



Assets | Engineering | Environment | Noise | Spatial | Waste

Conceptual Design & Closure Report

Seven Mile Waste Facility



Prepared for City of Karratha

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Project Number: TW16001



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Executive Summary

The City of Karratha (the City) commissioned Talis Consultants Pty Ltd (Talis) for the provision of consultancy services encompassing the detailed design and approvals for the future Class III landfill cells at its Seven Mile Waste facility.

A composite basal containment layer, designed to comply with Best Practice Landfill Guidelines, is proposed for the future landfill cells, which will be composed of a geosynthetic clay liner (GCL) and overlain by a 2 mm high density polyethylene (HDPE) geomembrane. The containment layer will be utilised across the base and the embankments of the new landfill cells. The basal containment will include a protection geotextile to prevent any long term damage from the overlying leachate collection layer and waste fill.

There has been no recorded environmental impacts by the current waste disposal operations and the DER have indicated that approval for the original clay cap design (as proposed by Bowman, 2015) may be obtained. Talis is proposing that the same capping design continue from the Existing Waste Mass through to the future proposed Cells 1-12.

The implementation of this type of capping design will be determined by the availability on site of sufficient quantities of suitable materials. If the specific type and quantity of material is not available on site then alternative capping designs will need to be assessed.

The STATS June 2016 geotechnical investigation report, documents numerous refusals on the trial pit logs at shallow depth on a 'very dense layer' within the borrow area. A total of 815,690m³ of fill material is required for the construction of the new cells, daily cover material and capping material. Based on the depths to refusal, it is calculated that there is approximately 436,028m³ of material available from the borrow pit.

It is unknown whether the depth to refusal is a factor of the size of excavator utilised for the trial pitting or the presence of hard calcrete layers or rock in the area. Talis recommends that further investigation is undertaken in the area with a larger excavator and/or benching to a lower depth for the City of Karratha to confirm the viability of the borrow area as the long term source for cover and engineering material.

The City of Karratha will also have to confirm that the material at lower depths remains suitable for the preferred final capping method in accordance Best Practice landfill Guidelines. If the material is not suitable than alternative options will need to be considered.

Based on the estimated waste intake of 100,000m³ (including cover) in the first year, with an estimated waste growth rate of 2%, and that the existing landfill is filled to the master plan restoration profile, the existing operational phase will cease acceptance of waste in November 2019. The total void space in the new landfill cells is approximately 2.2 million cubic metres. Assuming waste inputs and density of waste after placement to be 750kg/m³ and the daily cover to be 10% of the total available void space volume, the new proposed cells can facilitate the intake of waste until October 2036.

A capital cost estimate has been prepared for the lifetime of the development and closure of the new landfill cells, based on the following assumptions:



- Detailed design has not yet been completed and quantities are based on indicative calculations;
- Rates are based on Talis' experience in the field and could change depending on market conditions;
- Talis assumes that sufficient material is available in the borrow pit to undertake all construction and capping works;
- Assumed constant inflation rate of 2%;
- Costs for the closure of the existing landfill are not included;
- Professional Fees and Services of 8% has been added to the total cost;
- Local loading of 30% has been added to the total cost;
- Contingency of 20% has been added to the total cost; and
- GST is not included in any of the estimates.

The total estimated capital costs for the life of the landfill is approximately \$38,965,775.

The minimum gate fee required to cover the Capital Costs associated with the development and capping of the Cells 1-4 calculated by dividing the total capital cost of \$12,583,238 by 706,799 tonnes, results in a cost per tonne of \$17.80. The minimum gate fee required to cover the Capital Costs associated with the development and capping of the full site for Cells 1-12 calculated by dividing the total capital cost of \$38,975,775 by 2,034,468 tonnes, results in a cost per tonne of \$19.15.

The difference in development and restoration cost per tonne for Cell 1-4 (\$17.80) compared to Cell 1-12 (\$19.15), is attributable to the decrease in available void capacity per cell due the lower final restoration profile of the latter cells, and partly due to the increased engineering and restoration costs due to inflationary increases.



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1 Introduction

1.1 Background

The City of Karratha (the City) commissioned Talis Consultants Pty Ltd (Talis) for the provision of consultancy services encompassing the detailed design and approvals for the future Class III landfill cells at its Seven Mile Waste facility (the Site). The boundary and layout of the Site is shown in Drawing TW16001-G-002.

The scope of works comprises four stages, including:

- Stage 1. Review existing conceptual cell design;
- Stage 2. Detailed design of a Class III landfill cell – as per the revised and approved conceptual design;
- Stage 3. Preparation of DER Works Approval required for cell construction; and
- Stage 4. Preparation of Tender documentation for construction of the Class III cells.

This Conceptual Design & Closure Report covers the works completed as part of Stage 1 of the project, including:

- Review of existing conceptual cell development design proposed in the Cell Development and Closure Plan – Seven Mile Waste Disposal Facility (CDCP) (Bowman, April 2015);
- Revised Conceptual Design, including;
 - Cell layout;
 - Leachate management system;
 - Capping works;
 - Void Space volumes; and
 - Projected estimated costs and Landfill Lifetime Financial Model.

1.2 Site Description

The Site is located approximately 8 km (12 km by road) west - southwest of Karratha. The Site Boundary, as shown in the Licence (L7021/1997/15) and depicted by the red line on the attached Drawing (TW16001-G-002 – Draft Site Master Plan), bounds an area across four lots. The Site Boundary covers the whole of Lot 552 to the north and the whole of Lot 85 to the south. The Site Boundary then encroaches into two lots to the south-west, Lot 551 on Plan 67856 and Lot 215 of Plan 216769.

The Site is licenced to undertake the following waste management activities:

- Category 57 – Used Tyre Storage – up to 174,000 tyres;
- Category 61 – Liquid waste facility – 100 to 116,500 tonnes per year;
- Category 62 – Solid Waste Depot – 500 to 20,000 tonnes per year; and
- Category 64 – Class II or Class III putrescible landfill site – 20,000 to 100,000 tonnes per year.

The Department of Environment Regulation (DER) has been advised that a new cell will need to be constructed and lined in accordance with Best Practice Landfill Guidelines (Victorian, BPEM).



1.3 Geology

The surface geology of the site consist of 'Pindan' Sands, which consist of red-brown alluvial sand, silt and clay. The Pindan Sands contain frequent pebbles and gravels throughout with harder lenses of calcrete below the surface. The Pindan Sand is underlain by Archaean bedrock of the northern Pilbara Craton, of the granite-greenstone volcanics sequence.

The groundwater is typically 5-10m below natural ground surface and is typically hyper saline-brackish, with no regional groundwater resource noted by the Department of Water (2013) Hydrogeological Atlas.



2 Review of Existing Design

The City has recently endorsed a Cell Development and Closure Plan (CDCP) (Bowman 2015) which included conceptual designs for 6 lined landfill cells to be constructed over the next 20 years.

Talis has carried out a technical review of the CDCP and have concerns with the overall design of the future cells and the potential risks that the design will impose on the landfill management and operations going into the future.

The existing conceptual design (CDCP) consists of 6 cells with each of the proposed cells having a vertical extraction well positioned at the centre. The cells have been laid out in such a way that includes landlocked cells, in particular cell 3 and assuming that the landfill footprint will extend further south in the future, cell 5 will also become landlocked. These cells have been positioned without external boundaries with the only possible method of leachate extraction via vertical concrete extraction wells located at the centre of each cell. Cells 2 & 5 will have a final cap heights of 34 m AHD and 27 m AHD respectively with sump depths of 23 m and 16 m respectively.

Due to our extensive experience in landfill design and operation we have determined that there are risks and ongoing costs associated with these types of extraction wells, including:

- The sumps need to be constructed in conjunction with the rate of fill of waste, relying on the waste density for vertical stability;
- Each stage could be either 2.4 m or 3.6 m depending on the number of concrete well rings used. As an example this could be between 5 and 8 stages over the lifetime of Cell 2;
- Each sump will require a power supply and leachate rising main both of which will have to traverse the waste body;
- The services will need to be relocated each time the sumps are extended;
- The exposed location of the services will be a health & safety hazard for heavy plant for the duration of the cell with potential for damage to the plant, plant operator and services if run over;
- There is operational costs associated with relocating the services at each stage and an ongoing risk of additional costs, if they are accidentally damaged from the waste filling operations;
- The compaction of waste around the sumps will be next to impossible for fear of the waste compactor impacting the sump and dislodging the concrete rings; and
- This could lead to the sump needing a surround of gravel or clay for stability. This will lead to additional operating costs and loss of void space.
- Talis' proposed revised conceptual design will eliminate the risk and costs associate with current leachate extraction towers.

The City stated during the initiation meeting that there is currently two large evaporation ponds to the north of the Site which they wish to consider for leachate, instead of constructing a new leachate pond to the south east of the Site as proposed in the CDCP. The City has requested that Evaporation Pond 3 be repurposed as the leachate storage pond for the new cells. This pond has been constructed with a compacted subbase and lined with 2 mm HDPE.



The current licence L7021-1997-15 (December 2015) Condition 1.3.3 'Table 1.3.2 Waste Processing' states 'The separation distance between the base of the landfill and the highest groundwater level shall not be less than 3m.'

Excavation works have already been undertaken in the landfill footprint of the future CDCP Cells 1-6, and in parts, the depths of the excavation are currently less than 2m separation distance between the excavation and the maximum seasonal groundwater levels from the perimeter groundwater level data supplied by the City of Karratha.

BPEM stipulates a minimum separation distance of 2m of wastes to the groundwater table for municipal and solid inert landfills. It is therefore proposed in order to minimise backfill and maximise potential void space for the City of Karratha that a minimum distance of 2m be utilised as the basis for future cells and the change of separation distance be included as an amendment through the DER approvals process.



3 Revised Conceptual Design

In accordance with Best Practice Landfill Guidelines, Talis proposes design changes to negate the limitations and risks outlined in Section 2. The most important change, is to design out the vertical leachate extraction towers. The City has specified that the new cells are to be designed for use as a Class III landfill in accordance with Best Practice Landfill Guidelines. The conceptual design components include;

- Cell layout;
- Leachate management system; and
- Capping works.

The revised conceptual design components are described in more detail within the following sections and shown in Drawing TW16001-G-002.

3.1 Cell Layout

As mentioned previously, the main purpose of this redesign is to remove the leachate extraction towers. To achieve this the number of cells has been reduced from 6 to 4 as shown in Drawing TW16001-G-002. The cells' floors have been re-graded to divert leachate to the external edge of the new cells to form leachate extraction sumps as indicated on Drawing TW16001-C-002. The re-graded floors conforms to Best Practice Landfill Guidelines where the header pipe has a gradient greater than 1% and the subsidiary leachate collection lines are not less than 3%.

3.2 Basal Liner

A composite basal containment layer, designed to comply with Best Practice Landfill Guidelines, will be composed of a geosynthetic clay liner (GCL) and overlain by a 2 mm high density polyethylene (HDPE) geomembrane. This containment layer will be utilised across the base and the embankments of the new landfill cells. The basal containment will include a protection geotextile to prevent any long term damage from the overlying leachate collection layer and waste fill.

In accordance with Best Practice Landfill Guidelines, modern landfills must have a composite impermeable environmental barrier commonly known as the Basal Liner as shown in Figure 3-1. The basal lining system comprises of the following (from bottom to top):

- Compacted Sub-base: The excavated surface shall be compacted and proof rolled, prior to laying the Secondary Impermeable Barrier.
- Secondary Impermeable Barrier: GCL (Geosynthetic Clay Liner) shall be installed as the first layer of the composite liner system on a prepared sub-grade and on the side slopes of the cell batters. The GCL characteristically has a hydraulic conductivity of less than 1×10^{-9} m/s;
- Primary Impermeable Barrier: A 2 mm layer of High Density Polyethylene (geomembrane) will overlay the GCL to form a composite barrier which provides the best protection to the environment;
- Protection Layer: The geomembrane is vulnerable to damage from the overlying materials, therefore to provide protection for this layer a protection/cushion geotextile will be placed on top;

- Leachate Collection Layer: A 300 mm layer of highly porous low calcareous gravel with a grading of 20 mm to 50 mm, is to be placed over the geotextile protection layer to provide further protection and provide drainage of leachate to the leachate sumps with a hydraulic conductivity greater than 1×10^{-3} m/s; and
- Separation Layer: A separation geotextile with a high permeability will overlay the Leachate Collection Layer to prevent the future disposed waste from obstructing the drainage of the leachate to the sump.

