanthum	Dancing Triggerplant	Priority 3	
Verticordia mitodes		Priority 3	
Verticordia stenopetala		Priority 3	
Banksia arborea	**Yilgarn Dryandra**	**Priority 4**	
Eremophila caerulea subsp. merrallii		Priority 4	
Eucalyptus formanii		Priority 4	
Sowerbaea multicaulis	Many Stemmed Lily	Priority 4	

Of the 50 species identified in the database searches, 25 are possibly present on the tenement site and a further 7 could occur on the pipeline route where soil mapping indicates the presence of some ironstone soils. There are four species ranked as Priority 1, five as Priority 2, eighteen as Priority 3 and five as Priority 4 in the list of species that potentially could occur on the site and pipeline route.

All three species listed as Threatened under the WC Act and Endangered under the EPBC Act are considered 'Unlikely' to be present on the Facility.

Direct impacts on terrestrial flora and vegetation during construction and operation of the Proposal include the removal of vegetation and impacts to land managed by the DBCA. Up to 40 ha of native vegetation clearing is expected for development of Cells 2 to 4. Clearing will be within the Mining Area, in which up to 202.3 ha of clearing is authorised by MS 1078.

There may be indirect impacts on flora and vegetation such as an increased incidence of fire, altered hydrology, increased dust, the uptake of saline water and the introduction and spread of weeds. Mitigation and management measures will be implemented in accordance with the approved Flora and Vegetation Management Plan to eliminate or reduce these impacts, including ensuring that vegetation clearing is kept to a minimum, ensuring populations of conservation significant flora are clearly marked and avoided, implementing dust suppression and management measures, monitoring vegetation health and incorporating weed management into the construction and operational environmental management plan for the Proposal.

7.9 Fauna

Tellus undertook a Level 1 vertebrate fauna assessment, a targeted Malleefowl survey and a short-range endemic (SRE) survey to fulfil the requirements of EPA Guidance for terrestrial fauna. These studies identified two fauna habitats within the prescribed premises boundary, which are open woodland and shrubland. Both the fauna habitats were in 'very good to excellent' condition. Another targeted survey for the Facility was undertaken by Terrestrial Ecosystems in October 2021.

The species listed in Table 7.4 are potentially found in the vicinity of the Facility and are listed as being conserved under the WC Act and/or the EPBC Act.

Table 7.4 Species that are potentially found in the vicinity of the Facility

Species	Common name	Status under the Wildlife Conservation Act	Status as per EPBC Act
Myrmecobius fasciatus	Numbat	Schedule 1	Vulnerable
Calyptorhynchus latirostris	Carnaby's black - cockatoo	Schedule 1	Endangered
Leipoa ocellata	Malleefowl	Schedule 1	Vulnerable
Dasyurus geoffroii	Chuditch	Schedule 1	Vulnerable
Apus pacificus	Fork - tailed swift	Schedule 3	Migratory
Platycercus icterotis xanthogenys	(Mallee) Western Rosella	Schedule 1	
Lophochroa leadbeateri	Major Mitchell's Cockatoo	Schedule 4	
Falco peregrinus	Peregrine Falcon	Schedule 4	
Aspidites ramsayi	Woma	Schedule 4	
Morelia spilota imbricata	Carpet Python	Schedule 4	
Acanthophis antarcticus	Southern Death Adder	Priority 3	
Hylacola cauta whitlocki	Shy Heathwren	Priority 4	
Pseudomys occidentalis	Western Mouse	Priority 4	
Oreoica gutturalis	Crested Bellbird	Priority 4	
Burhinus grallarius	Bush Stone-curlew	Priority 4	
Nyctophilus(timorien sis) sp. 1	Central Long-eared Bat	Priority 4	
Ardeotis australis	Australian Bustard	Priority 4	
Charadrius rubricollis	Hooded Plover (western subspecies)	Priority 4	

Species	Common name	Status under the Wildlife Conservation Act	Status as per EPBC Act
Calamanthus camestris montananellus	Rufous Fieldwren	Priority 4	
Macropus irma	Western Brush Wallaby	Priority 4	
Isoodon obesulus fusciventer	Quenda	Priority 5	
Ninox novaeseelandiae	Southern Boobook		Marine
Polytelis anthopeplus	Regent Parrot		Vulnerable
Calamanthus campestris hartogi	Dirk Hartog Island rufous fieldwren		Vulnerable
Coracina novaehollandiae	Black-faced Cuckoo-shrike		Marine
Petrochelidon nigricans	Tree Martin		Marine

