Environmental Assessment and Management Plan

Havieron Gold Mine Stage 1 Landfill

Prepared for Newcrest Mining Limited

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1 Introduction

Newcrest Operations Ltd (Newcrest) are developing the Havieron Project (the Project), located approximately 45km east of the existing Telfer Gold Mine (Telfer), approximately 1,300km north-northeast of Perth in the Pilbara region. The Project is developing in two stages, with Stage 1, relating to exploration and preliminary works, currently underway. Construction of Stage 2, relating to mining and ore processing, is expected to commence in late 2022. Currently, Stage 2 of the Project has been referred to the Environmental Protection Authority (EPA) under Section 38 of the Environmental Protection Act 1986 (WA).

As part of the Stage 1 works, which have already commenced, a landfill (the Site) is required to manage non-mineral wastes generated onsite during construction of the Project. This landfill is urgently needed onsite, with waste currently being transported to Port Hedland over a distance of approximately 520km. The proposed landfill will be a small, rural landfill that will run for the duration of Stage 1 only, which is anticipated to conclude in first quarter (Q1) of 2024. During the development for Stage 2 works, the landfill will be decommissioned, and all wastes generated during the lifespan of the Project will be transferred to the Class II landfill at the nearby Telfer Gold Mine.

1.1 Report Objectives

This Environmental Assessment and Management Plan (EAMP) will provide Newcrest with clear direction on operations and works required to facilitate the development of a landfill in compliance with the Western Australia *Environmental Protection (Rural Landfill) Regulations* 2002 (WA Rural Landfill Regulations). It will outline the design considerations implemented to manage environmental impacts and ensure the safe and stable development of the landfill over its short-term operational lifespan.

The key objectives of the EAMP are to:

- Describe the current environmental attributes at the Site;
- Outline the Site detail, design, and operations;
- Identify any potential risks to environmental aspects associated with the Site;
- Outline the environmental engineering and management measures to be implemented to ensure that all potential impacts are managed to appropriate standards; and
- Support the approvals process for the landfill, including the Works Approval under Part V of the *Environmental Protection Act 1986,* and Site Registration under Regulation 5B of the *Environmental Protection Regulations 1987*.

1.2 Scope of the Report

To satisfy the objectives outlined in Section 1.1, this report contains the following sections:

- Introduction;
- Site Description;
- Description of Proposal;
  - Need for Proposal
  - Landfill Conceptual Design;
  - Landfill Operations;

  - WA Rural Landfill Regulations Compliance Summary
- Environmental Aspects and Management;
- Residual Risk Assessment; and
- Conclusion.

1.3 Approvals Strategy

The proposed landfill aims to provide urgent, short-term waste management at the Project over the duration of Stage 1 works, which are expected to conclude in Q1 2024. The Site will be classified as a Category 89 prescribed premises under Part 2 of Schedule 1 of the *Environmental Protection Regulations 1987*. The anticipated waste generation rates will average 1,300 tonnes (t) annually, as discussed further in Section 3.1.2.; however, the maximum tonnage per annum of 5,000t has been specified to account for any unforeseen increases in waste generation. Details of the prescribed premises category are listed in Table 1-1.

Table 1-1: Category of Prescribed Premises

Category No.	Name	Description	Production or Design Capacity (per annum)	Expected Throughput (per annum)
89	Putrescible Landfill Site	Premises on which waste (as determined by reference to the waste type set out in the document entitled "Landfill Waste Classification and Waste Definitions 1996" published by the Chief Executive Officer, as amended from time to time) is accepted for burial	More than 20 but less than 5,000 tonnes	5,000 tonnes

A Works Approval application for the construction of the facility will be submitted under Part V of the *Environmental Protection Act 1986* and will include an allowance for time-limited operations due to the urgency of establishing an on-site waste management solution. Following receipt of the finalised Works Approval, the first cell of the landfill will be constructed, and the application for the Category 89 Premises registration as described in Schedule 1 and as per regulation 5B of the *Environmental Protection Regulation 1987* will be submitted. Once approved, this registration will allow the operation and progressive development of the Site during Stage 1 of the Project, with landfilling activities concluding at the end of this period in Q1 2024.

2 Site Description

The following sections provide an overview of the key aspects of the Site, including its location, surrounding land uses, sensitive receptors, flora and fauna, and environmental attributes.

2.1 Site Location and Access

The Site is located approximately 450km east southeast of Port Hedland, and 45km east of Newcrest's Telfer Gold Mine. The Site is entirely contained within the Project's waste rock landform (WRL), within mining lease M45/1287, which is jointly held by Greatland Pty Ltd (Greatland) and Newcrest Operations Ltd. The Stage 1 WRL development envelope is approximately 5.1 hectares (ha), and the landfill cells will be contained within the footprint of this landform, with access from the main box-cut road. The active landfill cell will be surrounded by a gated temporary stock-fence, which can be relocated as additional landfill cells are required and developed.

A locality plan of the Site is provided in Figure 1.

2.2 Surrounding Land Use

The Site is located within the Havieron Project, along its southern edge. Evaporation ponds will be located to the west, and the laydown and administration areas will be located approximately 600m to the east. The Stage 1 WRL will encapsulate the landfill, with rock deposition occurring around the entirety of the landfill Site. The Stage 2 WRL will be developed to the immediate north and east of the existing WRL. The boxcut is located to the northeast of the Site.

The Stage 1 WRL will be constructed in three benches, two of which will have a depth of 5m, with the third having a depth of 4m, giving the final landform a height of 14m above ground level. DumpSolver has prepared a memorandum outlining the design and rehabilitation of the Stage 1 Waste Rock Landform (the WRL Memo), available in Appendix C.

The Site layout is outlined in Figure 2.

2.3 Sensitive Receptors

The Project is located within the Great Sandy Desert surrounded by native vegetation. The nearest sensitive receptors within the Project are the mine's administration area, located approximately 500m to the east of the Site, and the temporary mine camp, located approximately 2.2km to the north-west. Karlamilyi National Park is a sensitive receptor located approximately 23km to the southeast. The nearest communities are the Punmu Aboriginal Community, 60km south-east and Nullagine, 260km to the west.

According to the *Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986) No. 3 – Separation Distances between Industrial and Sensitive Land Uses* prepared by the West Australian Environmental Protection Authority (WA EPA), a Category 89 prescribed premises should maintain a 500m buffer distance for sensitive uses. The proposed Site location is compliant with these guidelines.

Figure 3 displays the location of these identified sensitive receptors and the 500m buffer distance from the edge of the landfill development area.

Newcrest has developed an Environmental Management System (EMS), which provides over-arching guidance for the management of all environmental aspects at the Project, including the Site. The EMS ensures that any risks to sensitive receptors are mitigated or minimal.

2.4 Flora and Fauna

Vegetation at the Site is predominantly *Grevillea wickhamii* open shrubland over *Acacia stellaticeps* and *Tribulus spp.* and low open shrubland over *Triodia epactia* hummock grassland[1]. Vegetation local to the Site has already been cleared as part of the development of the WRL, and no further clearing will be required as part of the landfill development. The existing vegetation clearing was approved under a Native Vegetation Clearing Permit (9035/1).

Several fauna species have been located in the development envelope of the project, including the Night Parrot, Greater Bilby, Bush-tailed Mulgara, Northern Marsupial Mole, Gull-billed Tern, Great Desert Skink and other migratory bird species[1]. Subterranean fauna has also been reported in groundwater onsite, including stygofauna, amphibious and troglofauna[1]. Figure 4 shows the identified habitats and species at and in the vicinity of the Havieron Project.

Development of the Site will comply with Newcrest's Flora and Fauna management plans for the Project, including the Bilby Management Plan submitted with the Stage 1 Mining Proposal.

2.5 Environmental Attributes

The following section outlines the key environmental attributes of the Site, that are particularly relevant to the landfill design, including climate, topography, geology, hydrogeology (groundwater), and hydrology (surface water).

2.5.1 Climate

The Site experiences a tropical-arid to semi-arid environment, with very hot summers and warm winters. During the warmer months from December through to March, there is frequent cyclonic activity and tropical lows drawing in from the northwest coast. According to the Bureau of Meteorology (BOM), the closest weather station with long-term data is Telfer Aero (Station 01303), approximately 45km west of the Site. The temperature and humidity data has been sourced from this weather station and is further discussed in the sections below.

As there is limited quality controlled BOM data available for rainfall and pan evaporation, this data was sourced from Scientific Information for Land Owners (SILO), a database of Australian climate data from 1889 to the present day that is hosted by the Queensland Department of Environment and Science (DES). It provides daily meteorological datasets for a range of climate variables in ready-to-use formats suitable for biophysical modelling, research, and climate applications. The datasets are constructed from observational data obtained from BOM, using mathematical interpolation techniques to infill gaps in time series and construct spatial grids. The spatial grid selected (Latitude: -21.75, Longitude: 122.65) encompasses the Site in its entirety.

[1] Havieron Underground Mine Project Referral Supporting Document, October 2021, Newcrest Mining Limited, Revision 3

2.5.1.1 *Rainfall*

Being in a tropical-arid zone, rainfall is seasonal with higher rainfall generally in the months of December to March. Table 2-1 presents a summary of SILO's rainfall records, from 1970 to 2020.

Table 2-1: Rainfall Overview in Millimetres (1970-2020)

Aspect	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	59.1	86.4	59.3	15.5	16.2	11.4	6.3	3.2	1.9	2.5	12.3	47.5	**321.5**
90th Percentile	62.5	114	187	112	5.8	3.4	8.4	0.1	0	27.6	67.8	25.7	**613.9**
Highest	33.7	190	257	37.2	44.4	0.1	0	0	0.6	0.2	41.9	74	**679.2**

The mean annual rainfall for the Site is calculated as 321 millimetres (mm) with the highest recorded annual rainfall at 679mm, which occurred in 2000.