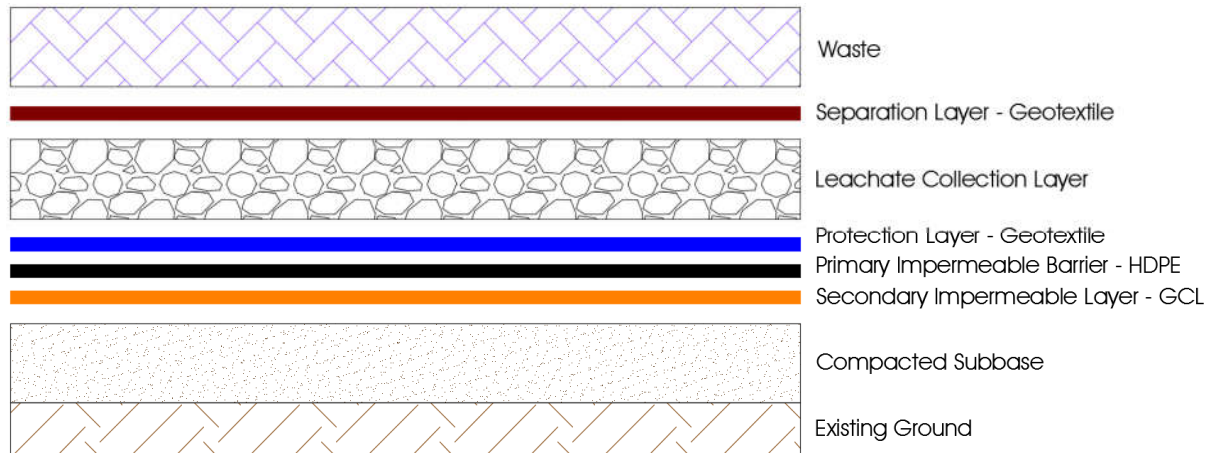


Figure 3-1 - Typical Basal Liner

3.3 Leachate Management System

The purpose of the leachate management system is to ensure that a head of leachate no greater than 300 mm is maintained on the basal lining system as per the Best Practice Landfill Guidelines. The system comprises of a leachate collection system to divert the leachate to a sump and leachate extraction side riser to remove the excess leachate and maintain the correct levels. The leachate that is removed will be pumped via a permanent leachate rising main to the leachate pond (currently Evaporation Pond 3). The components of the system are described in more detail below.

3.3.1 Leachate Collection System

The leachate collection system shall be installed within the leachate collection layer above the liner on the cell floor, at the locations shown on Drawing TW16001DG021. The collection system shall comprise 200 mm slotted/perforated primary pipework, with 160mm secondary slotted/perforated pipework. The header pipe shall extend to the sump at the low point of the landfill cell for extraction of the leachate.

To protect the barrier liner at the location of the pump sleeve, a sacrificial 2mm thick HDPE liner shall be installed on the protective geotextile over the primary HDPE geomembrane liner on the sump floor. The sump floor will have a 150 mm thick pad of concrete laid on the sacrificial liner, to protect the basal liner at the location of the leachate extraction side riser.

3.3.2 Leachate Extraction Side Riser

A 450 mm diameter HDPE side-riser pipe shall be installed on the slope of each cell at the location of each sump as shown in Drawing TWST001-G-001 acting as a pump sleeve. This



pump sleeve shall be a guide for a submersible leachate pump in the landfill sump and shall be perforated at the bottom to a height of 1,000 mm. The main leachate collection pipes shall connect to the pump sleeve at the landfills' sumps as indicated in Drawing TWST001-G-001.

Where the leachate side risers terminate at the top of the embankment a headwall shall be constructed. The headwall shall consist of a 200 mm thick reinforced concrete wall and shall incorporate two wing walls to retain capping soils in later phases. The headwall shall be constructed on a 200 mm deep reinforced concrete base, as shown in Drawing TWST001-G-001.

3.3.3 Leachate Pond

The leachate storage pond for the new cells will be the repurposed Evaporation Pond 3 to the north of the Site as shown in Drawing TW16001-G-002. The pond was constructed with a compacted subbase and a 2mm HDPE geomembrane liner. This type of construction is not to Best Practice Landfill Design and we are proposing that Pond undergoes an integrity inspection prior to use as a leachate dam and thereafter every six months. The DER has indicated that this could be a satisfactory outcome due to the very low volumes of leachate predicted to be produced at the Site due to its geographical location and extremely dry weather.

The leachate that may be produced in the new cells will be transferred to the new leachate pond by a new leachate rising main that will be installed adjacent to the perimeter of the landfill cells. Typical details are shown in Drawing TWST001-P-001.

3.4 Capping Works

In accordance with Best Practice Landfill Guidelines, the design of the final capping for the landfill shall:

- Minimise infiltration of surface water into the waste;
- Provide a long-term, stable barrier between waste and the environment in order to protect human health and the environment;
- Prevent the uncontrolled escape of landfill gas; and
- Providing land suitable for its intended after use.

The final top of waste profile plan layout in Drawing TW16001-G-003 shows the integration between the capping of the Existing Waste Mass and the capping future Cells.

A low permeability clay cap design was proposed in the CDCP for the existing waste mass as shown in **Figure 3-2**. As there has been no recorded environmental impacts by the current waste disposal operations and the DER have indicated that approval for the clay cap design may be obtained. Talis is proposing that the same capping design continue from the Existing Waste Mass through to the future proposed Cells 1-12.

The implementation of this type of capping design will be determined by the availability on Site of sufficient quantities of suitable materials. If the specific type and quantity of material is not available on site then alternative capping designs will need to be assessed. There is a significant risk associated with the capping design at present concerning onsite material availability, which the City should seek to address.

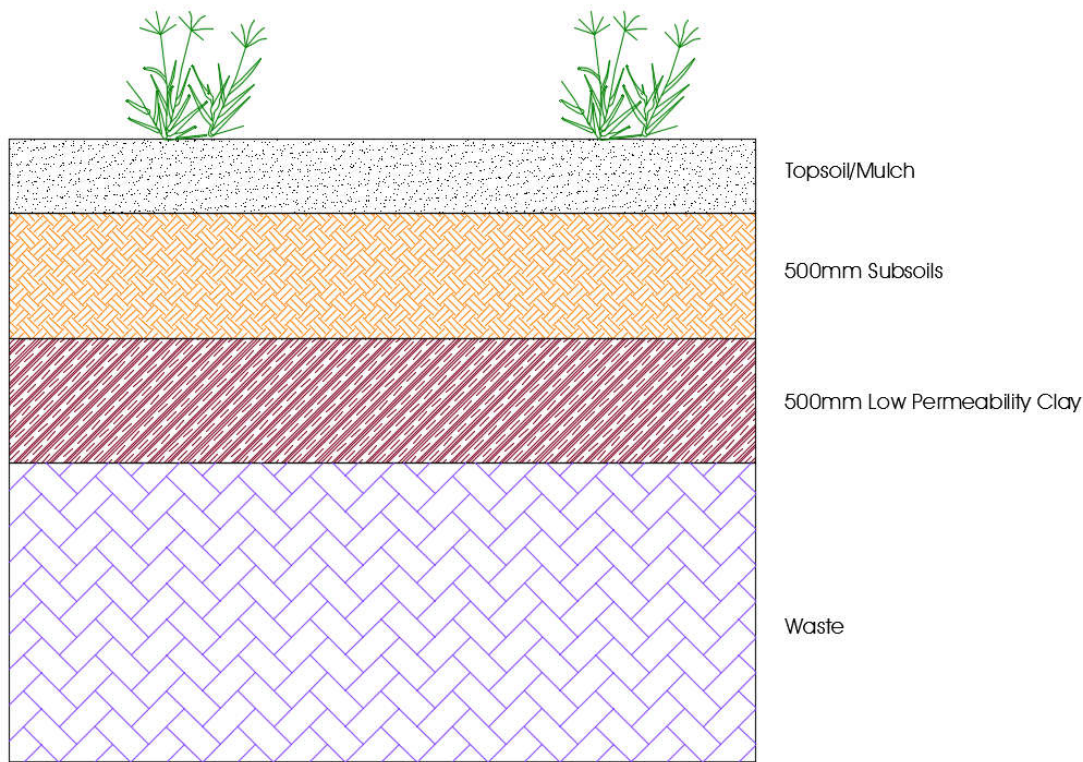


Figure 3-2 - Typical Capping Liner

4 Material Balance

Consideration should be given to Material Balance across the life of the landfill during the design. Major works that may require material throughout the life of the landfill includes cell construction (internal and external bunds), daily cover material and capping material. It is proposed that the borrow pit to the south of the Site will be used to balance this required fill material.

- Cell levels are as shown on Draft Site Master Plan (TW16001-G-002);
- Daily cover material is assumed as 10% of the total landfill void;
- Material available in the borrow pit is restricted to the depths as identified in the STATS geotechnical investigation report, trial pits (depth to refusal);
- The existing topography of the borrow pit is based on topographical data from Sept 2014; and
- All the material available for excavation in the borrow pit is assumed suitable for landfill construction and operating activities.

From the initial assessments of the STATS June 2016 geotechnical investigation report, the report documents numerous refusals on the trial pit logs at shallow depth on a 'very dense layer' within the borrow area. Talis have digitised these 'depths to refusal' using the site topographical data and utilised them in an initial Material Balance assessment to calculate material available in the borrow area.

A total of 815,690m³ of fill material is required for the construction of the new cells, daily cover material and capping material.

Based on the depths to refusal, it is calculated that there is approximately 436,028m³ of material available from the borrow pit. If the recent STATS geotechnical investigation is accurate of ground conditions there is sufficient volume of material in the borrow pit to create a balance over the life of the landfill for Cell 1-4 only.

Table 4-1: Approximate Material Balance Calculations

Item	Cell 1-4 only Cut/Fill (+/- m ³)	Cell 1-12 Cut/Fill (+/- m ³)
Daily cover material (10% of void Existing)	- 39,191	- 39,191
Daily cover material (10% of void New Cells)	- 75,852	- 218,333
Capping material (Existing)	- 134,768	- 134,768
Capping material (New Cells)	- 74,836	- 209,604
Fill to create new cells	- 92,244	- 213,794
Cut to create new cells	+ 16,543	+ 43,188
Material available from borrow pit (depth to refusal)	+ 436,028	+ 436,028
Net cut available	+ 35,681	- 336,474

As can be seen in the results from the Material Balance calculations, there is a risk of sufficient material being available to complete all the works at the Site.



It is unknown whether the depth to refusal is a factor of the size of excavator utilised for the trial pitting or the presence of hard calcrete layers or rock in the area. Talis recommends that further investigation is undertaken in the area with a larger excavator and/or benching to a lower depth for the City of Karratha to confirm the viability of the borrow area as the long term source for cover and engineering material.

The City of Karratha will also have to confirm that the material at lower depths remains suitable for the preferred final capping method in accordance Best Practice landfill Guidelines. If the material is not suitable than alternative options will need to be considered.



5 Void Space Modelling Calculations

The Void Space modelling has been undertaken to determine the available filling capacity for the facility across its operational life and ensure that the facility can cater for future waste management demands. Due to the uncertainty involved with the anticipated volumes of waste material expected to be received in the future, the City has advised Talis to base all calculations on a waste disposal volume of 100,000m³/year.

The density of waste after placement is assumed to be 750kg/m³ and the daily cover is assumed to be 10% of the total available void space volume, both values are commonly used industry standards. At the City's request, the Void Space Calculations assume that no waste is going to be diverted to New Energy's proposed Waste to Energy Plant at Port Hedland.