Evidence of Malleefowl within the prescribed premises boundary has been recorded during recent surveys by Terrestrial Ecosystems. The Malleefowl is listed as Vulnerable under the WC Act and the EPBC Act. The recent targeted survey found evidence that Malleefowl are still present in the vicinity of the project area. 53 historical and 4 new mounds were found in the area. However, there were no active mounds and no evidence to suggest that any of the historical mounds had been utilised for breeding in the past five or more years. Therefore, it was suggested that monitoring of the located mounds could be discontinued.

An additional four listed species were noted to possibly occur within the prescribed premises boundary are:

- Central Long-eared bat (*Nyctophilus timoriensis*)
- Western Rosella (Mallee) (*Platycercus icterotis xanthogenys*)
- Fork-tailed swift (*Apus pacificus*)
- Peregrine Falcon (*Falco peregrinus*).

The remaining eight species are considered unlikely to occur within the prescribed premises boundary due to lack of suitable habitat.

The Facility has a moderate SRE species diversity with a minimum of 30 species from SRE groups recorded (Bennelongia 2017). Of these, two potential SRE species, spider *Aganippe* sp. B26 and millipede *Antichiropus* sp., were recorded. *Aganippe* sp. B26 was collected from outside the impact area but within the prescribed premises boundary from tall eucalypt woodland habitat that is widespread. *Antichiropus* sp. was collected from two sites within the impact area from two different habitat types (tall eucalypt woodland and open heath). Both habitat types occur widely in the prescribed premises boundary and wider region.

During the targeted survey for Malleefowl, evidence was found for the presence of foxes (*Vulpes vulpes*) in the area. Therefore, an active feral animal reduction management program was recommended. A feral pest control program targeting feral cats and foxes was undertaken at the Sandy Ridge facility. Feral cat and fox activities were noted at several locations, but none were caught. The program recommended deploying baits on quarterly basis, until no fox tracks are observed around the facility. Further recommendations were made to secure putrescible waste to ensure that it is inaccessible to feral pests.

7.10 Sensitive receptors and specified ecosystems

Sensitive receptors and specified ecosystems are areas of high conservation value and special significance that may be impacted as a result of prescribed activities resulting in emissions and discharges from the Facility. Sensitive receptors and specified ecosystems pertinent to this Application are listed in Table 7.5.

Table 7.5 Distance to sensitive receptors and specified ecosystems from the site activity boundary

Sensitive receptors or ecosystems	Distance from prescribed activity
Human receptors	
On-site workers	-
On-site visitors to the Facility	-
Mount Walton Intractable Waste Disposal Facility (IWDF) (Facilities to cater for five personnel, however, operate infrequently on a campaign style basis during day-time operating hours, with the most recent operation being conducted in 2020)	Approximately 5 km east of the Premises.
Ex-Juardi pastoral station homestead	Approximately 50 km south of the Premises. Temporary tourist accommodation.
Carina Mine Camp	Approximately 52 km south of the Premises.
Town of Koolyanobbing	Approximately 75 km south-east of the Premises.
Environmental receptors	
Important wetlands – Western Australia	There are no important wetlands located within 20 km of the premises (based on available GIS dataset – Geomorphic Wetlands and Wetland (DIWA)). The closest Nationally Important Wetland is Lake Barlee, which is approximately 90 km northwest of the Premises.
Geomorphic Wetlands	There are no geomorphic wetlands within 20 km of the premises (based on available GIS dataset – Geomorphic Wetlands).
RAMSAR Wetlands	There are no RAMSAR wetlands within 20 km of the Premises.
Public drinking water source areas	There are no Public Drinking Water Source Areas within 20 km of the premises (based on available GIS dataset – Public Drinking Water Source Areas).
Major watercourses/waterbodies	There are no major watercourses/water bodies within 20 km of the premises (based on available GIS dataset – Hydrography WA 250K – Surface Waterbodies).
Non-Perennial Surface Water Bodies	DWER GIS data indicate two minor non-perennial waterbodies associated with Lake Raeside, one approximately 50 m south of the premises boundary and one approximately 450 m west of the premises boundary (based on available GIS dataset – Hydrography WA 250K – Surface Waterbodies). These waterbodies are located approximately 2.5 km and 1.4 km respectively from the proposed infrastructure area and temporary waste storage area.
Parks and Wildlife Managed Lands and Waters	The Mount Manning Range Nature Reserve is located approximately 9.8 km north-west of the Premises. The Mount Manning – Helena and Aurora Ranges Conservation Park is located approximately 19.8 km west of the Premises. The Boorabbin National Park is located approximately 100 km south of the Premises.
Threatened Ecological Communities and Priority Ecological Communities	Vegetation with affinities to the Finnerty Range/Mt Dimer/Yendilberin Hills Vegetation Complexes (Banded Ironstone Formation) are located approximately 12.5 km to the southwest of the Premises.
Threatened/Priority Flora	Six threatened/priority flora are located within a 10 km radius of the Premises, the closest being approximately 3 km from the Premises boundary.
Threatened/Priority Flora – as identified in the Public Environment Review	*Calytrix creswellii* – listed as Priority 3 by the DBCA - recorded within the mine infrastructure area. *Melichrus sp*. – listed as Priority 3 by the DBCA – recorded within Bungalbin Hills.