2.5.1.2 *Temperature*

Table 2-2 shows the average maximum and minimum temperatures at the Telfer Aero weather station for years 1974 to 2020.

Table 2-2: Maximum and Minimum Temperatures at Telfer Aero

Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Maximum Temperature (°C)	40.3	38.8	37.6	34.7	29.1	25.4	25.5	28.5	33.0	37.4	39.6	40.3	**34.2**
Mean Minimum Temperature (°C)	26.1	25.4	24.2	20.8	15.4	11.9	10.7	12.6	16.6	21.2	23.7	25.6	**19.5**

The highest mean maximum temperature is 40.3°C in December and January, whilst the lowest mean minimum temperature is 10.7°C in July.

2.5.1.3 *Pan Evaporation*

The approximate average daily pan evaporation rates for the Site are based on the calculated monthly rates from SILO. Table 2-3 outlines the average pan evaporation data, from 1970 to 2020.

Table 2-3: Pan Evaporation Average Data for the Site in Millimetres (mm)

Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Monthly	368	300	308	255	202	164	178	222	280	356	380	390	**3,405**
Daily	11.9	10.7	9.9	8.5	6.5	5.5	5.8	7.2	9.3	11.5	12.7	12.6	

The daily average pan evaporation ranges from 5.5mm to 12.7mm and monthly from 164 mm to 390 mm. The total annual average pan evaporation for the Site is calculated as 3,405mm. This is a

significant potential evaporation rate that is approximately five times the wettest rainfall year experienced at Site.

2.5.1.4 *Humidity*

BOM data suggests that the Site experiences low humidity year-round due to the Site's hot arid climate. Table 2-4 shows the morning, afternoon and calculated average humidity at Telfer Aero from 1975 to 2010.

Table 2-4: Morning and Afternoon Relative Humidity at Telfer Aero

Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean 9am Relative Humidity (%)	41	48	40	33	37	43	38	32	24	21	24	32	**34**
Mean 3pm Relative Humidity (%)	24	30	26	22	25	27	23	19	14	12	13	19	**21**
Average Humidity (%)	33	39	33	28	31	35	30	26	19	17	19	26	**28**

As can be seen from the data in the table, the Site experiences a very low humidity year-round, with the highest mean humidity occurring during February, and the lowest occurring during October. For comparison, the typical annual average humidity for the Perth Metropolitan Area is 55%, approximately twice as high.

2.5.2 Topography

Topography at the Site is relatively flat, with natural ground elevations ranging from 251mAHD to 248mAHD. The WRL, where the Site will be located, is varied in height and has a current maximum elevation of 254.5mAHD, with side slopes at approximately 1:2 (V:H). The elevation of the topography surrounding the Site generally slopes from east to west. The final profile of the WRL will sit at an elevation of approximately 262mAHD, with 3 distinct benches and approximately 11m-14m above existing ground levels.

The general topography of the Site is shown in Figure 2 with further details provided in Drawing C-100 in Appendix A.

2.5.3 Geology

The surface geology of the Project is predominantly characterised by quaternary eolian sands, with wind-formed dunes of up to 30m in height present across the area[2]. Minor gravelly plains are interspersed among these dunes, including plains with thin sand cover over calcrete.

A Waste Characterisation Study[3] was undertaken for the Stage 2 WRL, and this report summarises the materials that will comprise the Stage 1 WRL. These Stage 1 WRL materials are present during the construction of the decline and identifies geology near the surface of the Site. Beyond the surface sands, geology at the Site comprises of saprolite and saprock underlain by mudstone, tillite, sandstone and siltstone. Characterisation testing was undertaken on the saprolite material as part of the Project

[2] L. Kelder & E. Howard (Landloch Pty Ltd), *Havieron Soil Characterisation Report*, September 2020
[3] C. Lison & A. Botfield (Landloch Pty Ltd), *Havieron Project Stage 2 Waste Characterisation Study*, October 2021

Closure Investigations[4], and showed that the permeability ranges from $1.11x10^{-10}$m/s to $5.56x10^{-10}$m/s at 95% Maximum Modified Dry Density (MMDD) and 100% of Optimal Moisture Content (OMC). No testing has been undertaken on the permeability of other materials from the Stage 1 decline development, however the Project's proximity to Telfer indicates that siltstone present at Havieron could have similar properties to the Outer Siltstone Member (OSM) material present at the Telfer Gold Mine. This OSM material has been approved for use in Telfer's tailings dams and landfills due to its low permeability nature.

The entire base of the WRL was constructed with an estimated 540mm of low-permeable saprolite material with an approximate permeability of $6x10^{-10}$ m/s achieved. The construction documentation is provided in Appendix C.

2.5.4 Hydrology

There are no permanent surface water bodies at the Project, with Lake Dora being the nearest major surface water body approximately 40km south-east of the Project. Surface water systems at the Site are generally ephemeral, with informal drainage lines between sand dunes shedding water to the west where it accumulates in clay pans before evaporating.

Surface water at the Site is managed through the WRL surface water management system, which comprises of a sedimentation and drainage ditch that captures runoff from the WRL landform and directs it into evaporation ponds.

A Flood Study[5] was undertaken for the Project and found that no surface water would impact the WRL during a 1-in-100-year flood event. A map showing the results of the flood study is presented in Figure 5.

2.5.5 Hydrogeology

A Hydrogeological Assessment[6] of the Site identified four distinct aquifers at the Site, with the unconfined aquifer being closest to the Site at a depth of approximately 7 metres below ground level (mbgl). With the construction of the first WRL bench, this depth has increased to 10mbgl across the Site. The unconfined aquifer generally flows from east to west in line with general topographic formations. Figure 6A shows the depth to groundwater across the project.

The top, unconfined aquifer is hydrologically separate from the upper confined aquifer at the Site, however to the west the separating layer of mudstone thins, and the unconfined aquifer and upper confined aquifer become hydraulically connected. The upper confined aquifer is typically found at depths of 10mbgl in the west to 110mbgl in the east, with groundwater flows trending east to west.

Groundwater monitoring bores are installed at the Site, including two hydrologically down-gradient of the Stage 1 WRL, with two others to the north and north-east. There are no production bores hydrologically down-stream of the Site. The location of the groundwater bores at the Project has been presented in Figure 6B.

[4] C. Lison (Landloch Pty Ltd), *Havieron Project Closure Investigations*, October 2021
[5] Rockwater Pty Ltd, *Havieron Project Surface Water Assessment*, September 2020
[6] Rockwater Pty Ltd, *H3-Level Hydrogeological Assessment of the Havieron Project*, May 2021

3 Description of Proposal

The aim of the proposed Site is to provide an emergency, short-term landfill for the duration of Stage 1 of the Project. Waste is currently trucked approximately 520km to Port Hedland once per week for disposal at significant cost and generating significant greenhouse gas emissions. This landfill will enable waste disposal onsite in the short-term whilst Newcrest assesses the requirements for using the nearby Telfer Gold Mine Landfill for waste disposal once the Project advances to Stage 2.

The following sections outline the need for the proposal, the design considerations and details, and the operational measures that will be incorporated over the landfill's anticipated 2-year lifespan.

3.1 Need for Proposal

The proposed landfill will be established to manage the waste generated during Stage 1 of the Havieron Gold Mine. During Stage 1, ancillary infrastructure is constructed by a crew of approximately 300 staff that reside in a temporary camp located at the Project. The following sections describe the waste characteristics and generation anticipated during this period.

3.1.1 Waste Types

The landfill is proposed to be a Class II putrescible landfill operating as a Category 89 prescribed premises, which will accept the following waste types up to a combined total of 5,000 tonnes per annum:

- Clean and uncontaminated fill;
- Inert Waste Type 1 (i.e., general and industrial waste);
- Inert Waste Type 2 (i.e., tyres and plastics);
- Special Waste Type 2 (i.e., biomedical waste); and
- Putrescible Waste.

It is anticipated that the landfill will usually be operated during daylight hours, and that access to the landfill will be restricted to the designated landfill operator, or site contractors under the direct supervision of the landfill operator.

3.1.2 Waste Quantities

A waste generation model has been developed for the Site using Telfer Gold Mine's waste generation as a baseline and adjusting based on the relative size of both operations, and types of wastes accepted.

The Telfer Gold Mine Landfill received on average approximately 2,625 tonnes per annum (tpa) from 2017 to 2020. The breakdown and tonnages of waste received from 2017 to 2020 is shown in Table 3-1.

Table 3-1: Historical Telfer Waste Data

Waste Type	2017 (t)	2018 (t)	2019 (t)	2020 (t)	Average (t)	Average (%)
Inert Type 1	1,531	1,761	1,500	1,263	1,514	*58%*
Inert Type 2*	344	0	300	819	366	*13%*

Waste Type	2017 (t)	2018 (t)	2019 (t)	2020 (t)	Average (t)	Average (%)
Putrescible	758	677	772	771	745	*28%*
Special Waste Type 1	0	0	0	0	0	*0%*
Special Waste Type 2	0.7	0.2	0.15	0.3	0.3	*0.01%*
Total	**2,635**	**2,439**	**2,572**	**2,855**	**2,625**	***100%***

**Includes Clean fill, bioremediated soils and contaminated solid waste tonnages, if any*

This average waste input has been used as the starting point for the Havieron waste generation model, which features the following adjustments based on waste type:

- Inert Type 1: Industrial operations are the largest generator of this waste stream onsite, and this waste generation has been halved to reflect the relative difference in sizes between Telfer and Havieron mine and processing operations.
- Inert Type 2: Industrial operations are the largest generator of this waste stream onsite, and this waste generation has been halved to reflect the relative difference in sizes between the Telfer and Havieron mine and processing operations.
- Putrescible: Putrescible waste has been adjusted from the Telfer's waste generation using a proportional work-hours approach. In 2020, 4,316,073 workhours were undertaken at Telfer. Comparatively, with an assumed maximum workforce of 300 staff during Stages 1 and 2 and assuming 24 hours of work, 7 days a week, 52 weeks a year, the Project is likely to have 2,620,800 workhours annually. This represents a reduction in putrescible waste generation of approximately 40%. This has been further reduced by a third for Stage 2 waste generation, to represent that only a third of meals will likely be consumed at the Project (i.e., lunch).
- Special Waste Type 1: This waste will not be accepted at the Site and has been removed from modelling.
- Special Waste Type 2: This waste has been reduced using the proportional work-hours approach taken for the Putrescible waste stream.