The existing landfill is central to the northern lot of the Site as shown on Drawing TW16001-G-003 – Draft Site Master Plan Restoration. The draft restoration site master plan final fill profile is modelled with a crest height of 34.5m AHD along the spine of the future landfill expansion area. The profile attains a maximum waste height of 35.5m AHD at a localised peak over the existing operational phase, to enable the required 1:20 landfill cap design gradients to be formed, to adequately shed water, in accordance with current best practice (BPEM 2015) guidelines.

The current maximum height of the landfill, as per the topographical survey completed on 28 January 2016 is approximately 26.5m Australian Height Datum (AHD). There is approximately 391,905m³ of void remaining in the existing landfill as shown in **Table 5-1**, compared to the Draft Site Master Plan Restoration (TW16001-G-003). Based on the estimated waste intake of 100,000m³ (including cover) in the first year, with an estimated waste growth rate of 2%, the existing landfill will cease acceptance of waste in November 2019.

Immediately south of the existing landfill is an area allocated for the development of new landfill cells. The filling of the new landfill cells will amalgamate into the existing landfill. The allocated area will be separated evenly to create 12 cells of similar void space. The approximate layout of the twelve cells is shown on the attached Drawing (TW16001-G-0002 Draft Site Master Plan). The layout supports the use of inclined leachate extraction side risers, which will save cost and reduce maintenance and operations going forward.

The total void space in the new landfill cells is approximately 2.2 million cubic metres. The void space has been separated to give 12 cells; void per cell and filling duration is shown in **Table 5-1**.

Waste voids for Cell 1-4 have been modelled with temporary waste slopes adjacent to the existing waste cells. Temporary waste slopes have not been modelled for Cells 5-12 and void capacity is based on the remaining total void at the site modelled between the proposed basal footprint and proposed fill profile (Draft Site Master Plan Cell Layout - Drawing TW16001-G-002 and Draft Site Master Plan Restoration - Drawing TW16001-G-003 respectively) divided between the number of cells.

Based on the above assumptions, the new cells can facilitate the intake of waste until October 2036. The date of cell development should be approximately 9 months before previous waste infilling in the cell is complete to account for construction and CQA approval to ensure



continuation of landfilling activities. A 6 month period has been allowed between filling completion and capping to allow for CQA Approvals and Contractor mobilisation.

Table 5-1: Estimated Landfill Lifetime

Landfill Cell	Void (m3)	Estimated Date for Commencing Cell Development	Estimated Date of Cell Full	Landfilling Duration (years)	Date of Cell Capping
Existing Landfill	391,905	N/A	Nov 2019	3.81	May 2020
Cell 1	188,090	Feb 2019	Jul 2021	1.69	Jan 2022
Cell 2	196,549	Oct 2020	Apr 2023	1.71	Oct 2023
Cell 3	192,619	Jul 2022	Dec 2024	1.64	Jun 2025
Cell 4	181,258	Mar 2024	May 2026	1.48	Nov 2026
Cell 5	190,000	Aug 2025	Dec 2027	1.53	Jun 2028
Cell 6	190,000	Mar 2027	May 2029	1.46	Nov 2029
Cell 7	174,136	Aug 2028	Sep 2030	1.32	Mar 2031
Cell 8	174,136	Dec 2029	Dec 2031	1.27	Jun 2032
Cell 9	174,136	Mar 2031	Mar 2033	1.24	Sep 2033
Cell 10	174,136	Jun 2032	Jun 2034	1.22	Dec 2034
Cell 11	174,136	Sep 2033	Aug 2035	1.17	Feb 2036
Cell 12	174,136	Nov 2034	Oct 2036	1.15	Apr 2037

The results shown in can be used to determine what financial year that each of the key capital works need to be implemented to ensure continued operations at the site.



6 Cost Estimate and Landfill Life Financial Model

6.1 Cell 1-12 Development & Capping Costs

A capital cost estimate has been prepared for the lifetime of the development, and closure of the new landfill cells. The cost is broken down into each financial year, with an assumed constant inflation rate of 2%. This full whole of life cost estimate is included in **Appendix B**. The costs have been based on the conceptual designs prepared by Talis for Cells 1-12.

The cost estimates do not include operational costs or costs for capping the existing landfill, and are based on the same assumptions used to calculate the void space in **Section 5**, including:

- Site survey January 2016;
- 100,000 m³ of waste disposal per year, plus 2% growth; and
- Final waste profile modelled with a crest height of 34.5m AHD along the spine of the future landfill expansion area, with a maximum waste height of 35.5m AHD at a localised peak over the existing operational phase.

The costs are calculated based on the estimated quantities and rates for each item. The following assumptions were made to calculate the whole of life costs:

- Detailed design has not yet been completed and quantities are based on indicative calculations;
- Rates are based on Talis' experience in the field and could change depending on market conditions;
- Talis assumes that sufficient material is available in the borrow pit to undertake all construction and capping works;
- Assumed constant inflation rate of 2%;
- Costs for the closure of the existing landfill are not included;
- Professional Fees and Services of 8% has been added to the total cost;
- Local loading of 30% has been added to the total cost;
- Contingency of 20% has been added to the total cost; and
- GST is not included in any of the estimates.

The Professional Services loading of 8% has been applied to cater for consultancy and specialist services required to assist with approvals, design, project management and contract administration activities, site supervision and Construction Quality Assurance. The percentage added for Professional Fees and Services to cover consultancy fees is an estimate.

A local loading of 50% is referenced from Rawlinson's – Australian Construction Handbook and is an estimated cost variation associated with the distance from Perth, this has been reduced to 30% in the updated financial model after instruction by City of Karratha during discussions with Talis at the meeting at Talis' offices on 22/08/16.

The total estimated capital costs for the life of the landfill is approximately \$38,965,775 and is summarised in **Table 6-1** overleaf.

Table 6-1 Total Estimated Capital Costs

Item	Total	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6	Cell 7
Cell Development	\$18,913,154	\$1,771,280	\$1,658,673	\$1,290,841	\$1,166,138	\$1,393,559	\$1,436,445	\$1,547,988
Capping	\$5,748,729	\$785,010	\$486,363	\$396,798	\$408,970	\$395,801	\$411,791	\$398,632
Works Sub-Total	\$24,661,883	\$2,556,291	\$2,145,036	\$1,687,639	\$1,575,109	\$1,789,360	\$1,848,237	\$1,946,620
Professional Fees and Services	\$1,972,951	\$204,503	\$171,603	\$135,011	\$126,009	\$143,149	\$147,859	\$155,730
Local Loading (30%)	\$7,398,565	\$766,887	\$643,511	\$506,292	\$472,533	\$536,808	\$554,471	\$583,986
Contingency	\$4,932,377	\$511,258	\$429,007	\$337,528	\$315,022	\$357,872	\$369,647	\$389,324
Total Cost	\$38,965,775	\$4,038,939	\$3,389,158	\$2,666,470	\$2,488,672	\$2,827,188	\$2,920,214	\$3,075,660

Item	Cell 8	Cell 9	Cell 10	Cell 11	Cell 12
Cell Development	\$1,708,257	\$1,544,261	\$1,514,946	\$1,993,962	\$1,886,803
Capping	\$406,605	\$458,037	\$527,899	\$538,457	\$534,366
Works Sub-Total	\$2,114,862	\$2,002,299	\$2,042,844	\$2,532,419	\$2,421,169
Professional Fees and Services	\$169,189	\$160,184	\$163,428	\$202,594	\$193,693
Local Loading (30%)	\$634,458	\$600,690	\$612,853	\$759,726	\$726,351
Contingency	\$422,972	\$400,460	\$408,569	\$506,484	\$484,234
Total Cost	\$3,341,481	\$3,163,632	\$3,227,694	\$4,001,222	\$3,825,447

6.2 Cells 1-4 Development & Capping Costs

Taking into account the local loading, contingency and professional services factors the overall capital cost estimate for the composite basal engineering cell lining and development of Cells 1-4 at the Seven Mile Landfill is estimated to be approximately \$9,301,354. The cost estimate excluding local loading and contingencies is approximately \$5,886,933. As these works are to be completed over 4 phases, the costs spread over the 4 cells is summarised below in **Table 6-2**.

Table 6-2 Estimated Cell 1-4 Development Costs

Item	Cell 1	Cell 2	Cell 3	Cell 4	Total
Earthworks	\$535,981	\$523,344	\$282,769	\$281,364	\$1,623,458
Basal Liner System	\$1,110,788	\$1,002,324	\$957,141	\$832,824	\$3,903,077
Leachate Extraction	\$98,370	\$105,808	\$40,598	\$41,410	\$286,186
Surface Water Management	\$26,142	\$27,198	\$10,333	\$10,540	\$74,212
Sub-Total	\$1,771,280	\$1,658,673	\$1,290,841	\$1,166,138	\$5,886,933
Local Loading (30%)	\$531,384	\$497,602	\$387,252	\$349,841	\$1,766,080
Professional Services (8%)	\$141,702	\$132,694	\$103,267	\$93,291	\$470,955
Contingency (20%)	\$354,256	\$331,735	\$258,168	\$233,228	\$1,177,387
Total	\$2,798,623	\$2,620,704	\$2,039,529	\$1,842,498	\$9,301,354

The Capping of Cells 1-4 will be constructed using a site-won engineered impermeable clay layer as described in **Section 3.4**. Based on this type of capping design, the Capping of Cells 1-4 is estimated to be approximately \$3,281,884. The cost estimate excluding local loading and contingencies is approximately \$2,077,142. Estimated Capping cost estimates for Cell 1-4 are shown in **Table 6-3**.

Table 6-3 Estimated Cell 1-4 Capping & Restoration Costs

Item	Cell 1	Cell 2	Cell 3	Cell 4	Total
Earthworks	\$175,578	\$182,671	\$186,325	\$193,852	\$738,427
Restoration/ Revegetation	\$63,208	\$65,762	\$67,077	\$69,787	\$265,834
Surface Water Management	\$361,202	\$45,433	\$46,342	\$48,214	\$501,191
Landfill Gas Management System	\$185,022	\$192,497	\$97,054	\$97,117	\$571,690
Sub total	\$785,010	\$486,363	\$396,798	\$408,970	\$2,077,142
Local Loading 30%	\$235,503	\$145,909	\$119,039	\$122,691	\$623,143
Professional Services 8%	\$62,801	\$38,909	\$31,744	\$32,718	\$166,171
Contingency 20%	\$157,002	\$97,273	\$79,360	\$81,794	\$415,428
Total	\$1,240,317	\$768,453	\$626,940	\$646,173	\$3,281,884

Table 6-4 Estimated Total Cell 1-4 Development & Capping Costs

Item	Cell 1	Cell 2	Cell 3	Cell 4	Total
Cell	\$1,771,280	\$1,658,673	\$1,290,841	\$1,166,138	\$5,886,933
Capping	\$785,010	\$486,363	\$396,798	\$408,970	\$2,077,142
Sub total	\$2,556,291	\$2,145,036	\$1,687,639	\$1,575,109	\$7,964,075
Local Loading 30%	\$766,887	\$643,511	\$506,292	\$472,533	\$2,389,222
Professional Services 8%	\$204,503	\$171,603	\$135,011	\$126,009	\$637,126
Contingency 20%	\$511,258	\$429,007	\$337,528	\$315,022	\$1,592,815
Total	\$4,038,939	\$3,389,158	\$2,666,470	\$2,488,672	\$12,583,238

Note: All costings are exclusive of GST.

6.3 Development Cost Comparison

The minimum gate fee required to cover the Capital Costs associated with the development and capping of the Cells 1-4 can be calculated by dividing the total capital cost of \$12,583,238 by 706,799 tonnes, as shown in **Table 6-5** resulting in a cost per tonne of \$17.80.