Sensitive receptors or ecosystems	Distance from prescribed activity
	Banksia arborea – listed as Priority 4 by the DBCA - recorded within the groundwater abstraction area.
Threatened/Priority Fauna	Historic *Leipoa ocellata* (Malleefowl) disused mounds are mapped within premises boundary.

No bush forever sites are listed in the area, given the Facility is not within the metropolitan area or other conservation reserves. There are no ESAs listed under the EP Act or TEC or PEC recorded at the Facility.

8. Emissions and discharges

This section identifies the potential emissions and discharges associated with the proposed development at the Facility. The sensitive receptors have been presented in Section 7.10.

8.1 Construction

8.1.1 Dust emissions

The mining phase will involve controlled blasting and continuous mining to construct new cells, and excavation and earthmoving activities associated with the development of access tracks and surface water management. There is a potential for dust to be generated during these activities as material is collected, transported, spread, and compacted in the formation of this infrastructure.

Windblown dust from open areas is also likely to occur throughout this phase. The dust causing mechanisms and controls are the same as for the site development phase. Extreme weather conditions can potentially cause more significant dust emissions which could potentially impact on nearby receptors.

Impacts on vegetation and flora in the prescribed premises boundary resulting from dust generating activities would be localised. The main activities likely to create suspended dust particles in the air would be associated with vegetation removal, topsoil and subsoil stripping, blasting, excavation of overburden and ore, backfilling, truck movements and stockpiling. The extent of the dust dispersion would be determined by the intensity of the specific activity and the direction of the prevailing wind conditions. It is noted that all activities following the blasting activities will be undertaken beneath the Air Dome.

Dust can also produce physical effects on plants such as blockage and damage to stomata, shading, and abrasion of leaf surface or cuticle. This can result in cumulative effects such as drought, stress on already stressed species or lead to decreased plant health, and even death in extreme circumstances. Decreased growth and vigour of plants may mean that they are more susceptible to pathogens and other disturbance, and these plants are more likely to be subject to increased mortality. Such impacts on individual plants generally result in decreased productivity and can result in changes in vegetation and community structure (Farmer 1993).

Although the generation of dust from mining activities is unavoidable, the impacts on flora and vegetation are considered low due to the frequency and extent of each activity. These include the following:

– Blasting would likely occur at a frequency of one event per year and would last for a matter of seconds
– Excavation of overburden and ore, as well as backfilling with overburden, would be undertaken at one cell location per year, primarily below the ground surface and within the Air Dome, restricting the volume of dust released
– All continuous mining activities following the controlled blasting will be undertaken once the Air Dome has been erected over the cell.

Saline groundwater with concentrations similar to seawater would be used for dust suppression activities on hardstand work areas and internal access roads within the proposed development.

Dust is more likely to be a hazard close to the cell (i.e., less than 1,000 m), with the hazard decreasing with distance until background dust levels are reached. However, under adverse weather conditions dust can travel considerable distances. Dust accumulation on leaf surfaces can reduce essential plant processes including photosynthesis, respiration, and transpiration. Given the remote location of the site and the use of an Air Dome, the dust emissions are expected to have minor impact within the immediate vicinity of the Facility and are unlikely to impact on nearby sensitive receptors.