The resulting waste generation model for Havieron Stages 1 and 2 is presented in Table 3-2.

Table 3-2: Havieron Waste Generation Model

Waste Type	Stage 1 (t)	Stage 1 (%)	Stage 2 (t)	Stage 2 (%)
Inert Type 1	757	54.4%	757	69.4%
Inert Type 2	183	13.1%	183	16.8%
Putrescible	452	32.5%	151	13.8%
Special Waste Type 2	0.2	0%	0.2	0%
Total	**1,392**	**100%**	**1,091**	**100%**

Putrescible waste only accounts for approximately 32% on average of the waste that will be landfilled at the Site during Stage 1. The majority of the waste (approximately 68%) is inert.

Given the correlation between the volume of waste generated in a community and its population, an annual population growth rate is typically applied to determine what future volumes should be catered for at a landfill. However, there are currently no plans to expand the number of personnel at

the Project over the course of its lifespan. Therefore, additional future waste projections will not be generated, and the waste values as outlined in Table 3-2 will be used for void space modelling, which is discussed further in Section 3.2.4. If a significant change in the number of employees or activities at the Project occurs, then these waste generation rates, and the associated modelling, should be revisited.

Waste generation modelling is presented in Appendix B.

3.2 Landfill Conceptual Design

To enable Newcrest the flexibility to adapt landfilling around the development of the Stage 1 WRL, the landfill design comprises key components that will remain consistent across landfill cell development even as cell geometry and layout is varied to facilitate ongoing WRL development. These key elements include the landfill width, base, bunds and supporting infrastructure layout, and are discussed in the following sections.

3.2.1 Design Considerations

Development of the Stage 1 WRL will change depending on the conditions encountered at the underground mining face, and as such the WRL's ongoing construction rates are unknown. Therefore, the development of the landfill cells within the Stage 1 WRL must be adaptable to this varied filling.

As discussed in Section 2.5.3, the entire base of the WRL was constructed with an estimated 540mm of low-permeable saprolite material with an approximate permeability of $6x10^{-10}$ m/s achieved. This allows for the location of the landfill cells to be anywhere within the Stage 1 WRL and still achieve a low-risk environmental profile. The construction documentation is provided in Appendix C.

Consideration must also be given to the WA Rural Landfill Regulations, which specify set design criteria impacting landfill cell layouts, tipping face size, environmental management systems, and surrounding Site layout.

Therefore, a minimum landfill cell design has been developed for the Site to comply with the WA Rural Landfill Regulations, whilst allowing Newcrest to locate the landfill cells in a way that will not impact the ongoing development of the Stage 1 WRL. The minimum design, which includes environmental controls, has been outlined in Section 3.2.2, whilst full compliance with the WA Rural Landfill Regulations has been discussed further in Section 3.4.

3.2.2 Landfill Cell Design

The following sections outline the key landfill design elements that will be common to all landfill cells at the Site. These minimum design elements will ensure that suitable environmental controls are applied to all landfill cells at the Site, regardless of orientation of position within the Stage 1 WRL.

Drawing C-101 in Appendix A shows an indicative landfill cell layout with the required landfill cell designs.

3.2.2.1 *Landfill Base*

The base for each landfill cell will be constructed from a 300mm compacted layer of in-situ soils to form a solid foundation for landfill operations. In general, soils for this basal layer should meet the following specification:

- Minimum compacted thickness of 300mm;
- Free from organic matter and other deleterious material; and
- Dry density of 95% of the maximum dry density (or 5% air voids).

The +500mm thick low-permeability saprolite layer that forms the base of the WRL provides the necessary containment layer for any landfill operations that are to take place within the WRL. The base of any landfill operations will be at a minimum of 3m above the surrounding natural ground level. This will result in a minimum separation distance from groundwater of 10m. As the Stage 1 WRL is further developed, this separation from groundwater will increase, improving environmental outcomes for additional waste placement.

This compacted layer will form a hardstand upon which waste will be placed and will feature a minimum 2% grade sloping away from the entrance of the landfill cell to ensure that rainfall on the waste mass is retained within the landfill.

Drawing C-300 in Appendix A shows the typical detail of the landfill's 300mm compacted soil base.

3.2.2.2 *Landfill Bunds*

Landfill bunds will be constructed around the perimeter of the landfill cell to retain waste and water that has come into contact with the waste. These bunds will be 2m high to help retain any litter within the landfill cell, and to act as a guide for the maximum tipping area to ensure that filling complies with the WA Rural Landfill Regulations. The bunds will be constructed of non-dispersive site-won soils, which may include Stage 1 WRL material, and will be a minimum of 4.5m wide at 1:1 slopes.

A section of the landfill cell will remain open to allow access for landfilling operations, and the final section of bunding will be constructed as each cell reaches capacity, prior to the application of additional material for the next lift of the Stage 1 WRL. This open section of the landfill cell will be situated in the highest part of the cell, and may have a low drive-over bund as an additional surface water management measure if required. If the landfill cell is constructed from soils above the level of the existing WRL, then this drive-over bund will not be required.

Drawing C-101 and C-300 in Appendix A show the landfill bund layout and typical detail.

3.2.2.3 *Layout and Siting*

The layout and siting of each landfill cell is also important to ensure compliance with the WA Rural Landfill Regulations and to maintain adequate environmental controls.

A 3m firebreak will be maintained around each cell, which will also allow access around the cell in the event of a landfill fire or if bund maintenance is required. This firebreak will be located at the base of the landfill bund.

A temporary stock fence will surround each landfill cell, and will be relocated from a completed cell following the conclusion of landfilling and prior to landfilling commencing in the next cell. This fence will be located at the exterior of the firebreak, a minimum 3m from the edge of the landfill bund so as to minimise the impact on Stage 1 WRL operations. This fence is intended to deter most fauna from accessing the landfill, to act as a security measure to restrict access from unauthorised personnel, and to contain windblown litter to within the landfill cell boundary.

Each landfill cell will have a maximum width of 30m to allow easy compliance with the tipping area restrictions outlined in the WA Rural Landfill Regulations.

The siting of each landfill cell is also important to ensure the stability of the WRL and to minimise leaching from potentially acid forming (PAF) materials. Each landfill cell will not be directly sited above another landfill cell unless separated by a minimum 1m of WRL material, and no landfill cell will be sited above an area of the Stage 1 WRL used to contain PAF. No PAF material is expected to be encountered within the operational lifespan of the Site; however, should this material be placed in the WRL, the above restriction shall apply.

3.2.3 Proposed Final Fill Profile

It is proposed that each landfill cell will be filled to a maximum height of 2m in order to comply with the WA Rural Landfill Regulations. Due to the short-term, time-limited operation of the Site, it is anticipated that each landfill cell will be covered by WRL operations within a year of completion at a maximum.

Drawing C-102 and Drawing C-200 in Appendix A show the final waste fill profile of a typical landfill cell prior to WRL material being applied.

3.2.4 Void Space Modelling

Void Space Modelling has been undertaken to determine the required filling capacity for the proposed landfill cell development using the calculated waste generation rates outlined in Section 3.1.2. This will allow Newcrest to understand the required footprint for a variety of landfill cell lifespans, and provide the ability to plan the siting of additional cells over the Site's limited lifespan.

For the purposes of this modelling, the density of waste after placement is assumed to be 0.8t/m^3 and the cover material requirements is assumed to be 25% of the total available void space volume, increased from common industry standard to account for the additional cover requirements outlined in Section 3.3.7.

Based on a rectangular, 30m wide, 2m high cell, the void space and lifespans for landfill cells of varying length are presented in Table 3-3.

Table 3-3: Estimated Landfill Cell Lifespans and Size

Landfill Cell Lifespan (months)	Total Void Space (m^3)	Net Void Space (ex. 25% Cover Soils) (m^3)	Required Landfill Cell Length (m)
1	181	145	5
3	544	435	14
6	1,088	870	25
12	2,176	1,741	48

*Assumed at 0.80t/m^3 compaction rate

Waste modelling undertaken shows that an estimated 4,251m^3 of void space will be required over the approximately 2-year lifespan of the Site. Should waste generation rates prove higher than anticipated, additional cells may need to be constructed within the Stage 1 WRL. The proposed landfill cell shown in Drawing C-101 has a void of 4,041m^3, providing a lifespan of 1 year and 11 months.

It is critical that landfill operators monitor the waste inputs and ensure that accurate records are maintained. These inputs should be reviewed biannually in conjunction with the void space

consumption within landfill to determine landfill compaction and consumption rates and to monitor the required landfill void and siting.

3.2.5 Rehabilitation Design

The Stage 1 WRL has a final height of 262mAHD, and will ultimately be merged with the Stage 2 WRL. The final WRL will feature 5m horizontal rock armour cover, with a minimum of 0.5m of rock armouring at the top of the landform. The horizontal waste rock cover will feature concave slopes at angles of 12°, 16° and 20°, and the slopes will have topsoil placed prior to contour ripping and seeding. These slopes will encourage surface water shedding away from the WRL and waste mass.

A 'Store and Release' surface water management method will be implemented for the top of the final waste rock landform, which sees surface water retained at the crest of the waste rock dump before being slowly released via passive seepage. Though this method of surface water management minimises erosion, it may promote infiltration of water near the crest of the WRL.