Table 6-5 Input tonnage – Cost Equivalency

Landfill Cell	Void (m3)	Daily Cover (10%)	Equivalent Waste Tonnes	Engineering & Capping Cost (\$)	Cost per tonne
Cell 1	188,090	17,099	175,266	\$4,038,939	
Cell 2	196,549	17,868	183,148	\$3,389,158	
Cell 3	192,619	17,511	179,486	\$2,666,470	
Cell 4	181,258	16,478	168,900	\$2,488,672	

Cell 5	190,000	17,273	177,045	\$2,827,188	
Cell 6	190,000	17,273	177,045	\$2,920,214	
Cell 7	174,136	15,831	162,263	\$ 3,075,660	
Cell 8	174,136	15,831	162,263	\$3,341,481	
Cell 9	174,136	15,831	162,263	\$3,163,632	
Cell 10	174,136	15,831	162,263	\$3,227,694	
Cell 11	174,136	15,831	162,263	\$4,001,222	
Cell 12	174,136	15,831	162,263	\$3,825,447	
Cell 1-4 Total	758,516	68,956	706,799	\$12,583,238	\$17.80
Cell 1-12 Total	2,183,332	198,485	2,034,468	\$38,965,775	\$19.15

Note: Compaction rate of 0.75 tonnes/m³ assumed for void usage.

The minimum gate fee required to cover the Capital Costs associated with the development and capping of the full site for Cells 1-12 can be calculated by dividing the total capital cost of \$38,975,775 by 2,034,468 tonnes, as shown in **Table 6-5** resulting in a cost per tonne of \$19.15.

The difference in development and restoration cost per tonne for Cell 1-4 (\$17.80) compared to Cell 1-12 (\$19.15), is attributable to the decrease in available void capacity per cell due the lower final restoration profile of the latter cells, and partly due to the increased engineering and restoration costs due to inflationary increases.



Appendix A **Drawings**



PRELIMINARY ONLY
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NORTHERN SURFACE WATER
COLLECTION POND

SECONDARY ACCESS ROAD

POND OVERFLOW
CHANNEL

FUTURE
MATERIALS
RECOVERY
FACILITY
WASTE
TRANSFER
STATION

WEIGHBRIDGE

ADMINISTRATION
AND
COMMUNITY
DROP OFF
FACILITY

EXISTING LANDFILL

EVAPORATION POND 3 TO BE
CONVERTED TO LEACHATE POND

SULLAGE
PITS

HISTORICAL
DUMPING AREA

TYRE STORAGE
AREA

SCRAP
METALS

ASBESTOS

CONTAMINATED
HAZARDOUS
WASTE

SOUTHERN FUTURE
SURFACE WATER
COLLECTION POND

BORROW
AREA

CELL 2

CELL 4

CELL 6

CELL 8

CELL 10

CELL 12

PROPOSED SITE OF
FUTURE LANDFILL CELLS

CELL 11

CELL 9

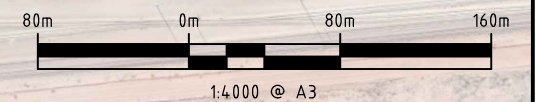
CELL 7

CELL 5

CELL 3

CELL 1

EXPLORATION DRIVE



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No.	Date	Drawn By	Check By	Amendment / Issue	App.
A	30.06.16	CDB	SC	ISSUED FOR CLIENT REVIEW	

Project:

SEVEN MILE WASTE
FACILITY - KARRATHA
CELLS 1 TO 4

Title:

DRAFT SITE MASTER PLAN
CELL LAYOUT

Drawn by:	CDB	Job No:	TW16001
Checked by:	SC	File No:	TW16001-G-002
Approved by:		Drg. No:	G-002
Scale:	1:4,000 @ A3	Rev:	A
Date:	30.06.16		



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NORTHERN SURFACE WATER
COLLECTION POND

SECONDARY ACCESS ROAD

POND OVERFLOW
CHANNEL

FUTURE
MATERIALS
RECOVERY
FACILITY
WASTE
TRANSFER
STATION

WEIGHBRIDGE

ADMINISTRATION
AND
COMMUNITY
DROP OFF
FACILITY

EVAPORATION POND 3 TO BE
CONVERTED TO LEACHATE POND

SULLAGE
PITS

HISTORICAL
DUMPING AREA

TYRE STORAGE
AREA

SCRAP
METALS

EXISTING LANDFILL

PROPOSED SITE OF
FUTURE LANDFILL CELLS

CELL 2

CELL 4

CELL 6

CELL 8

CELL 10

CELL 12

CELL 11

CELL 9

CELL 7

CELL 5

CELL 3

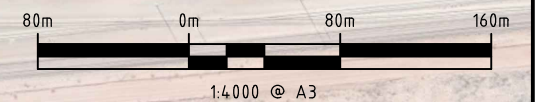
CELL 1

CONTAMINATED
HAZARDOUS
WASTE

ASBESTOS

SOUTHERN FUTURE
SURFACE WATER
COLLECTION POND

BORROW
AREA



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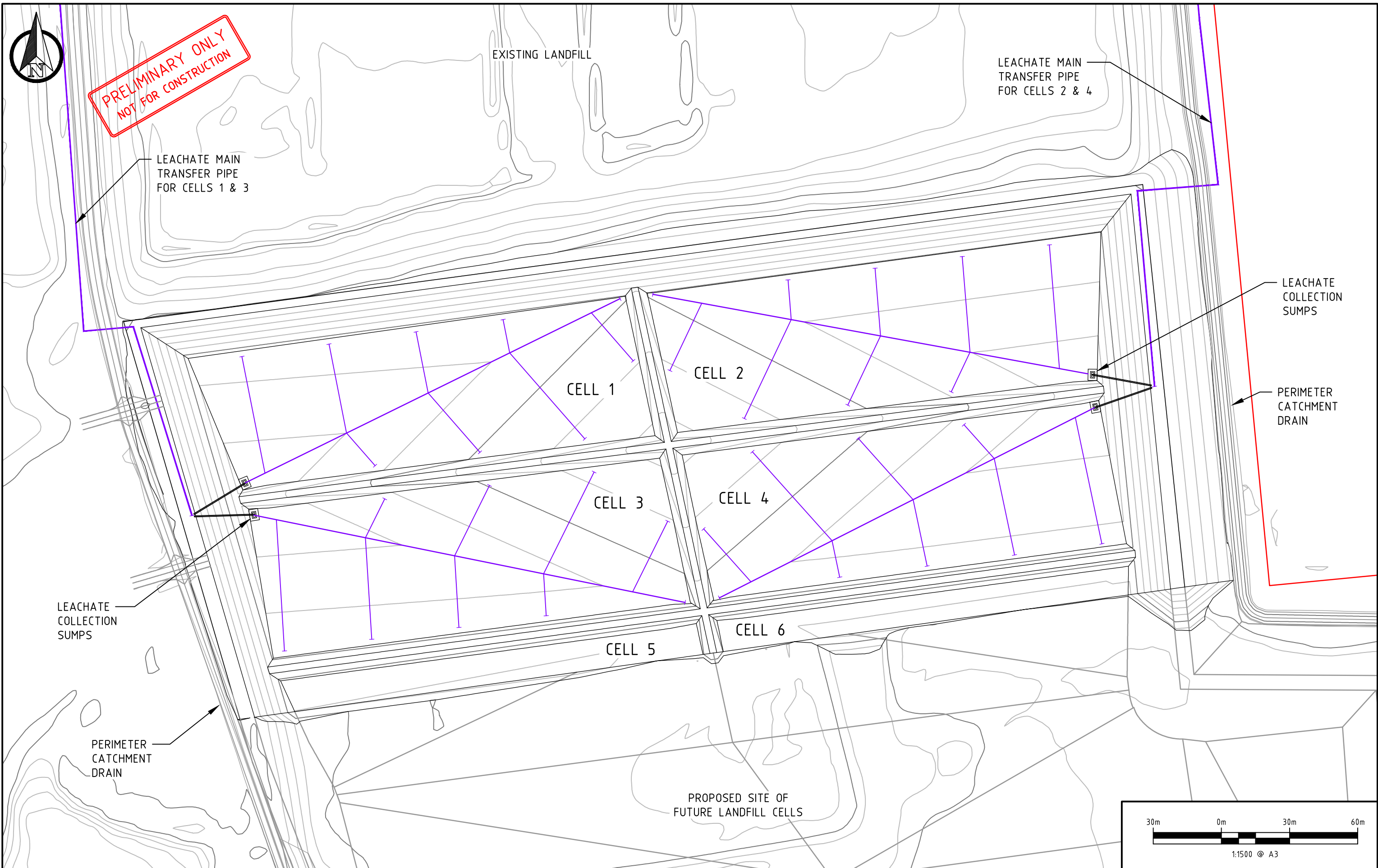
Project:


SEVEN MILE WASTE
FACILITY - KARRATHA
CELLS 1 TO 4

Title:

DRAFT SITE MASTER PLAN
RESTORATION

Drawn by:	CDB	Job No:	TW16001
Checked by:	SC	File No:	TW16001-G-003
Approved by:		Drg. No:	G-003
Scale:	1:4,000 @ A3	Rev:	A
Date:	30.06.16		






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Client:



City of
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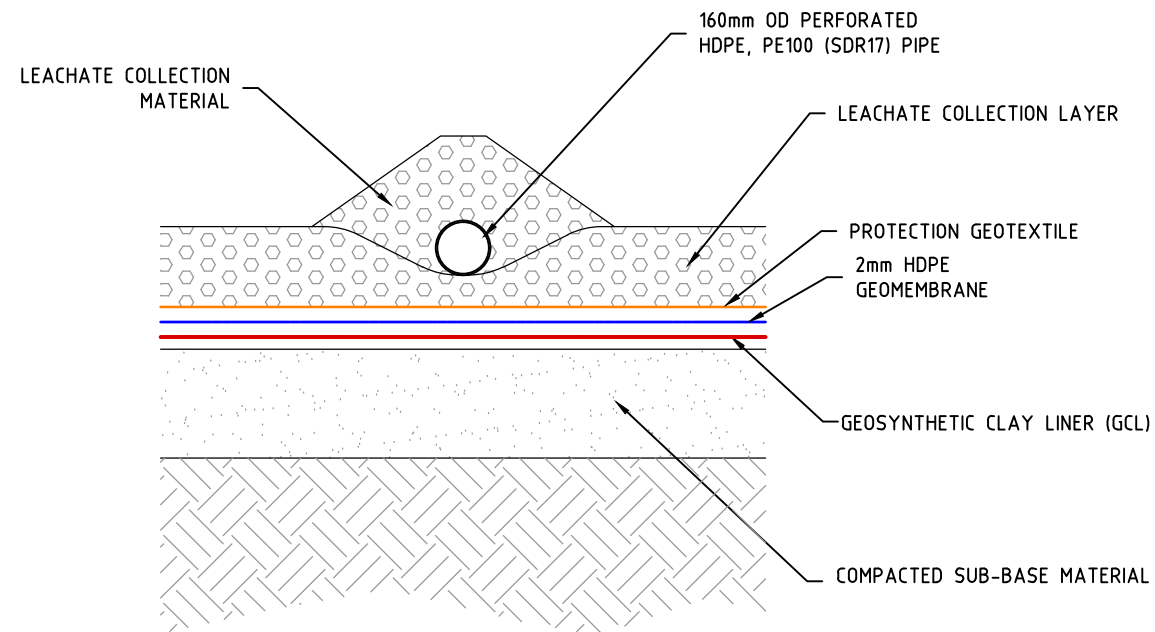
Project:

SEVEN MILE WASTE FACILITY - KARRATHA

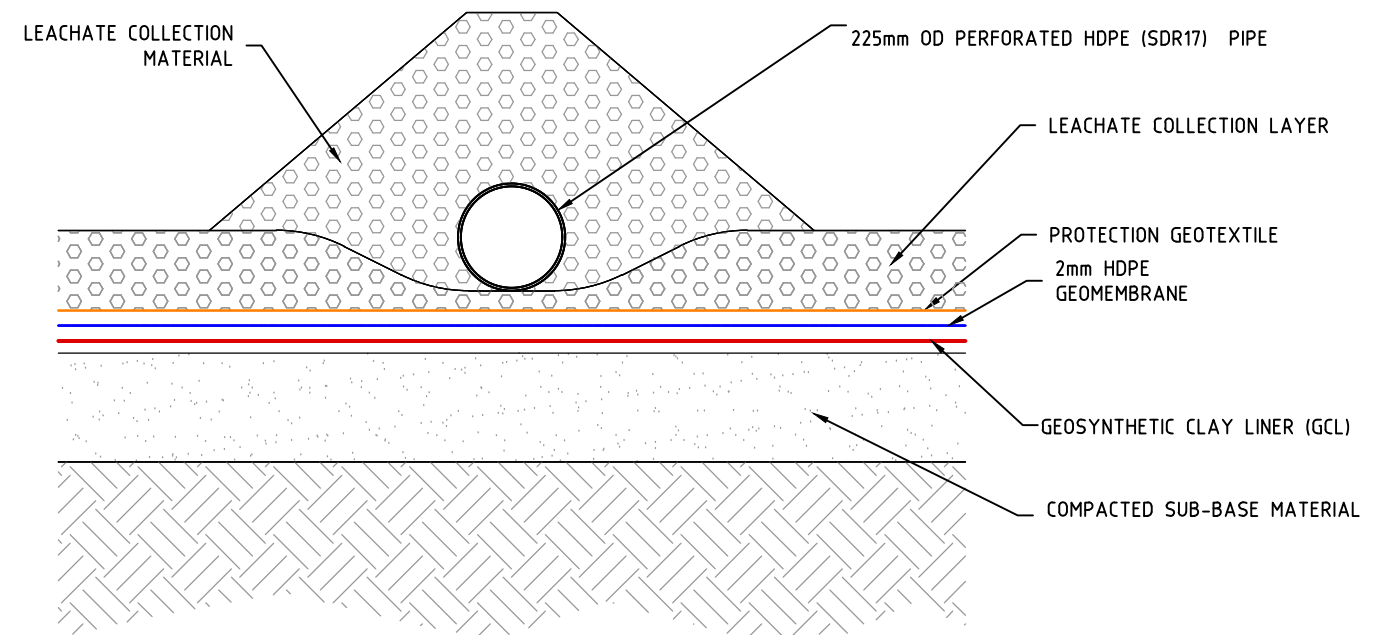
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LEACHATE COLLECTION AND MANAGEMENT LANDFILL CELLS 1-4

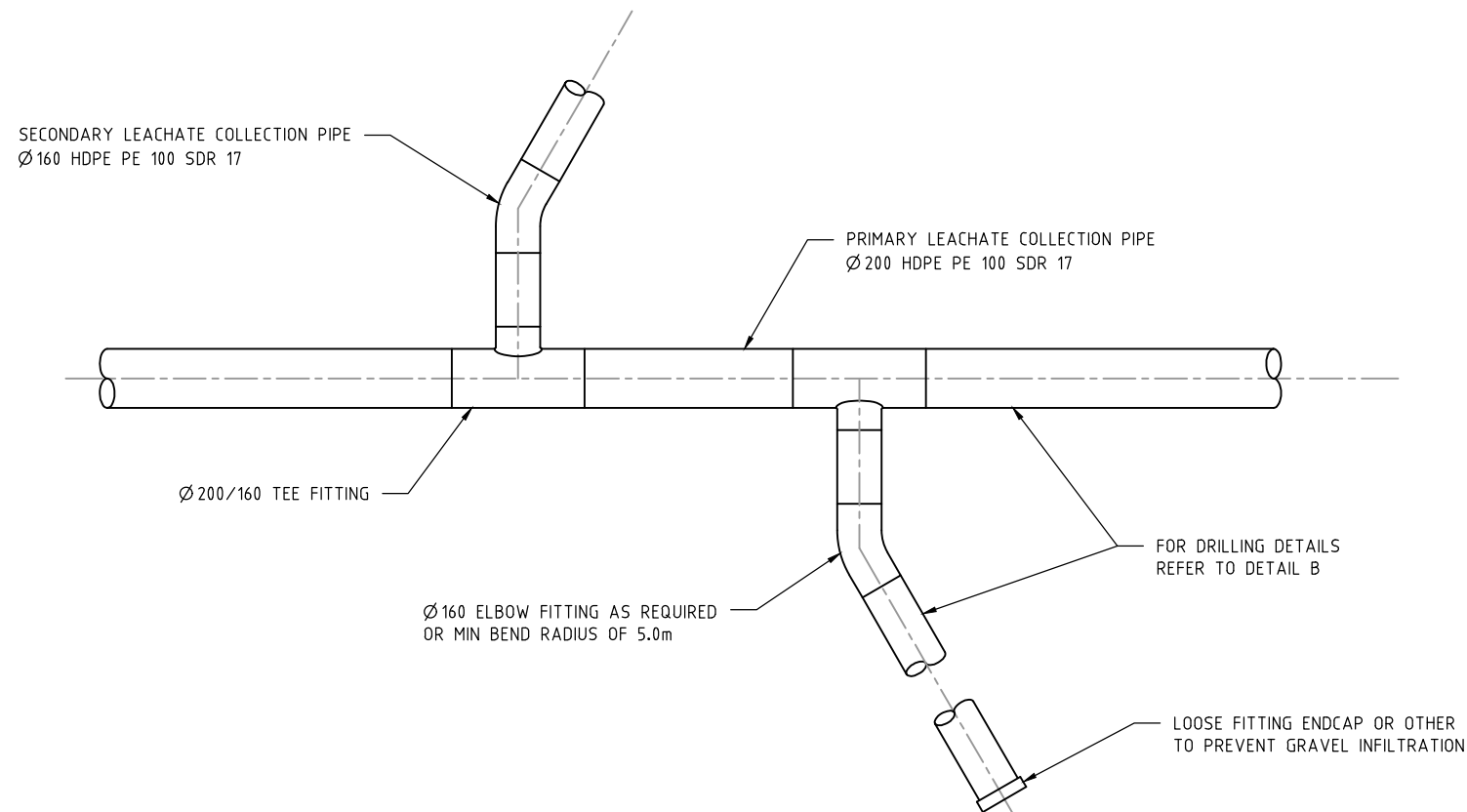
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Approved by:		Drg. No:	C-002
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Date:	30.06.16		



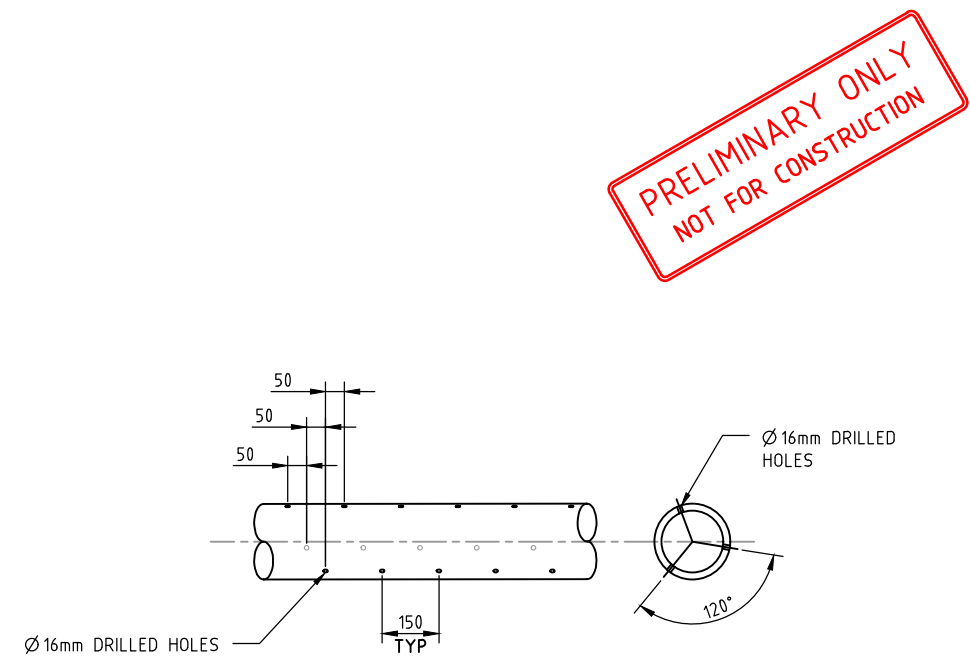
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B TYPICAL SECTION THROUGH PRIMARY LEACHATE DRAIN
SCALE: NTS



A TYPICAL DETAIL - LEACHATE COLLECTION PIPES
SCALE: NTS



B TYPICAL SECTION - LEACHATE COLLECTION DRILLING
SCALE: NTS

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A	15.07.16	ISSUED FOR CLIENT REVIEW	

Project:	SEVEN MILE WASTE FACILITY - KARRATHA
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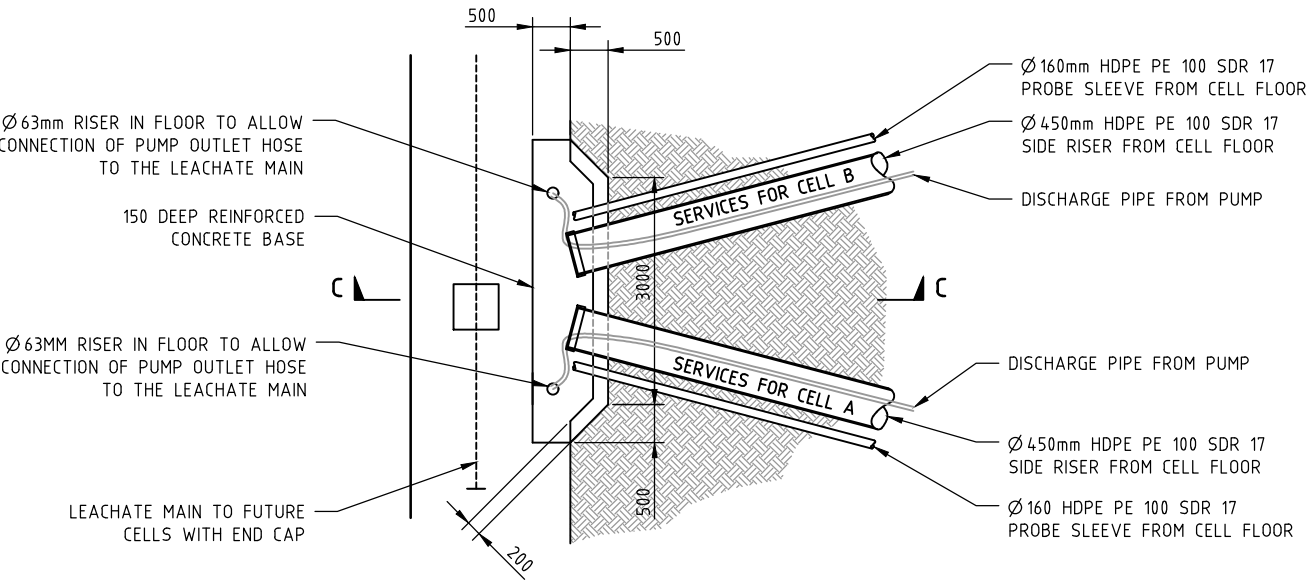
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Approved by:		Dr. No:	P-902
Scale:	NTS	Rev:	A
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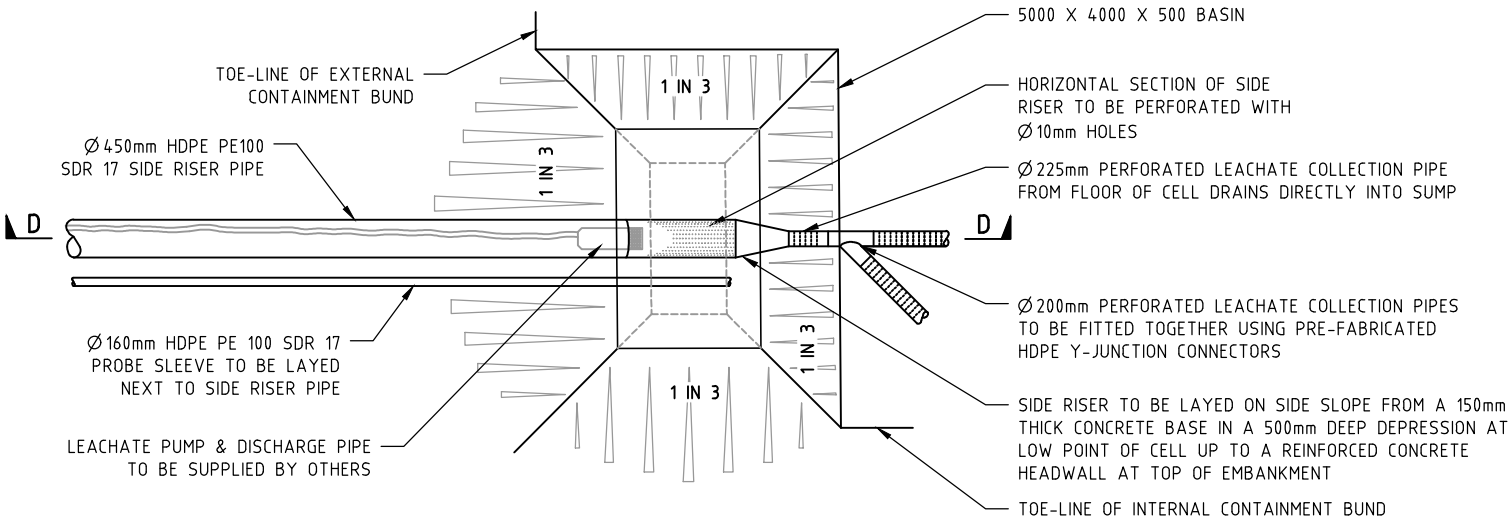
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LEGEND