Dust deposition monitor gauges have been established at the Facility and are presented in Figure 8.1. The dust deposition gauge results are presented in Table 8.1.

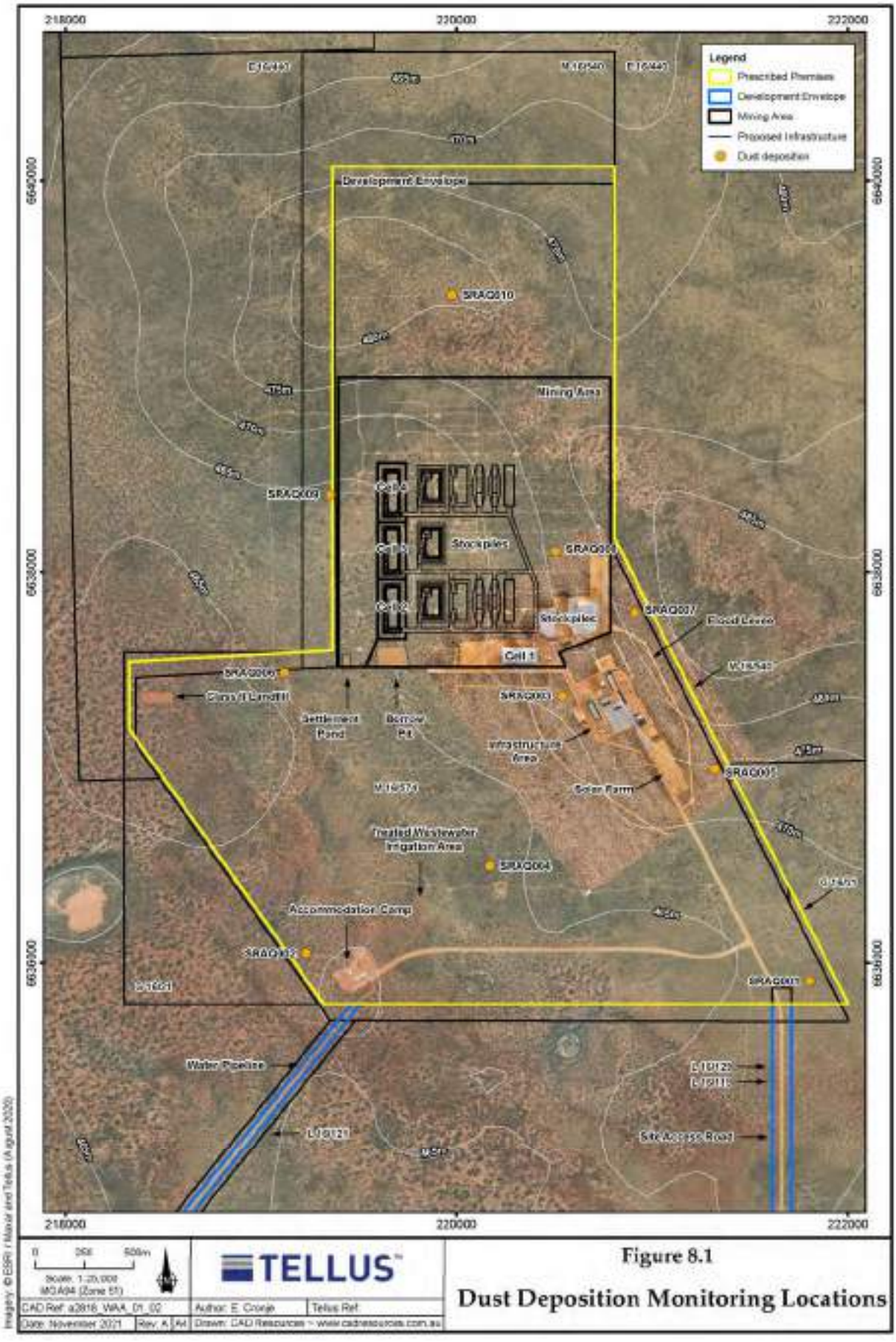


Figure 8.1 Dust deposition monitoring locations

Table 8.1 Dust deposition gauge results

Sample	Oct. 2019 to Jan 2020		Jan 2020 to Apr 2020		Apr 2020 to Jul 2020	
	Total Solids (mg)	Alpha, α (Bq)	Total Solids (mg)	Alpha, α (Bq)	Total Solids (mg)	Alpha, α (Bq)
Village	150	0.017 ± 0.004	65	0.069 ± 0.013	650	<0.021
Weather station	300	<0.008*	280	0.020 ± 0.005	610	<0.021
Control	N/A	N/A	66	0.035 ± 0.009	510	<0.021
South-East	180	0.015 ± 0.004	110	0.031 ± 0.008	850	<0.021
South-West	N/A	N/A	110	0.029 ± 0.007	630	<0.021
North-West	N/A	N/A	74	0.037 ± 0.008	610	<0.021
North-East	N/A	N/A	94	0.030 ± 0.007	610	<0.021

8.1.2 Air emissions

Gaseous emissions during the construction phase will be limited to combustion emissions from mobile equipment and generators. Emissions from light vehicles will be short-lived and are not considered to represent a significant source of emissions. Mobile equipment and generator emissions are only expected to have a minor, temporary impact on local air quality and will not impact on sensitive receptors. Gaseous emissions will be minimised by ensuring mobile equipment and generators are maintained in accordance with manufacturer's specifications.

8.1.3 Noise emissions

Noise emissions will occur due to mobile equipment generated noise and any blasting that may be required for the civil works.

8.1.4 Light emissions

The majority of construction work is expected to be undertaken during daylight hours; however, some night shift work, weekend and public holiday work might be required. Some light emissions will therefore occur during the construction phase. However, given the distance to the nearest receptor and the use of an Air Dome, these emissions are not expected to be noticeable.

8.1.5 Emissions to land

There is potential for emissions to land to occur due to spills or leaks of environmentally hazardous materials (chemicals/hydrocarbons) from storage areas, from mobile equipment or generators, during refuelling or during servicing of mobile equipment and generators. Due to the absence of surface and groundwater flow, risk of run-off is expected to be minimal. Any release which does occur will be a priority and shall be promptly addressed.

Storage of environmentally hazardous materials is in accordance with the *Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007* and in accordance with Dangerous Goods Licence DGS022452.