Therefore, each landfill cell will be covered with a minimum 300mm compacted low-permeability soil layer prior to any waste rock being placed above the waste mass, as discussed further in Section 3.3.8. Additionally, no landfill cell will be situated within 1m of the top of the WRL, prior to rock armouring installation, to increase the distance between potentially ponded water and any waste mass. These measures will reduce the risk of water infiltration and leachate generation.

3.2.6 Material Balance

A Material Balance is the calculation of the volume of materials required to carry out engineering works, daily cover activities for the landfill and its final restoration and comparing these quantities to the volume of material which can be retrieved from the Site. The Site is unique in that while no excavation works are required to establish the landfill, there is still an abundance of suitable soil material to meet the landfill's requirements due to the surrounding mining operations within the Project. This abundance of material ensures that any deficiencies can easily be covered by the mine's operations. Due to the varied cell geometry expected over the Site's short-term lifespan, no void calculations have been determined for the required landfill bunds; however, other calculations have been undertaken to determine the material required throughout the life of the landfill for:

- Landfill base construction;
- Daily cover material, which is assumed as 25% of the total landfill void; and
- The stockpile of cover soils required to comply with the WA Rural Landfill Regulations.

Table 3-4 shows the approximate material balance required for the Site.

Table 3-4: Approximate Material Balance Calculations for the Site

Item	Landfill Total Cut/Fill (+/-m^3)
Landfill Development	
Landfill Basal Layer	-810
Daily Cover Material (25% of Void Space)	-870
Landfill Capping Layer	-810
Total	**-2,480**

Daily Stockpile Requirement	
Stockpile Maintained at Landfill Cell	-60

Note: The fill to create new landfill cells assumes that the in-situ material is not already suitable for cell development

The development of the Site will require an estimated 2,480m^3 over a two-year lifespan. A cover soils stockpile of approximately 60m^3 should be maintained in the vicinity of the landfill active face, which may be sourced from the WRL, if appropriate.

3.3 Landfill Operations

The implementation of appropriate management practices will ensure the successful management of landfill operations whilst minimising the risk of any long-term environmental impacts. The key factors for ensuring effective landfill management include:

- Maintaining a small tip face/working face as far as practicable;
- Appropriate unloading techniques;
- Inspection during unloading;
- Correct waste placement/deposition;
- Compaction of waste; and
- Daily covering of waste with suitable material and thickness.

To ensure the landfill is operated effectively and efficiently, the following section outlines the requirements for the active tip face size, unloading techniques, waste placement including compaction and cover requirements, disposal activities during adverse weather conditions and phasing of filling.

3.3.1 Phasing of Filling

Filling of each landfill cell should progress from the lowest to highest point of the cell, progressing from the farthest point from its access point, back towards this point.

Each landfill cell should be developed with adequate time to allow the smooth transition of landfill operations and relocation of environmental controls such as the temporary stock fence.

3.3.2 Waste Measurement

As the Site lacks a weighbridge, throughput at the Site will be measured on a volumetric basis. For each load delivered to the landfill, the following should be recorded:

- Date;
- Waste type;
- Bin size;

Waste will be measured using the methodology outlined in Section 3.1 of the 'Approved manner for estimating the volume or weight of waste received at and disposed of to landfills', under Regulation 3 of the *Waste Avoidance and Resource Recovery Levy Regulations 2008*.

Waste deposition records should be reviewed monthly to ensure that waste generation and available void space are aligned, and to ensure that waste deposition is within the limits of the landfill regulations.

3.3.3 Tip Face Size

Waste deposited at the active tip face will be kept to a maximum of 30m long by 2m high in accordance with the WA Rural Landfill Regulations. The tipping face should be kept as small as practicably possible to minimise leachate generation and reduce the required cover soil amounts.

3.3.4 Unloading

Unloading shall occur within 5m of the active tip face to minimise unnecessary handling. Unloading is undertaken at a suitable height to minimise the generation of dust, windblown waste and to maintain a tidy working area.

3.3.5 Inspection at Tip Face

The waste collection vehicle should take waste to the unloading area, making sure the working area is safe and managing any hazards prior to disposal. All waste is inspected at the tip face by designated Newcrest personnel, which may be the Newcrest Environmental Team or an appointed representative, to ensure no unacceptable waste types are deposited in the landfill. The waste is visually inspected as it is deposited into the active landfill area. In the event non-conforming waste is identified, it should be removed from the tip face. Designated Newcrest personnel shall arrange for the collection of the non-conforming waste and appropriate treatment.

3.3.6 Water Bodies

The pooling of water within the tip face can cause traction issues for vehicles and may attract vermin. The designated Newcrest personnel should endeavour to clear any such water bodies around the active tip face. Compaction and daily covering of material can help to alleviate the generation of water bodies forming within the waste mass.

3.3.7 Waste Placement and Compaction

In general, the preferred method for the placement of waste is as follows:

- Unloading the waste at the head of respective tipping areas;
- Pushing wastes to the tip face using the front-end loader;
- Spreading and compacting waste in 500mm thick layers to form a 2m deep platform;
- Development of a level platform across the landfill width until the other side is reached; and
- Repetition of this procedure until the pre-settlement final fill landfill profile is reached.

Once waste activities are completed for a certain area, cover material is applied in line with Section 3.3.8. This cover is applied to:

- Prevent windblown litter;
- Reduce pests such as dingoes, rodents and birds; and
- Reduce stormwater ingress into the waste mass.

To maintain vehicular access to the tip-face, it is essential that the waste compaction is kept as high as possible. If sufficient waste compaction is not achieved, it may be necessary to apply additional clean fill to allow access to the tip-face for the waste delivery vehicles. Bulky objects which are difficult to bury can be placed at the base of the tip face and then covered from above. Drawing C-300 depicts the methodology for waste placement.

The specific waste placement/deposition procedures for Putrescible and Type 2 Special Wastes are detailed in the following sections. All other waste types are to be placed in the landfill and covered as per the standard cover requirements discussed in Section 3.3.8.

3.3.7.1 *Putrescible Waste*

Putrescible waste must be disposed to the landfill in accordance with the following requirements:

- To be deposited at the basal layer of the landfill and covered with additional inert waste wherever possible; and
- Covered as soon as practicable after deposition with covers soils as described in Section 3.3.8.

3.3.7.2 *Special Waste Type 2*

Special Waste Type 2 waste must be disposed to the landfill in accordance with the following requirements:

- Only to be disposed of under the supervision of a designated Newcrest staff member;
- To be covered with 1m of cover soils immediately following deposition
- Details of the deposition will be recorded in a register maintained at the Site, including:
  - Date;
  - Name of supervising person;
  - Depth of cover soils placed over the waste; and
  - Coordinates of where waste was deposited if more than 1m^2 of waste was deposited.
- The location of biomedical wastes will be marked on a plan of the Site; and
- No works shall be carried out on the landfill that could lead to biomedical wastes being excavated or uncovered.

3.3.8 Initial and Intermediate Cover

An initial layer of suitable cover material is progressively applied to exposed waste on the top of the active landfill area. The proposed requirements for cover materials are summarised in Table 3-5.

Table 3-5: Site Cover Requirements

Waste Type	Material	Depth	Timescales
Clean Fill	No Cover Required		
Inert Waste Type 1			
Putrescible Waste		300mm	As soon as practicable after deposition.

Waste Type	Material	Depth	Timescales
Inert Waste Type 2	Type 1 Inert Waste, Soil or Clay	100mm	By the end of the working day in which the waste was deposited. Plastic waste with the potential to become windblown shall be covered as soon as practicable after deposition.
Special Waste Type 2		1,000mm	As soon as practicable after deposition.

The covering of waste will assist with minimising odour, windblown litter, attraction of vermin, fire risk and general amenity. The Landfill Operator must ensure that there are sufficient quantities of cover material available to cover the waste on a daily basis, and must maintain a stockpile as discussed in Section 3.2.6. The cover materials that can be used include soils free of rocks and deleterious material with a diameter greater than the thickness of the cover soil layer.

Type 2 special waste (clinical waste) and putrescible waste should be buried and covered immediately to align with the proposed deposition requirements.

Intermediate cover may be required for areas that are left for weeks or months until they are covered by the Stage 1 WRL operations. Intermediate cover shall be applied a thickness of 300mm and will assist in the reduction of rainfall infiltration and generation of litter.

A 300mm compacted layer of low permeability soils must be applied over all landfill cells at the conclusion of landfilling operations in that cell. This must be applied prior to any further waste rock deposition over the landfill to minimise the environmental risk associated with the WRL's 'Store and Release' surface water management strategy discussed in Section 3.2.5.

The cover material for the Site may from the excavated surplus overburden soils from the Stage 1 WRL, or wherever suitable materials are available onsite.

3.3.9 Stability

The stability of the landfill is a key factor that can impact on the integrity of the landfill's environmental controls. To ensure the stability of waste and to minimise short-term settlement, waste should be levelled and compacted soon after initial placement and repeatedly, when possible. The aspects affecting compaction include the nature of waste material, weight of the compacting plant, number of passes and depth of layer/lift. No more than 0.5m of waste should be compacted at any time and three to five passes of the compaction equipment should be undertaken to maximise compaction and minimise settlement. Following compaction, the waste mass should be stable, with large bulky items such as pallets and boxes adequately crushed to maximise void space utilisation.

The slope of the working face can impact on waste compaction, manoeuvrability, quantity of cover required and water drainage. Typically, the working face should be no steeper than 1:3 (V:H) to allow compacting plant to traverse the face.

3.3.10 Adverse Weather Conditions

During periods of high winds and heavy rainfall events, the placement of waste will cease until the designated Newcrest personnel deems it safe and acceptable to recommence works. Adverse weather conditions can result in the generation of litter and dust as well as general safety issues.