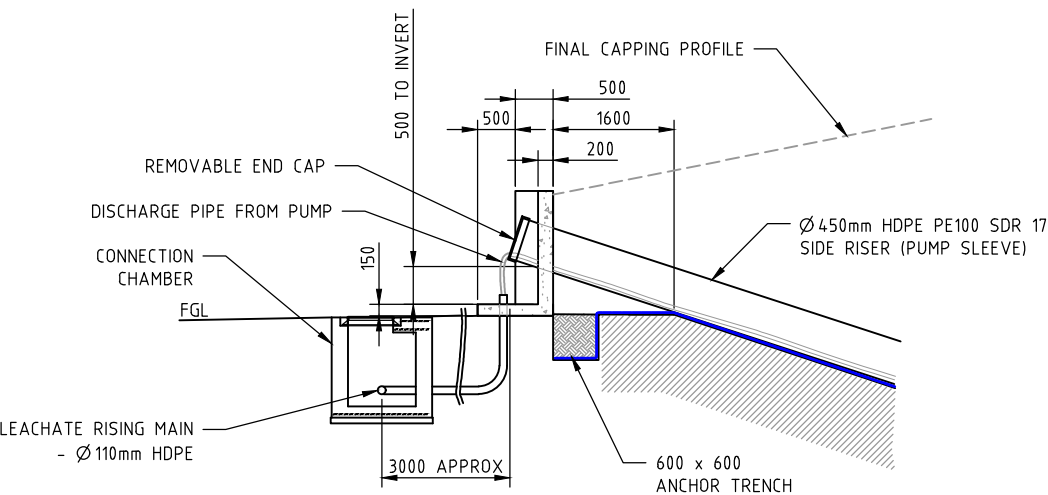
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- LINER - LLDPE (LINEAR LOW DENSITY)
- LINER - GCL (CLAY COMPOSITE)
- GEOFABRIC - PROTECTIVE LAYER
- GEOTEXTILE - SEPARATION LAYER



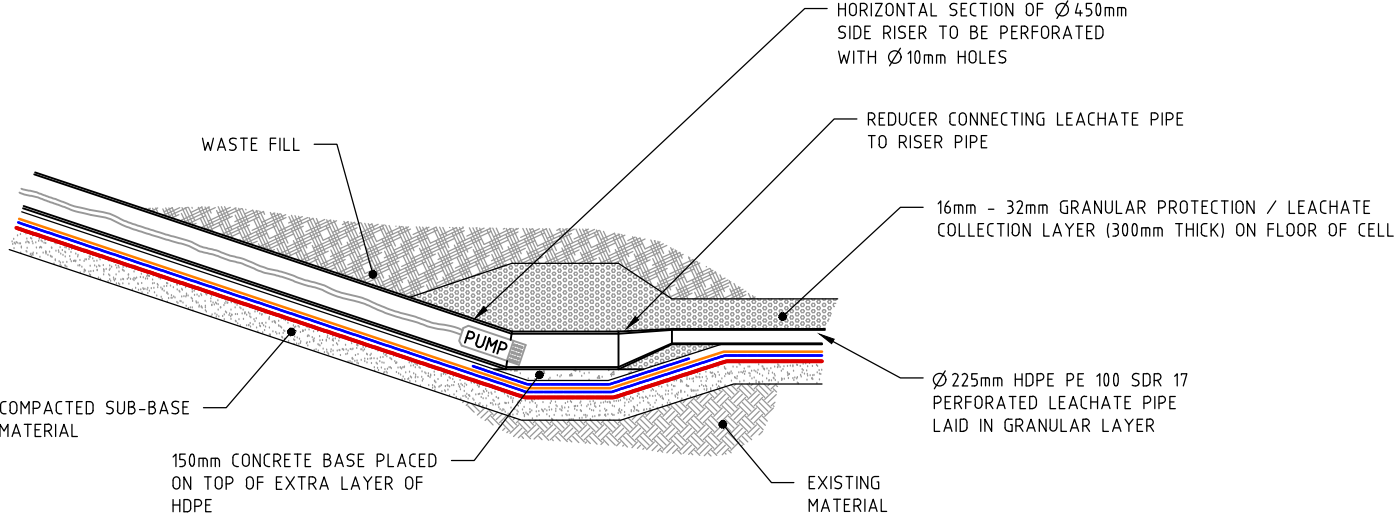
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SCALE: NTS



B TYPICAL PLAN - LEACHATE COLLECTION SUMP
SCALE: NTS



C TYPICAL SECTION - SIDE RISER HEADWALL
SCALE: NTS



D TYPICAL SECTION - LEACHATE COLLECTION SUMP
SCALE: NTS



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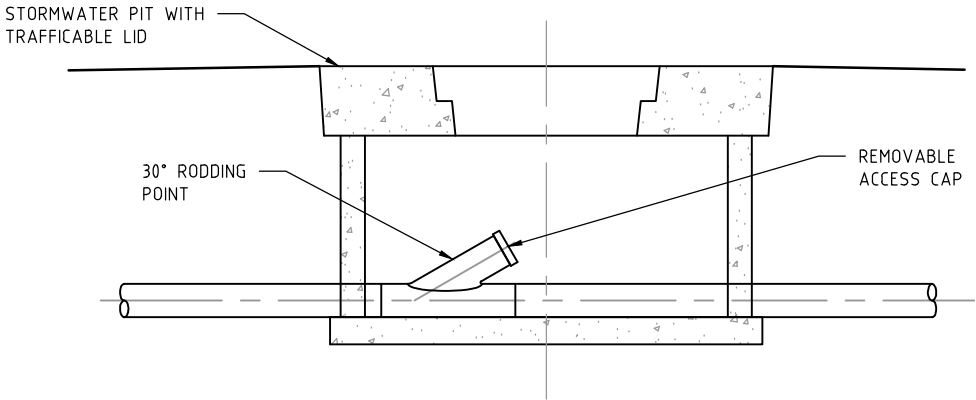
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Project: STANDARD LANDFILL DETAILS

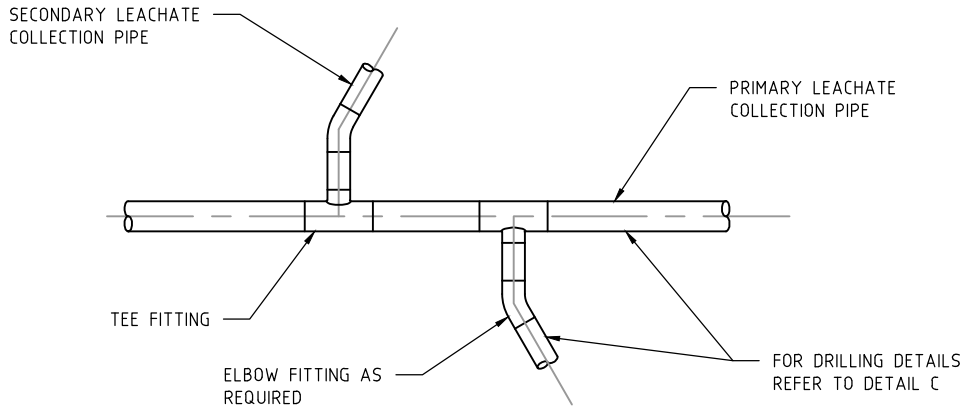
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Checked by:	SC	File No:	TWST001-G-001
Approved by:		Drg. No:	G-001
Scale:	NTS	Rev:	A
Date:	14.06.16		