Spill kits will be distributed around the key work areas and storage locations for easy access to materials when needed. In field refuelling vehicles will also carry spill kits on board.

If a waste spill or leak occurred and seeped or flowed to soil and vegetation, the potential impact to the receiving environment is considered to be slight and restricted to minimal impacts on a local scale. Contaminated material would be recovered and disposed in a waste cell.

8.1.6 Emissions to water

There are no specific emissions to water associated with the construction phase. Dewatering is not expected to be required for this work activity.

8.1.7 Stormwater

The cell will be covered with an Air Dome during the construction phase, so stormwater run-off is expected to be minimal. In addition, an on-site stormwater retention pond has been designed and constructed to contain a 100-year ARI, 72-hour storm event. It is lined with a high-density polyethylene (HDPE) liner. If the pond reaches capacity and overtops, it has been designed to overflow into the raw water pond located immediately adjacent, and which is also HDPE-lined.

Stormwater collected in the stormwater retention pond (and raw water pond if there has been overflow into it) will be sampled for contaminants prior to use on-site. If results indicate concentrations of contaminants greater than Facility trigger levels, water will be used in waste cells (e.g., for compaction).

8.1.8 Solid and liquid waste

Waste volumes generated during this phase are expected to be small. Construction activities will generate three main waste streams:

– Municipal waste such as food waste, paper, cardboard, cans and plastics
– Construction waste such as scrap metals, timber scraps, concrete and packaging
– Hydrocarbon waste such as used lubricants, oily rags and containers, absorbent materials and oil filters.

General wastes will be collected in standard bins and skip bins which either have a lid or will be covered with a net.

8.2 Operations

8.2.1 Air emissions

Minimal air emissions are expected from waste handling and management during the operations phase. In addition, considering that all operations will be carried out under an Air Dome and the distance from nearest sensitive receptors is significant, effect of air emissions on surrounding environments is expected to be insignificant.

8.2.2 Noise emissions

Considering the distance to the nearest receptor (refer to Section 7.10) and the use of an Air Dome, noise emissions during operations phase are not expected to be noticeable.

8.2.3 Light emissions

As the Facility will use an Air Dome over Cells 1 and 2 during their operations phase, insignificant light emission is expected to be emitted from the Facility.