3.3.11 Inspections

3.3.11.1 *Daily Fence Inspections*

A fence inspection should be undertaken at the Site at the end of each operational day prior to cessation of landfilling works. The entirety of the fence line should be inspected to ensure it is free of wind-blown litter and that no holes are present.

3.3.11.2 *Full Site Inspections*

Full Site inspections should be undertaken at the Site on a monthly basis. The purpose of these full Site inspections is to inspect Site infrastructure to identify non-conformances and implement corrective actions where necessary. A monthly Site inspection template has been developed to ensure appropriate areas are reviewed and recorded.

At a minimum, Site inspections should review the items described in Table 3-6.

Table 3-6: Proposed Full Site Inspection Contents

Item	Description
Landfill	• Road and hardstand areas intact / repairs or rectification required; • All signage and traffic control operating effectively (i.e., signs installed, in good condition, correct position and updated information; • Intermediate cover applied to filled areas; • Tip face being kept to minimum size and shaped for minimum cover placing; • No evidence of leachate generation within landfill area and / or leachate eruption through landfill batters; • No evidence of litter beyond the active tipping area; • No evidence of bird, vermin and / or feral animal activity; • No signs of dust generation; and • No noticeable odours present.
General Site	• Site vegetation control (i.e., no evidence of noxious weed infestations); • Sediment and Erosion control structures in place and in functional condition (as required); • Site firebreaks maintained; and • No evidence of contamination outside of operational areas.
Security	• Gates securely locked at all times; • Perimeter fencing in a sound and functional condition.
Other	• General observations; and • Identification of items not otherwise listed in the sections above.

3.4 WA Rural Landfill Regulations Compliance Summary

The WA Rural Landfill Regulations set out the requirements for Category 89 Prescribed Premises registered under Part V of the *Environment Protection Act 1986*. These requirements include:

- Landfill Siting
- Waste Deposition
- Required Infrastructure
- Landfilling Operations
- Environmental Controls; and
- Closure Requirements

Table 3-7 outlines the relevant requirements of the WA Rural Landfill Regulations that will affect the design and operation of the Site, and how the proposed landfill complies with those requirements.

Table 3-7: WA Rural Landfill Regulation Compliance Summary

Regulation	Description	Compliance
4.	**Landfill sites to which these regulations apply** These regulations apply to and in respect of premises specified in Schedule 1 Part 2 of the *Environmental Protection Regulation 1987* as Category 89 premises and registered under regulation 5B of those regulations.	The Works Approval Application for the landfill will seek time-limited operations under a Category 89 prescribed premises, and the Site will subsequently apply for registration as a Category 89 prescribed premises under regulation 5B of the *Environmental Protection Regulation 1987.*
5.	**Tipping area** The occupier of the landfill site must ensure that the tipping area of the site is not greater than – a) 30 metres in length; and b) 2 metres above ground level in height.	The Site will operate to maintain the required tipping area size at or below the requirements of regulation 5, as outlined in Section 3.3.3. Additionally, the design of each cell will feature a maximum width of 30m and a 2m high exterior landfill bund to help ensure that the tipping face can be maintained within the required dimensions, as outlined in Section 3.2.2. Monthly Site inspections described in Section 3.3.11.2 will also help ensure that the landfill tipping face is maintained at the required length and height.
6.	**Covering of waste** 1. The occupier of a landfill site must ensure that waste in the tipping area of the site is covered – a) At least as often as is specified in the Table to this regulation; and b) In accordance with sub-regulation (2). 2. Waste is to be – a) Covered with a dense, inert and incombustible material, or such other material as is approved in respect of a particular landfill site; and b) Totally covered, so that no waste is left exposed. 3. The occupier of a landfill site must ensure that there is enough cover material at any time stored and readily	Section 3.3.8 outlines the proposed cover depths and frequency, which are well above the cover requirements specified within the table of regulation 6. Section 3.2.6 outlines the required stockpile of soils that will be maintained in order to comply with sub-regulation 3.

<table>
<tr><th>Regulation</th><th>Description</th><th>Compliance</th></tr>
<tr><td></td><td>available on the site for the tipping area of the site to be covered, in accordance with this regulation, at least twice.
Table
<table>
<tr><th>Tonnes of waste received per year</th><th>Frequency waste is to be covered</th></tr>
<tr><td>Less than 500 tonnes</td><td>Monthly</td></tr>
<tr><td>Between 500 and 2 000 tonnes</td><td>Fortnightly</td></tr>
<tr><td>Between 2 000 and 5 000 tonnes</td><td>Weekly</td></tr>
</table></td><td></td></tr>
<tr><td>7.</td><td>Fencing of the landfill site
The occupier of a landfill site must ensure that there is a fence around the boundary of the site which is an effective barrier to cattle, horses and other stock</td><td>As discussed in Section 3.2.2.3, a temporary stock fence will be present in each active cell to prevent access from fauna, particularly dingoes, which are monitored in the surrounding area.</td></tr>
<tr><td>8.</td><td>Waste to be contained on landfill site
The occupier of a landfill site must ensure that –
1. Waste does not get washed, or blown, outside the site; and
2. Waste that has been washed, or blown, away from the tipping area of the site is returned to the tipping area at least once in each month.</td><td>Bunds and fencing at the Site will help ensure that litter is not washed or blown outside the Site, in compliance with sub-regulation 1.
Operationally, a daily fence inspection will be conducted at the Site to ensure that fences are maintained free of litter. This is above the requirements of sub-regulation 2 and will improve the management of litter and vermin at the Site.</td></tr>
<tr><td>9.</td><td>Separation of waste from water and site boundary
Unless otherwise approved in writing, the occupier of a landfill site must ensure that there is no waste within –
1. 35 metres from the fence surrounding the site;
2. 100 metres of any surface water body at the site; or</td><td>As part of the approval for the Site, there is a proposed reduction in the fence boundary required under sub-regulation 1. As the Project is a controlled Site, no member of the public nor adjacent land user can access the Stage 1 WRL and landfill. The nearest sensitive receptor is located approximately 500m from the Site boundary. The inclusion of fencing immediately surrounding the active landfill cell has been considered adequate to manage the risks. The rapid</td></tr>
</table>

Regulation	Description	Compliance
	3. 3 metres of the highest level of the water table aquifer at the site.	construction of the Stage 1 WRL will help increase the separation distance from the waste mass, and the top of each landfill cell will be situated a minimum of 1m from to surface of the final WRL. The evaporation ponds constructed approximately 20m west of the WRL to manage surface water runoff generated onsite and are not considered as a surface water body as discussed in the WA Rural Landfill Regulations. They do not meet the definition of a Surface Water Body under the definitions of the *Rights in Water and Irrigation Act 1914*. As outlined in Section 2.5.5, the minimum depth to groundwater at the Site is approximately 10m at the Site. As further discussed in Section 3.2.2.1, this depth to groundwater will only increase as the Stage 1 WRL is progressed towards its maximum height of 262mAHD.
10.	**Stormwater management** The occupier of a landfill site must ensure that stormwater on the site is adequately managed so that – 1. It is diverted from areas of the site where there is waste; and 2. Water that has come into contact with waste is to be diverted into a sump on the site, or otherwise retained on the site.	Landfill bunds will be installed as part of each cell development to both ensure that stormwater is diverted from the area of the Site where waste is deposited, and to ensure that water that has come into contact with the waste is retained on the Site. Additional drive-over bunds may be installed at the entrance to the landfill cell to prevent surface water from entering the landfill cell. Each landfill cell will have a minimum 2% grade sloping away from the entrance to further ensure that water that has come into contact with the waste will be retained on the Site. Long-term surface water management is discussed further in Section 3.2.5.
11.	**Dust suppression** The occupier of a landfill site must ensure that no visible dust escapes from the landfill site.	Dust suppression will be undertaken at the Site using a watercart, as and when required. Landfilling activities such as unloading of material will be undertaken in such a way as to minimise dust

Regulation	Description	Compliance
		generation, and daily cover soils used at the Site will be non-dispersive.
12.	**Firebreaks** The occupier of a landfill site must ensure that there is a firebreak of at least 3 metres around the boundary of the site.	A minimum firebreak of 3m will exist around each landfill cell as outlined in Section 3.2.2.3.
13.	**Burning of greenwaste only** 1. The occupier of a landfill site must ensure that waste is not burnt at the site, other than greenwaste burnt in accordance with this regulation 2. N/A 3. N/A	Greenwaste will not be burnt at the Site, so no further consideration has been given to regulation 13.
14.	**Outbreak of fire** 1. The occupier of a landfill site must ensure that there are appropriate procedures in force at the site so that – b. Any unauthorised fire on the site is properly extinguished; and c. Appropriate alarm and evacuation procedures are in place. 2. The occupier of a landfill site must ensure that an unauthorised fire on the site is extinguished as soon as possible 3. Within 14 days of an unauthorised fire at a landfill site, the occupier of the site must give to the Chief Executive Officer a report on the fire containing – b. Details on the date, time and location of the fire; c. The time the location of the fire was declared safe by the Fire Control Officer for the site; and	Fire incidents will be reported under Newcrest's Health and Safety System (HASS) and managed as outlined in Section 4.11. The required reporting to the CEO will be undertaken in the unlikely event that a fire should occur.