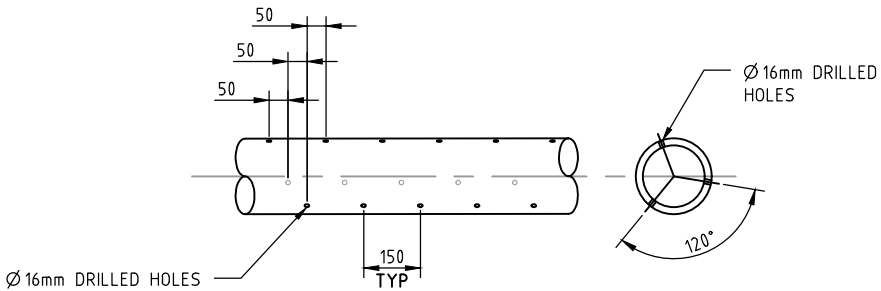


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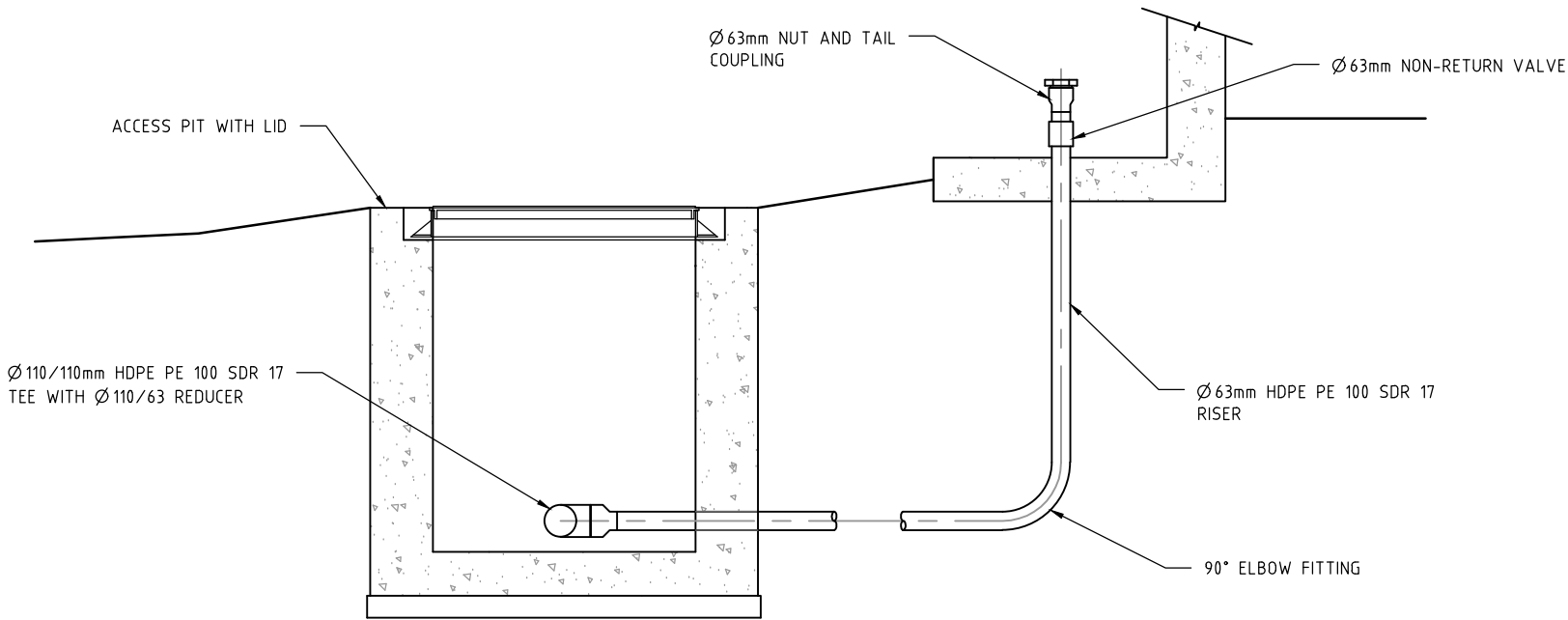
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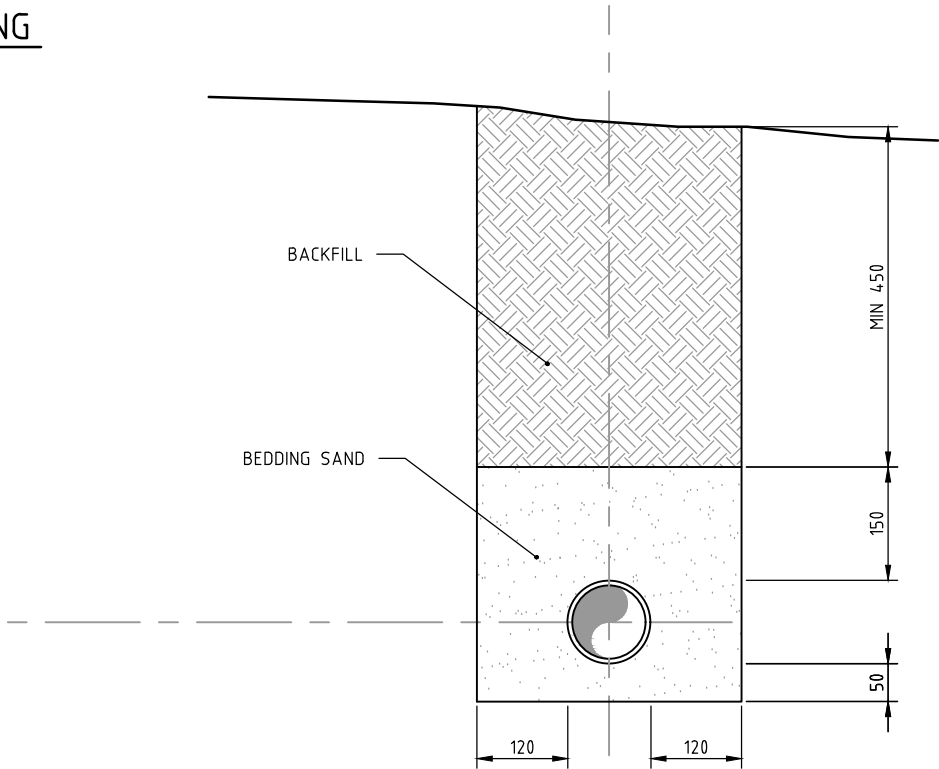
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C TYPICAL SECTION - LEACHATE COLLECTION DRILLING
SCALE: NTS



D TYPICAL DETAIL - LEACHATE MAIN CONNECTION
SCALE: NTS



E TYPICAL DETAIL - LEACHATE MAIN TRENCHING
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Approved by:		Drg. No:	P-001
Scale:	NTS	Rev:	A
Date:	14.06.16		



Appendix B **Landfill** **Financial Model**

Lifetime

Landfill Lifetime Financial Model



				Total		2018-19		2019-20		2020-21		2021-22	
No	Item	Unit	Rate	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount
	Sub-Total				\$ -		\$ -		\$ -		\$ -		\$ -
2	Cell Development - Earthworks												
	General Site Clearance and rationalising surface	m²	\$ 1.00	223,661.08	\$ 276,486.65	24,445.00	\$ 25,432.58	-	\$ -	22,636.00	\$ 24,501.93	-	\$ -
	General removal of spoil	m³	\$ 10.00	20,808.20	\$ 256,257.29	2,444.50	\$ 25,432.58	-	\$ -	2,263.60	\$ 24,501.93	-	\$ -
	Excavation and Place	m³	\$ 9.40	43,122.50	\$ 498,473.02	3,565.00	\$ 34,864.84	-	\$ -	4,777.00	\$ 48,605.32	-	\$ -
	Import and Place from Borrow	m³	\$ 14.00	227,519.00	\$ 3,917,318.76	29,475.00	\$ 429,321.06	-	\$ -	27,027.00	\$ 409,568.52	-	\$ -
	Excavate & fill to internal bunds	m³	\$ 12.70	16,440.00	\$ 256,037.17	1,584.00	\$ 20,929.52	-	\$ -	1,176.00	\$ 16,166.34	-	\$ -
	Sub-Total				\$ 5,204,572.88		\$ 535,980.58		\$ -		\$ 523,344.04		\$ -
3	Cell Development - Basal Liner System												
	Prepare surface to receive GCL	m²	\$ 1.50	220,198.08	\$ 409,023.96	24,278.00	\$ 37,888.25	-	\$ -	19,803.00	\$ 32,153.11	-	\$ -
	Supply and install GCL	m²	\$ 10.00	220,198.08	\$ 2,726,826.40	24,278.00	\$ 252,588.31	-	\$ -	19,803.00	\$ 214,354.04	-	\$ -
	Supply and install 2mm textured HDPE geomembrane	m²	\$ 10.00	220,198.08	\$ 2,726,826.40	24,278.00	\$ 252,588.31	-	\$ -	19,803.00	\$ 214,354.04	-	\$ -
	Supply and install protection geotextile	m²	\$ 9.00	220,198.08	\$ 2,454,143.76	24,278.00	\$ 227,329.48	-	\$ -	19,803.00	\$ 192,918.64	-	\$ -
	Supply and install 300mm leachate collection layer	m²	\$ 36.00	57,191.09	\$ 2,538,915.69	5,412.53	\$ 202,722.99	-	\$ -	5,336.33	\$ 207,943.90	-	\$ -
	Excavate anchor trench for HDPE & Geotextile	m	\$ 25.60	4,787.00	\$ 149,803.75	650.00	\$ 17,312.26	-	\$ -	555.00	\$ 15,379.20	-	\$ -
	Supply and install 225mm HDPE primary pipe	m	\$ 170.00	2,400.00	\$ 505,493.31	200.00	\$ 35,373.60	-	\$ -	200.00	\$ 36,802.69	-	\$ -
	Supply and install 180mm HDPE secondary pipe	m	\$ 155.00	6,324.00	\$ 1,214,447.69	527.00	\$ 84,985.07	-	\$ -	527.00	\$ 88,418.47	-	\$ -
	Sub-Total				\$ 12,725,480.98		\$ 1,110,788.27		\$ -		\$ 1,002,324.09		\$ -
4	Cell Development - Leachate Extraction												
	Supply and install 63mm HDPE leachate rising main pipe	m	\$ 100.00	2,002.00	\$ 232,886.27	585.00	\$ 60,863.40	-	\$ -	617.00	\$ 66,786.06	-	\$ -
	Supply and install 450mm HDPE inclined riser	m	\$ 812.00	300.00	\$ 301,809.24	25.00	\$ 21,120.12	-	\$ -	25.00	\$ 21,973.37	-	\$ -
	Supply and install 450 headwall for inclined riser	No	\$ 3,000.00	12.00	\$ 44,602.35	1.00	\$ 3,121.20	-	\$ -	1.00	\$ 3,247.30	-	\$ -
	Supply and install pump and connect to header	No	\$ 2,000.00	12.00	\$ 29,734.90	1.00	\$ 2,080.80	-	\$ -	1.00	\$ 2,164.86	-	\$ -
	Supply and install cut off valve	No	\$ 10,750.00	12.00	\$ 159,825.09	1.00	\$ 11,184.30	-	\$ -	1.00	\$ 11,636.15	-	\$ -
	Sub-Total				\$ 768,857.86		\$ 98,369.82		\$ -		\$ 105,807.74		\$ -
5	Cell Development - Surface Water Management												
	Excavate and line perimeter ditch	m	\$ 63.55	1,918.00	\$ 150,579.62	328.00	\$ 21,686.51	-	\$ -	328.00	\$ 22,562.65	-	\$ -
	Supply and install 600mm headwall	No	\$ 743.00	24.00	\$ 22,093.03	2.00	\$ 1,546.03	-	\$ -	2.00	\$ 1,608.49	-	\$ -
	Supply and install 600mm culvert	No	\$ 2,796.00	12.00	\$ 41,569.39	1.00	\$ 2,908.96	-	\$ -	1.00	\$ 3,026.48	-	\$ -
	Sub-Total				\$ 214,242.05		\$ 26,141.51		\$ -		\$ 27,197.62		\$ -
6	Capping - Earthworks												
	Fill 500mm thick compacted clay layer	m³	\$ 10.00	104,802.00	\$ 1,356,109.27	-	\$ -	-	\$ -	-	\$ -	9,354.50	\$ 103,281.24
	Fill 500mm thick soil subbase	m³	\$ 5.00	104,802.00	\$ 678,054.63	-	\$ -	-	\$ -	-	\$ -	9,354.50	\$ 51,640.62
	Fill 200mm thick topsoil	m³	\$ 5.00	41,920.80	\$ 271,221.85	-	\$ -	-	\$ -	-	\$ -	3,741.80	\$ 20,656.25
	Sub-Total				\$ 2,305,385.75		\$ -		\$ -		\$ -		\$ 175,578.11
7	Capping - Restoration												
	Revegetation	m²	\$ 3.00	213,796.08	\$ 829,938.87	-	\$ -	-	\$ -	-	\$ -	19,083.18	\$ 63,208.12
	Sub-Total				\$ 829,938.87		\$ -		\$ -		\$ -		\$ 63,208.12
8	Capping - Surface Water Management												
	Berm	m	\$ 63.55	2,796.00	\$ 231,243.18	-	\$ -	-	\$ -	-	\$ -	233.00	\$ 16,348.29
	Upper and Lower Chambers; including 300mm precast circular segment and slab	No	\$ 560.00	24.00	\$ 17,491.03	-	\$ -	-	\$ -	-	\$ -	2.00	\$ 1,236.57
	Concrete precast pipes with protective mesh	m	\$ 315.00	900.00	\$ 368,951.50	-	\$ -	-	\$ -	-	\$ -	75.00	\$ 26,083.91
	Excavate natural soil for surface water lagoon	m³	\$ 7.19	40,000.00	\$ 317,533.64	-	\$ -	-	\$ -	-	\$ -	40,000.00	\$ 317,533.64
	Sub-Total				\$ 935,219.35		\$ -		\$ -		\$ -		\$ 361,202.41
9	Capping - Landfill Gas Management System												
	Gas Management System	m²	\$ 5.00	258,033.00	\$ 1,678,185.49	-	\$ -	-	\$ -	-	\$ -	33,516.00	\$ 185,021.86
	Sub-Total				\$ 1,678,185.49		\$ -		\$ -		\$ -		\$ 185,021.86
	Works Sub-Total												
	Cell Development				\$ 18,913,153.76		\$ 1,771,280.18		\$ -		\$ 1,658,673.50		\$ -
	Capping				\$ 5,748,729.46		\$ -		\$ -		\$ -		\$ 785,010.49
	Total				\$ 24,661,883.22		\$ 1,771,280.18		\$ -		\$ 1,658,673.50		\$ 785,010.49
	Contingency and Local Loading												
	Professional Fees and Services		8%		\$ 1,972,950.66		\$ 141,702.41		\$ -		\$ 132,693.88		\$ 62,800.84
	Local Loading		30%		\$ 7,398,564.97		\$ 531,384.05		\$ -		\$ 497,602.05		\$ 235,503.15
	Contingency		20%		\$ 4,932,376.64		\$ 354,256.04		\$ -		\$ 331,734.70		\$ 157,002.10
	Total Cost				\$ 38,965,775.49		\$ 2,798,622.68		\$ -		\$ 2,620,704.13		\$ 1,240,316.58
	Cost in Year 1 Dollars (\$)						\$ 2,689,948.75		\$ -		\$ 2,421,125.52		\$ 1,123,392.94