8.2.4 Emissions to land

The Facility is in a remote area within the Goldfields region. The Facility is not accessible by public roads and is not open to public access. The location of the Facility was selected based on the climatic and geological characteristics that make the site suitable for containing intractable wastes, consistent with the Basel Convention concerning chemical waste disposal and the requirements of the *Code of Practice for the near-surface disposal of radioactive waste in Australia* (NHMRC 1992). Those same site characteristics that make the Facility suitable for a near surface geological repository also make the Facility suitable for above-ground storage of wastes awaiting disposal.

The Facility has a waste approval process and register for all potentially hazardous substances proposed for use at the Facility to ensure they can be appropriately handled and stored on site. The Facility is operated in accordance with the *Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007* and in accordance with Dangerous Goods Licence DGS022452 (DG Licence). Waste acceptance is governed by strict waste acceptance criteria, with only solid wastes (once treated/immobilised) to be disposed in waste cells.

Wastes will be stored in their primary waste packages in appropriate freight containers within dedicated waste zoning groups as per the *Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007* in accordance with DG Licence, where applicable.

Solid wastes may be stored in either the East Yard or the Mixed Store. Liquid or sludge wastes may be stored in either the Mixed Store or the Radioactive Waste Warehouse and Yard. Tellus will store materials 'like with like' wherever possible and in accordance with its DG Licence.

Pavement types and civil earthworks have been designed and constructed to provide appropriate drainage management for the different storage areas within the infrastructure area (i.e., Radioactive (and sludge/liquid) Waste Facility, Mixed Store and East Yard). Wastes stored in containers will only be removed and managed in concrete bunded, covered facilities.

Vehicular traffic will be excluded from waste storage areas by bunding, fencing and/or signage, procedures, and training. The only vehicle authorised in waste storage areas will be the reach stacker.

– The Mixed Store has been constructed with Pavement Type A
– All solid chemical waste will be stored in a primary storage package (e.g., steel drum, bulka-bag) within a sea container
– All storage packages will have clear readable chemical labels
– Sea containers will be stacked and segregated as per storage requirements for the East Yard area of the DG Licence
– Sea containers will remain closed unless they need to be opened to prevent or mitigate a discharge of waste to the environment.

The potential impact to the environment in case of potential waste spill or leak is considered to be slight and restricted to minimal impacts on a local scale. Contaminated material will be recovered and disposed in a waste cell.

8.2.5 Emissions to water

No local or regional groundwater aquifer has been identified, reducing the possibility of groundwater contamination and ingesting contaminated groundwater.

The nearest surface waterway is greater than 50 km from the Facility and Tellus considers that there is no off-site Premises risk to public health caused by the Facility's activities.

8.2.6 Solid and liquid waste

An uncontrolled release of waste from the existing WIP, either untreated liquid/sludge or treated spade-able product, may result in impacts to soil and vegetation health. Waste acceptance criteria is used to determine the acceptability of wastes at the Facility. If an emission were to occur, it would likely have the characteristics of a Class IV or Class V waste.

Waste (either treated or untreated) discharges may result in localised impacts to soil and indirectly impacts on vegetation health. A release of NORM may result in localised soil impacts.

The WIP is attended at all times when in operation.

If material was discharged to soil and vegetation from the WIP, the impact to the receiving environment is considered slight: restricted to minimal impacts on a local scale. Contaminated material can be recovered and disposed in a waste cell.

8.2.7 Stormwater

If a waste spill or leak occurred in waste handling areas and the material was washed by stormwater into the on-site stormwater retention pond or was discharged from the sludge/liquid waste handling area, it may either seep into the underlying soil or overtop to soil and vegetation. Uncontrolled chemical discharges may result in localised impacts to soil and indirectly to impacts on vegetation health in the surrounding area. A release of NORM sludge or soils may result in adverse soil impacts at a local scale.

All operations on site will be conducted under an Air Dome to minimise the potential adverse impacts associated with stormwater runoff.

Stormwater from the waste cell area will drain to the settlement sump in the south-west corner of the Mining Area via a v-drain. Stormwater collected in the settlement sump is intended to be retained for reuse, evaporate or infiltrate. If the sump reaches capacity, it has been designed to overflow into the adjacent area. “Clean” stormwater upslope of the waste cells will be diverted away from this area by a flood levee to the east.