Regulation	Description	Compliance
	d. The cause, or suspected cause, of the fire.	
15.	**Approval for disposal at landfill site of clinical waste or material containing asbestos** 1. The occupier of a landfill site must ensure that clinical waste or material containing asbestos is not disposed of at the site unless the site is approved for the disposal of that waste or material, as is relevant. 2. The occupier of a landfill site must ensure that clinical waste and material containing asbestos is disposed of in accordance with the relevant approval. 3. Where there is a conflict between a requirement of regulation 16 and a requirement of an approval, the requirement of regulation 16 prevails.	Approval for this disposal of clinical waste (type 2 special waste) will be sought as part of the approval for the landfill, as outlined in Section 3.1.1. Any clinical waste disposed of at the site will be disposed of in accordance with the methodology outlined in Section 3.3.7.2, and the methodology will be updated to comply with any relevant approval. Disposal of asbestos waste will not occur at the Site and has not been sought under this application.
16.	**Disposal of clinical waste and material containing asbestos** 1. The occupier of a landfill site is to ensure that clinical waste and material containing asbestos disposed of at the site is disposed of under the occupier's personal supervision or the personal supervision of a person nominated by the occupier 2. The person supervising the disposal of clinical waste or material containing asbestos at a landfill site is to ensure that it is covered as soon as is practicable after its disposal – a) With a dense, inert and incombustible material; and b) To a depth of at least one metre. 3. The occupier of a landfill site is to ensure that there is kept at the landfill site an accurate and up to date –	Disposal of clinical waste will occur as outlined in Section 3.3.7.2, which satisfies the requirements of Regulation 16.

Regulation	Description	Compliance
	a) Register of clinical waste and material containing asbestos disposed of at the landfill site; and b) A plan of the landfill site showing the position of clinical waste and material containing asbestos disposed of at the landfill site. 4. The person supervising the disposal of clinical waste or asbestos containing material at a landfill site is to make an entry in the register within 2 hours of supervising the covering of waste under subregulation (2), stating- a) The date; b) The person's name; c) That the waste has been covered in accordance with that subregulation; and d) Where more than one square metre of waste was covered, grid coordinates with reference to the plan of the landfill site so that the position of the waste can be easily and accurately ascertained. 5. The occupier of a landfill site is to ensure that the grid references entered in the register are marked on the plan of the landfill site.	
17.	**Post-closure plan** 1. The occupier of a landfill site must prepare and submit to the Chief Executive Officer for approval, a post-closure rehabilitation plan, in accordance with sub-regulation (2), for the site within 18 months of the site being registered under regulation 5B of the *Environmental Protection Regulations 1987*	The post-closure plan for the Site will be covered in further detail under the Mine Closure Plan that will be submitted to the Department of Mines, Industry, Regulation and Safety (DMIRS). A summary of responses to the requirements of sub-regulation 2 is as follows: a) The Site will form part of the Waste Rock Landform at the Havieron Project;

Regulation	Description	Compliance
	2. A post-closure rehabilitation plan is to set out a plan for the rehabilitation of the site after it has ceased to be a landfill site and, in particular, is to specify – a) Options for the use of the site after it has ceased to be a landfill site, and is to specify the preferred options; b) A conceptual design of the infrastructure needed for the preferred option for the use of the site after it has ceased to be a landfill site; c) The estimated final contours of the site, after allowing for settlement, and specifying to what extent settlement has been allowed for; d) The capping materials proposed to be used on the site; e) A proposed system of drainage of the site; f) Measures proposed for the protection of the environment and the monitoring of the site; and g) The estimated period for which the site will require protection and monitoring.	b) The conceptual design of the Stage 1 WRL has been determined and is available in the DumpSolver Memo presented in Appendix C; c) Drawing C-102 in Appendix A shows indicative final waste heights, with the final Stage 1 WRL shown in Appendix C. Settlement is anticipated to be minimal, as outlined in Section 4.13, and no allowance has been made for it. d) The landfill will be fully covered by the material within the Stage 1 WRL. Once final contours of WRL are achieved then a rehabilitation plan will be implemented. The details of the WRL rehabilitation are described in Section 3.2.5; e) Surface water management and drainage will see runoff flow towards the west where evaporation ponds have been constructed to manage surface water. Further details of drainage surrounding the WRL are discussed in Section 4.4; f) Ongoing monitoring and management will be addressed in the Mine Closure Plan, however as discussed in Section 5, the low waste volumes disposed of at the Site over a short timeframe will result in minimal monitoring requirements. Additionally, there will be 12 years of mine operation where monitoring will occur in line with the Site's Water Management Plan; and g) The monitoring and management period will be addressed in the Mine Closure Plan, however as discussed above, there will be a minimum of 12 years' monitoring prior to commencement of the mine closure monitoring regime.

4 Environmental Aspects and Management

The key environmental aspects requiring consideration and management during the construction and operation of the Site include the following:

- Odour
- Noise
- Dust
- Stormwater
- Groundwater
- Leachate
- Landfill Gas
- Litter
- Traffic
- Vermin and Fauna
- Fire
- Security; and
- Stability

To ensure the potential environmental impacts that may during construction or operation of the landfill will be appropriately managed and minimised, Newcrest will implement a variety of engineering and management measures, which are described in the following sections.

4.1 Odour

Odour emissions may arise from the acceptance of putrescible wastes. Odour emissions will be generated from the natural decomposition of putrescible waste that will be disposed onsite. However, it is unlikely these additional sources of odour generating materials will result in significant odour impacts off site. Given the significant separation distance from sensitive receptors and the low putrescible waste fraction, it is anticipated that the risk will be low.

Although the Site meets the recommended separation distances, a range of management measures will be implemented to ensure that the generation of odour at the Site is appropriately minimised and managed:

- Operations are the landfill are expected to occur only approximately two to three times per week;
- Waste will be covered regularly as outlined in Section 3.3.8;
- Putrescible waste will be immediately covered by 300mm of cover soils; and
- Odour levels will be continuously monitored by Site staff, and action taken if required.

It is anticipated that these odour management measures will enable Newcrest to appropriately manage potential odour impacts at the site.

4.2 Noise

Noise emissions associated with the project has the potential to result in noise impacts. Noise emissions will be generated from construction, the plant during waste deposition and covering, and from road and engine noise generated from vehicles entering and exiting the Site. Current mining operations at the Site occur on a 24-hour basis and there is a fleet of mining vehicles that drive to, and on, the Stage 1 WRL and associated access road. Noise emissions from the development and operations are going to be comparable to noise emissions from the existing WRL operations, albeit occurring on a significantly smaller and less frequent scale. Therefore, the proposed development of the landfill is not anticipated to significantly increase noise emissions on site.

Noise emissions will be produced during construction and operational activities. As mentioned previously, there are several sources of noise associated with the proposed activities including equipment and vehicle movements. To ensure that noise emissions are minimised, the following noise emission management measures will be implemented:

- The nearest sensitive receptor for the Site, the administration area, is approximately 0.5km away, and no sensitive receptors will be constructed any closer to the Site;
- Vehicles will be restricted to a maximum speed of 30km per hour (km/hr) unless otherwise signed;
- Noise reducing workplace procedures will be adopted such as slow unloading of materials from the lowest height possible;
- All materials handling will be confined to the designated areas;
- All equipment and machinery will be maintained in good working condition; and
- Staff and visitors will be provided with appropriate personal protective clothing (PPE) to mitigate any noise impacts associated with the site activities.

The above noise mitigation measures are anticipated to be sufficient to appropriately manage noise emissions and ensure compliance with the Noise Regulations.

4.3 Dust

Dust will be generated during the construction of the landfill and during the operation of the facility, namely:

- Earthworks;
- Construction of buildings and associated infrastructure;
- Vehicle movements once the landfill is operational; and
- Material handling activities (loading and unloading, etc).

The landfill will contain a compacted basal layer, which will limit the amount of dust generated.

The generation of dust is anticipated to occur mainly during the construction phase of a landfill cell. To manage the generation of dust, Newcrest will implement the following management measures:

- Use of water cart (as required);
- Operations will cease during periods of high winds and cyclonic events.
- Vehicles will be restricted to a maximum speed of 30km/hr, or as per the Site's Traffic Management Plan; and
- All waste loads are to be covered during transport.

It is anticipated that the implementation of the engineering and management measures listed above will be sufficient to manage dust at the site.

4.4 Stormwater

Surface water, or stormwater, will be generated as a result of precipitation falling onto the Site. If surface water comes into contact with waste material at the Site, it can generate leachate. Therefore, water should be directed away from the active tipping area wherever possible.

To ensure that surface water is appropriately managed at the Site, the following management measures will be adopted:

- Use of landfill bunds to prevent stormwater from entering the landfill;
- A 300mm raised basal layer or a 300mm drive-over bund at the entrance to each landfill cell to prevent stormwater ingress;
- The larger WRL surface water management system, including:
  - Evaporation ponds;
  - Sediment and drainage bund; and
  - Drainage sump.

It is anticipated that these management measures will enable Newcrest to appropriately manage potential stormwater within the Site.

4.5 Groundwater

Groundwater may be impacted by leachate percolating through in-situ ground and may also cause landfill inundation if the separation distance is inadequate.

As discussed in Section 2.5.5, the depth to groundwater at the Site is currently 10m, which will increase in subsequent lifts of the WRL. This is in excess of the 3m requirement of the WA Rural Landfill Regulations and will ensure that groundwater does not inundate the Site, whilst also increasing the distance over which leachate must travel prior to impacting groundwater.

Each landfill cell is also designed to minimise leachate generation and leakage from the cell, as outlined in Section 4.4. The compacted soils layer present at the base of each landfill cell will help retain the minimal quantities of leachate that will be generated, as will the significant quantity of soils beneath each landfill cell. The +500mm thick low-permeability saprolite layer across the entire base of the WRL ensures that any generated landfill leachate should be retained within the WRL.

Groundwater monitoring immediately hydraulically down-stream of the Site is also undertaken approximately monthly in line with the Site's Water Management Plan, which is currently being finalised, and this will identify if groundwater contamination has occurred. In the event that a declining groundwater quality trend is identified, further monitoring and investigations will be undertaken.

4.6 Leachate

Leachate may be generated by putrescible wastes, and by water coming into contact with waste material. This liquid has the potential to impact groundwater quality and surface water quality if not correctly managed.

As outlined in Section 3.1, the Site accepts a small annual quantity of putrescible waste, with the majority of waste comprising of inert wastes and cover soils. Additionally, climate conditions at the Site are arid, with low annual average rainfall and low relative humidity year-round as discussed in Section 2.5.1. The combination of these factors results in a dry waste mass, with minimal leachate generation potential.

Any water that comes into contact with waste will be retained within the landfill by the landfill bunds and graded floor, which comprises a compacted soils layer to minimise infiltration. The +500mm thick low-permeability soil layer across the entire base of the WRL ensures that any generated landfill

leachate should be retained within the WRL. The separation depth to groundwater of 10m exceeds the requirements of the WA Rural Landfill Regulations and further reduces the leachate risk of the Site. The addition of a low-permeability layer on top of the landfill following closure will decrease long-term infiltration, and ensure that the minimal leachate generation potential is maintained post-closure.

These management measures are adequate for the management of the leachate risk at the Site.

4.7 Landfill Gas

As outlined in Section 3.1.2, the Site accepts a very low quantity of putrescible waste annually, and the conditions at the Site result in a very dry waste mass. These factors not only reduce leachate generation from the landfilled putrescible waste, but also landfill gas generation, which is dependent on the moisture content within the waste. Therefore, a dry waste mass with a low putrescible fraction would not produce significant quantities of landfill gas.

Landfill gas can cause an asphyxiation and explosion risk, particularly when it accumulates in subsurface services such as utility pipes and basements. The remote location of the landfill and WRL ensures that there are no receptors or pathways for exposure of landfill gas, significantly reducing the risk.

The WA Rural Landfill Regulations do not set out a requirement for landfill gas management, and the low waste deposition rates required for a Category 89 landfill ensure that landfill gas generation is maintained at a manageable level. Landfill gas will naturally vent and oxidise through the surrounding WRL and will not require additional active or passive management systems.

The management measures described above are considered adequate for the landfill gas risk at the Site.

4.8 Litter

Litter may be generated as a result of transporting and handling waste, particularly during windy conditions. As well as reducing visual amenity, litter can attract vermin to the Site, which may affect surrounding land uses if these vermin migrate offsite.

To ensure that the generation of litter is minimised and appropriately managed at the Site, the following management measures will be implemented:

- All waste will be unloaded as close to the ground as possible, and will be covered the day of deposition;
- All waste loads entering the Site will be covered to prevent uncontrolled release of litter;
- A boundary fence will be installed to prevent any litter escaping;
- The boundary fence will be inspected regularly, and any maintenance works scheduled accordingly;
- Any litter generated around the Site and along the fence lines will be collected on a regular basis as part of routine procedures; and
- Wind-blown litter will be collected as soon as practicable.

These management measures will enable Newcrest to appropriately manage litter on the Site.

4.9 Traffic

The landfill will result in increased traffic movements to and from the Site and on the surrounding road network. Onsite traffic movements have the potential to generate noise, dust and create an occupational health and safety risk to staff. The following traffic movements are anticipated to occur onsite:

- Front-end loader and other vehicles for waste deposition and cover; and
- Limited light-vehicle access for inspections and servicing from staff.

The small volumes of waste generated at the Site will result in minimal operational waste movements, estimated to average two to three times per week. This, in addition to traffic management measures, will minimise the additional traffic impacts at the Site as far as practicable.

To minimise any potential impacts of traffic movements at the site, Newcrest's Traffic Management Plan (Doc. Ref. No. 702-8000-SA-PLA-004) will be implemented. The current version of this document has been presented in Appendix D, and specifies:

- Pedestrian Management;
- Mobile Plant and Equipment Permits;
- General Site Wide Road User Requirements;
- Road Design Construction and Management;
- Management of Change;
- Private Vehicles;
- Exceptions, Breaches and Performance Management; and
- Road Safety Awareness.

Through the adoption of the Traffic Management Plan, all potential impacts associated with traffic movements will be controlled to appropriate standards.

4.10 Vermin and Fauna

Vermin and fauna such as rats, mice, birds, insects, cats and dingoes may be attracted to waste management facilities particularly those with poor housekeeping practices. If uncontrolled, vermin can present a health risk to staff and surrounding land users.

The acceptance of waste (particularly putrescible waste) can attract vermin which has the potential to impact local health of staff and nearby land users. To control potential vermin issues, Newcrest proposes to adopt the following management measures:

- The generation of odour and litter will be minimised through the implementation of appropriate management measures (see Sections 4.1 and Section 4.8);
- Regular litter collections will be undertaken onsite;
- All waste loads will be covered during transport;
- Waste will be covered daily, and putrescible waste will be covered as soon as practicable following deposition with a greater cover soils requirement.
- A perimeter fence will be installed, monitored and maintained on a regular basis;

- A feral cat control program will be implemented in line with broader Project management measures;
- Any suspected and/or known shelters or breeding grounds for vermin on the site will be eliminated; and
- Should any vermin issues be experienced, professional services will be utilised to eradicate vermin at the site.

Through the adoption of the vermin management measures set out above, any potential adverse impacts associated with the proposed operations are anticipated to be adequately managed.

4.11 Fire

Fires may occur through faulty equipment, machinery, waste acceptance, landfill fires or arson. Although unlikely to occur, fire management measures will be implemented to ensure this risk is mitigated. Havieron has a Fire Trigger Action and Response Plan (TARP) (Doc. Ref. No. 702-8000-ER-PLA-001), which is provided in Appendix E, that covers a range of actions based on the threat of fires. An emergency response team is available 24-hours a day to respond to fires as they arise and have a dedicated watercart for this purpose. Fire response will comply with the requirements of the WA Rural Landfill Regulations outlined in Section 3.4.

Fire management measures have also been included in the design of the landfill, including:

- A 3m firebreak to allow access for firefighting;
- Small landfill cell size and dispersed cell location to minimise the risk of fire spreading;
- Cover soils stockpile near the active tip face that can be used to smother a fire; and
- Security fence around the perimeter of the Site.

These management measures will enable Newcrest to appropriately manage a fire if it was to occur at the Site.

4.12 Security

Access to the overall Project is restricted, with only approved personnel and contractors allowed onto the Havieron Mine Site. Access to the Site will be further controlled via a gate at the entrance which is locked outside operational hours to ensure access for unauthorised vehicles and persons is restricted. A perimeter fence will fully extend around each landfill cell. To ensure the security of the Site is not compromised, the following measures will be implemented:

- The fence will be installed and relocated for all landfill cells; and
- The entrance gate will be locked securely outside of operational hours.

It is anticipated that the measures listed above will be sufficient to ensure the security of the Site is maintained during operations.

4.13 Stability

Consideration has also been given to the stability of the overall Stage 1 WRL, and the impact landfilling activities may have. Settlement often occurs from the uneven degradation of putrescible wastes, and

can be amplified when waste is uncompacted over large waste depths. To manage the risks associated with stability, the Site will feature the following risk management measures:

- A low putrescible waste fraction and overall low volume of waste material;
- Waste bench heights of a maximum 2m;
- Waste compaction during deposition;
- Variation in cell location, so no cells are immediately located on top of each other; and
- Significant soil surcharge of minimum 1m at Site closure.

It is anticipated that these measures will be more than adequate to manage the stability risk at the Site during operation and post-closure.

5 Residual Risk Assessment

The risk assessment outlined in this section is conducted to assess the environmental, public health and amenity risks associated with various aspects of ongoing landfill development and operation. The risk assessment framework is adapted from the Department of Water and Environmental Regulation's (DWER) *Risk Assessments, Part V, Division 3, Environmental Protection Act 1986 (WA)*, and is detailed in the sections below.

5.1 Methodology

The objective of the risk assessment is to ensure the potential environmental and social risks associated with the operation and closure of the landfill are understood and managed appropriately to confirm suitable management measures are in place and there is no unacceptable residual risk. The sections below identify 'source-pathway-receptor' scenarios to determine the level of risk before, and after management measures have been implemented.

5.1.1 Source of Contamination or Harm

For the purpose of this assessment, a source is defined as a primary risk with the potential to cause significant contamination or harm to the environment. With regards to the environment and public health, sources and its potential hazards which may arise have been identified and are shown in Table 5-1.

Table 5-1: Sources of Contamination or Harm

Source	Description	Risk Description
Landfill Gas	Compounds within the gas which are asphyxiant.	Carbon Dioxide and Methane can replace oxygen and accumulates in enclosed areas, inadvertently causing an asphyxiation risk to humans and fauna
	Compounds within the gas which are explosive.	Methane is explosive and flammable at 5-15% v/v in surplus oxygen which causes a risk to human health and infrastructure
	Compounds within the gas that are toxic	Hydrogen Sulfide can be fatal in concentrations greater than 500ppm[7]
	Compounds within the gas that are ecotoxic	Methane at 45% v/v and Carbon Dioxide at 5-10% v/v cause stress in the root zone
Leachate	Chemically contaminated solution generated by rainwater mixing with waste or through decomposition of organic or liquid waste inputs.	Leachate commonly contains ammonia, ammoniacal nitrogen and total nitrogen which can impact water sources and those who rely on them

[7] International Programme on Chemical Safety and World Health Organisation, 2003, Concise international Chemical Assessment Document 53 – Hydrogen Sulphide: Human Health Aspects

Source	Description	Risk Description
Stormwater	Surface water generated by rainfall	Improper management can lead to generation of leachate, erosion, and damage to infrastructure
Dust	Fine particles that can be blown in the wind.	Dust causes reduced visual amenity and can be dangerous if it includes asbestos fibres
Exposed Waste	Waste material that is physically exposed.	Increased risk of leachate generation in addition to harm or sickness if physical contact or consumption occurs
Litter	Light waste materials that can blow in the wind.	Reduced visual amenity and may easily travel beyond the Site's boundary
Odour	Odour emissions from landfill gas or open tip face	Reduced amenity due to smell
Physical Aspects	Surface irregularities which pose a health and safety threat to end users.	Trip, slip or fall hazards from uneven surfaces
	Unstable design or shape of the landfill.	Unstable profiles that may cause landslides or slope failures
Noise	Sounds emitted from vehicles and plant onsite	Noise emissions can reduce amenity on and immediately surrounding the Site
Fire	Potential for fires from waste materials or faulty equipment	Fire is a large risk to human and environmental health, and can cause damage to Site infrastructure
Vermin and Fauna	Animals attracted to the landfill by odour or exposed waste	Vermin and feral animals may cause nuisance and present health risks
Security	Restriction of access to the Site	Unauthorised personnel may access the Site, resulting in a security risk to the Site facilities, plant and equipment
Traffic	Vehicle movements around the Site	Possibility for vehicles to collide with Site personnel, structures or other vehicles. Poor design of traffic flow and operations can lead to unpredictable traffic routes and create safety hazards onsite.

5.1.2 Pathways of Potential Contamination or Harm

For the purpose of this assessment, a pathway for a hazard is defined as the route by which potential contamination or harm can migrate. The key migration pathways generally include the following:

- Air through which lightweight materials such as dust and litter, odour and landfill gas travel;
- Surface along which the sources of contamination or harm can travel or be present at (e.g. surface water runoff, litter, persons walking or working over the surface); and
- Sub-surface whereby the underlying soils, bedrock, aquifers and infrastructure permit gas and leachate migration towards the receptors.

5.1.3 Receptors of Potential Contamination or Harm

For the purpose of this assessment, a receptor is defined as the location where the impact of the contamination or harm is registered. The possible receptors of the contamination or harm caused by the hazards identified are summarised in Table 5-2.

Table 5-2: Generic Receptors that may be Impacted by Potential Contamination or Harm

Receptor	Description of the Receptor
Surrounding Land Users	People who work or live beyond the boundary of the landfill. Some of these are referred to as sensitive receptors.
Site Users	Persons authorised to traverse across the Site, including: • Operational staff; • Contractors carrying out maintenance or monitoring; and • Visitors inspecting the site.
Buildings/Infrastructure	Buildings or infrastructure that are semi-permanently or permanently occupied and used for work or residential purposes.
Vegetation and Flora	Vegetation on and surrounding the landfill
Fauna	Fauna species whose habitats are within or surrounding the landfill
Groundwater	Groundwater that exists beneath the landfill either as a local perched system or as a regional aquifer from which a water supply may be extracted for industrial or potable purposes.
Surface Water	Permanent or semi-permanent surface water which provides a habitat for flora and fauna.

As discussed in Sections 2.3 and 2.5.4, there are no surrounding land users or surface water bodies within the immediate vicinity of the landfill Site. Therefore, these receptors have not been considered when undertaking the risk assessment.

5.2 Risk Rating Matrix

To assess the various risks, the potential hazards identified in Table 5-1 were classified according to the risk assessment matrix shown in Table 5-5. This risk assessment matrix considers the consequence and likelihood of the risk, the definitions of which can be seen below in Table 5-3 and Table 5-4 below. Table 5-6 shows the appropriate risk treatments for each risk level.

Table 5-3: Consequence of Risk Occurring†

Consequence	Environment	Public Health* and Amenity (i.e. air and water quality, noise, & odour)
Severe	• On-site impacts: catastrophic • Off-site impacts local scale: high level or above • Off-site impacts wider scale: mid-level or above • Mid to long term or permanent impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are significantly exceeded	• Loss of life • Adverse health effects: high level or ongoing medical treatment • Specific Consequence Criteria (for public health) are significantly exceeded • Local scale impacts: permanent loss of amenity
Major	• On-site impacts: high level • Off-site impacts local scale: mid-level • Off-site impacts wider scale: low level • Short term impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are exceeded	• Adverse health effects: mid-level or frequent medical treatment • Specific Consequence Criteria (for public health) are exceeded • Local scale impacts: high level impact to amenity
Moderate	• On-site impacts: mid-level • Off-site impacts local scale: low level • Off-site impacts wider scale: minimal • Specific Consequence Criteria (for environment) are at risk of not being met	• Adverse health effects: low level or occasional medical treatment • Specific Consequence Criteria (for public health) are at risk of not being met • Local scale impacts: mid-level impact to amenity
Minor	• On-site impacts: low level • Off-site impacts local scale: minimal • Off-site impacts wider scale: not detectable • Specific Consequence Criteria (for environment) likely to be met	• Specific Consequence Criteria (for public health) are likely to be met • Local scale impacts: low level impact to amenity
Slight	• On-site impact: minimal • Specific Consequence Criteria (for environment) met	• Local scale: minimal impacts to amenity • Specific Consequence Criteria (for public health) criteria met

^ Determination of areas of high conservation value or special significance should be informed by the Guidance Statement: Environmental Siting

** In applying public health criteria, DWER may have regard to the Department of Health's, Health Risk Assessment (Scoping) Guidelines*

† From DWER Guidance Statement: Risk Assessments rev. V2 February 2017 "on-site" means within the prescribed premises boundary

Table 5-4: Likelihood

Likelihood	The following criteria will be used to determine the likelihood of the risk event occurring.
Almost Certain	The risk event is expected to occur in most circumstances
Likely	The risk event will probably occur in most circumstances
Possible	The risk event could occur at some time
Unlikely	The risk event will probably not occur in most circumstances.
Rare	The risk event may only occur in exceptional circumstances

The risk matrix in Table 5-5 below combines the level of likelihood and consequence to determine the level of associated risk.

Table 5-5: Risk Assessment Matrix

		Consequence				
		Slight	**Minor**	**Moderate**	**Major**	**Severe**
Probability	**Almost Certain**	Medium	High	High	Extreme	Extreme
	Likely	Medium	Medium	High	High	Extreme
	Possible	Low	Medium	Medium	High	Extreme
	Unlikely	Low	Medium	Medium	Medium	High
	Rare	Low	Low	Medium	Medium	High

Table 5-6: Risk Treatment Table†

Rating of Risk Event	Acceptability	Treatment
Extreme	Unacceptable	Risk event will not be tolerated. DWER may refuse application.
High	May be acceptable. Subject to multiple regulatory controls	Risk event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
Medium	Acceptable, generally subject to regulatory controls	Risk event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
Low	Acceptable, generally not controlled	Risk event is acceptable and will generally not be subject to regulatory controls.

† From DWER Guidance Statement: Risk Assessments rev. V2 February 2017

5.3 Risk Profile

Risk management measures refer to the key management strategies that will be adapted onsite to ensure that all hazards and potential risks identified are controlled to an appropriate level, and that strategies are in place to react to any potential incidents or accidents. In most cases these risk management measures decrease the probability and/or consequence of the identified hazards, thus lowering the risk rating. Table 5-7 presents a summary of the 'source-pathway-receptor' scenarios identified in the risk assessment process. The table includes risks both before and after the successful implementation of the proposed engineering and management measures prescribed within this EAMP.

Table 5-7: Residual Risk Profile

Source of Concern	Receptor	Pathway	Pathway Completion	Risk Description	Probability	Consequence	Risk Rating	Management Measures	Revised Pathway Completion	Revised Probability	Revised Consequence	Revised Risk Rating
Odour	Site Users	Fugitive Emissions	Complete	Lowered amenity due to odour	Likely	Minor	Medium	• Operations at the landfill are expected to occur only approximately two or three times per week; • Waste will be covered regularly as outlined in Section 3.3.8; • Putrescible waste will be immediately covered by 300mm of cover soils; and • Odour levels will be continuously monitored by Site staff, and action taken if required.	Incomplete			
		Subsurface Migration	Partially Complete		Possible	Minor	Medium		Partially Complete	Rare	Slight	Low
Landfill Gas	Site Users	Fugitive Emissions	Incomplete	Toxicity from trace gasses, predominantly hydrogen sulphide.	Landfill gas will be unable to accumulate next to the landfill as it will oxidise and disperse. No subsurface pathways exist in the vicinity of the landfill.			The risk is adequately managed via the design of the landfill and minimal landfill gas generation from the small, dry waste mass.	Incomplete	Landfill gas will be unable to accumulate next to the landfill as it will oxidise and disperse. No subsurface pathways exist in the vicinity of the landfill.		
		Subsurface Migration	Incomplete						Incomplete			
		Fugitive Emissions	Incomplete	Asphyxiation from high carbon dioxide levels, explosion, and fire risk from methane between 5 and 15% v/v					Incomplete			
		Subsurface Migration	Incomplete						Incomplete			
	Site Infrastructure	Subsurface Migration	Incomplete	Explosion and fire risk from methane between 5-15% v/v					Incomplete			
	Flora	Subsurface Migration	Incomplete	Root stress from carbon dioxide levels between 5-10% v/v	No pathway to vegetation is present at the Site.				Incomplete	No pathway to vegetation is present at the Site.		
Leachate	Site Users	Migration via surface water runoff	Partially Complete	Contact with or consumption of leachate	Unlikely	Moderate	Medium	• The landfill base will consist of a 300mm compacted layer of Site-won soils and the base of the entire WRL was constructed with a +500mm low-permeability saprolite layer to mitigate any leachate seepage into the environment; • The landfill cell perimeter will be mostly bunded to contain any leachate generated; • The landfill floor will be sloped away from the entrance into cell; • Waste will be covered regularly as outlined in Section 3.3.8;	Partially Complete	Rare	Minor	Low
	Flora		Partially Complete		Unlikely	Minor	Medium		Partially Complete	Rare	Minor	Low
	Fauna		Partially Complete		Unlikely	Moderate	Medium		Partially Complete	Rare	Slight	Low
	Ground Water	Migration via groundwater	Partially Complete		Unlikely	Minor	Medium		Partially Complete	Rare	Minor	Low