Legend:	Colour	Cell Development	Cell Capping
Exsting Landfill			
Mass		N/A	18/11/2019
Cell 1		17/02/2019	28/07/2021
Cell 2		27/10/2020	12/04/2023
Cell 3		12/07/2022	2/12/2024
Cell 4		3/03/2024	26/05/2026
Cell 5		25/08/2025	5/12/2027
Cell 6		6/03/2027	21/05/2029
Cell 7		21/08/2028	15/09/2030
Cell 8		15/12/2029	22/12/2031
Cell 9		23/03/2031	19/03/2033
Cell 10		18/06/2032	7/06/2034
Cell 11		6/09/2033	8/08/2035
Cell 12		8/11/2034	1/10/2036

Landfill Lifetime Financial Model



				2022-23		2023-24		2024-25		2025-26		2026-27	
No	Item	Unit	Rate	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount
	Sub-Total				\$ -		\$ -		\$ -		\$ -		\$ -
2	Cell Development - Earthworks												
	General Site Clearance and rationalising surface	m²	\$ 1.00	16,567.00	\$ 18,657.13	15,934.00	\$ 18,303.16	-	\$ -	15,720.24	\$ 18,787.14	16,376.10	\$ 19,962.37
	General removal of spoil	m³	\$ 10.00	1,656.70	\$ 18,657.13	1,593.40	\$ 18,303.16	-	\$ -	1,250.00	\$ 14,938.66	1,250.00	\$ 15,237.43
	Excavation and Place	m³	\$ 9.40	2,964.50	\$ 31,381.98	5,171.00	\$ 55,834.62	-	\$ -	3,330.63	\$ 37,415.81	3,330.63	\$ 38,164.12
	Import and Place from Borrow	m³	\$ 14.00	12,141.00	\$ 191,418.33	10,681.00	\$ 171,767.56	-	\$ -	18,524.38	\$ 309,936.80	18,524.38	\$ 316,135.54
	Excavate & fill to internal bunds	m³	\$ 12.70	1,584.00	\$ 22,654.78	1,176.00	\$ 17,155.85	-	\$ -	1,560.00	\$ 23,677.17	1,560.00	\$ 24,150.72
	Sub-Total				\$ 282,769.36		\$ 281,364.35		\$ -		\$ 404,755.58		\$ 413,650.18
3	Cell Development - Basal Liner System												
	Prepare surface to receive GCL	m²	\$ 1.50	17,983.00	\$ 30,377.67	14,055.00	\$ 24,217.17	-	\$ -	15,720.24	\$ 28,180.71	16,376.10	\$ 29,943.56
	Supply and install GCL	m²	\$ 10.00	17,983.00	\$ 202,517.79	14,055.00	\$ 161,447.77	-	\$ -	15,720.24	\$ 187,871.42	16,376.10	\$ 199,623.75
	Supply and install 2mm textured HDPE geomembrane	m²	\$ 10.00	17,983.00	\$ 202,517.79	14,055.00	\$ 161,447.77	-	\$ -	15,720.24	\$ 187,871.42	16,376.10	\$ 199,623.75
	Supply and install protection geotextile	m²	\$ 9.00	17,983.00	\$ 182,266.01	14,055.00	\$ 145,302.99	-	\$ -	15,720.24	\$ 169,084.28	16,376.10	\$ 179,661.37
	Supply and install 300mm leachate collection layer	m²	\$ 36.00	4,901.51	\$ 198,716.19	4,807.87	\$ 198,818.41	-	\$ -	4,544.10	\$ 195,502.33	4,369.99	\$ 191,771.59
	Excavate anchor trench for HDPE & Geotextile	m	\$ 25.60	363.00	\$ 10,465.20	296.00	\$ 8,704.28	-	\$ -	368.00	\$ 11,258.73	287.00	\$ 8,956.20
	Supply and install 225mm HDPE primary pipe	m	\$ 170.00	200.00	\$ 38,289.52	200.00	\$ 39,055.31	-	\$ -	200.00	\$ 40,633.15	200.00	\$ 41,445.81
	Supply and install 180mm HDPE secondary pipe	m	\$ 155.00	527.00	\$ 91,990.58	527.00	\$ 93,830.39	-	\$ -	527.00	\$ 97,621.14	527.00	\$ 99,573.56
	Sub-Total				\$ 957,140.74		\$ 832,824.09		\$ -		\$ 918,023.17		\$ 950,599.58
4	Cell Development - Leachate Extraction												
	Supply and install 63mm HDPE leachate rising main pipe	m	\$ 100.00	-	\$ -	-	\$ -	-	\$ -	140.00	\$ 16,731.30	140.00	\$ 17,065.92
	Supply and install 450mm HDPE inclined riser	m	\$ 812.00	25.00	\$ 22,861.10	25.00	\$ 23,318.32	-	\$ -	25.00	\$ 24,260.38	25.00	\$ 24,745.59
	Supply and install 450 headwall for inclined riser	No	\$ 3,000.00	1.00	\$ 3,378.49	1.00	\$ 3,446.06	-	\$ -	1.00	\$ 3,585.28	1.00	\$ 3,656.98
	Supply and install pump and connect to header	No	\$ 2,000.00	1.00	\$ 2,252.32	1.00	\$ 2,297.37	-	\$ -	1.00	\$ 2,390.19	1.00	\$ 2,437.99
	Supply and install cut off valve	No	\$ 10,750.00	1.00	\$ 12,106.25	1.00	\$ 12,348.37	-	\$ -	1.00	\$ 12,847.25	1.00	\$ 13,104.19
	Sub-Total				\$ 40,598.16		\$ 41,410.12		\$ -		\$ 59,814.38		\$ 61,010.67
5	Cell Development - Surface Water Management												
	Excavate and line perimeter ditch	m	\$ 63.55	77.00	\$ 5,510.71	77.00	\$ 5,620.92	-	\$ -	77.00	\$ 5,848.01	77.00	\$ 5,964.97
	Supply and install 600mm headwall	No	\$ 743.00	2.00	\$ 1,673.48	2.00	\$ 1,706.95	-	\$ -	2.00	\$ 1,775.91	2.00	\$ 1,811.43
	Supply and install 600mm culvert	No	\$ 2,796.00	1.00	\$ 3,148.75	1.00	\$ 3,211.73	-	\$ -	1.00	\$ 3,341.48	1.00	\$ 3,408.31
	Sub-Total				\$ 10,332.93		\$ 10,539.59		\$ -		\$ 10,965.39		\$ 11,184.70
6	Capping - Earthworks												
	Fill 500mm thick compacted clay layer	m³	\$ 10.00	-	\$ -	9,354.50	\$ 107,453.80	9,354.50	\$ 109,602.88	-	\$ -	9,354.50	\$ 114,030.83
	Fill 500mm thick soil subbase	m³	\$ 5.00	-	\$ -	9,354.50	\$ 53,726.90	9,354.50	\$ 54,801.44	-	\$ -	9,354.50	\$ 57,015.42
	Fill 200mm thick topsoil	m³	\$ 5.00	-	\$ -	3,741.80	\$ 21,490.76	3,741.80	\$ 21,920.58	-	\$ -	3,741.80	\$ 22,806.17
	Sub-Total				\$ -		\$ 182,671.46		\$ 186,324.89		\$ -		\$ 193,852.42
7	Capping - Restoration												
	Revegetation	m²	\$ 3.00	-	\$ -	19,083.18	\$ 65,761.73	19,083.18	\$ 67,076.96	-	\$ -	19,083.18	\$ 69,786.87
	Sub-Total				\$ -		\$ 65,761.73		\$ 67,076.96		\$ -		\$ 69,786.87
8	Capping - Surface Water Management												
	Berm	m	\$ 63.55	-	\$ -	233.00	\$ 17,008.76	233.00	\$ 17,348.94	-	\$ -	233.00	\$ 18,049.83
	Upper and Lower Chambers; including 300mm precast circular segment and slab	No	\$ 560.00	-	\$ -	2.00	\$ 1,286.53	2.00	\$ 1,312.26	-	\$ -	2.00	\$ 1,365.27
	Concrete precast pipes with protective mesh	m	\$ 315.00	-	\$ -	75.00	\$ 27,137.70	75.00	\$ 27,680.45	-	\$ -	75.00	\$ 28,798.74
	Excavate natural soil for surface water lagoon	m³	\$ 7.19	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -
	Sub-Total				\$ -		\$ 45,432.99		\$ 46,341.65		\$ -		\$ 48,213.85
9	Capping - Landfill Gas Management System												
	Gas Management System	m²	\$ 5.00	-	\$ -	33,516.00	\$ 192,496.74	16,567.00	\$ 97,054.40	-	\$ -	15,934.00	\$ 97,117.29
	Sub-Total				\$ -		\$ 192,496.74		\$ 97,054.40		\$ -		\$ 97,117.29
	Works Sub-Total												
	Cell Development				\$ 1,290,841.19		\$ 1,166,138.16		\$ -		\$ 1,393,558.53		\$ 1,436,445.13
	Capping				\$ -		\$ 486,362.92		\$ 396,797.90		\$ -		\$ 408,970.42
	Total				\$ 1,290,841.19		\$ 1,652,501.08		\$ 396,797.90		\$ 1,393,558.53		\$ 1,845,415.55
	Contingency and Local Loading												
	Professional Fees and Services		8%		\$ 103,267.30		\$ 132,200.09		\$ 31,743.83		\$ 111,484.68		\$ 147,633.24
	Local Loading		30%		\$ 387,252.36		\$ 495,750.32		\$ 119,039.37		\$ 418,067.56		\$ 553,624.67
	Contingency		20%		\$ 258,168.24		\$ 330,500.22		\$ 79,359.58		\$ 278,711.71		\$ 369,083.11
	Total Cost				\$ 2,039,529.08		\$ 2,610,951.70		\$ 626,940.69		\$ 2,201,822.47		\$ 2,915,756.57
	Cost in Year 1 Dollars (\$)				\$ 1,811,043.46		\$ 2,272,990.58		\$ 535,087.84		\$ 1,842,386.55		\$ 2,391,935.95

Legend:	Colour	Cell Development	Cell Capping
Exsting Landfill Mass		N/A	18/11/2019
Cell 1		17/02/2019	28/07/2021
Cell 2		27/10/2020	12/04/2023
Cell 3		12/07/2022	2/12/2024
Cell 4		3/03/2024	26/05/2026
Cell 5		25/08/2025	5/12/2027
Cell 6		6/03/2027	21/05/2029
Cell 7		21/08/2028	15/09/2030
Cell 8		15/12/2029	22/12/2031
Cell 9		23/03/2031	19/03/2033
Cell 10		18/06/2032	7/06/2034
Cell 11		6/09/2033	8/08/2035
Cell 12		8/11/2034	1/10/2036

Landfill Lifetime Financial Model



				2027-28		2028-29		2029-30		2030-31		2031-32	
No	Item	Unit	Rate	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount
	Sub-Total				\$ -		\$ -		\$ -		\$ -		\$ -
2	Cell Development - Earthworks												
	General Site Clearance and rationalising surface	m²	\$ 1.00	-	\$ -	17,363.46	\$ 22,021.07	20,715.18	\$ 26,797.29	15,590.70	\$ 20,571.60	14,595.18	\$ 19,643.19
	General removal of spoil	m³	\$ 10.00	-	\$ -	1,500.00	\$ 19,023.63	1,500.00	\$ 19,404.10	2,000.00	\$ 26,389.58	1,850.00	\$ 24,898.56
	Excavation and Place	m³	\$ 9.40	-	\$ -	3,330.63	\$ 39,705.96	3,330.63	\$ 40,500.07	3,330.63	\$ 41,310.08	3,330.63	\$ 42,136.28
	Import and Place from Borrow	m³	\$ 14.00	-	\$ -	18,524.38	\$ 328,907.41	18,524.38	\$ 335,485.56	18,524.38	\$ 342,195.27	18,524.38	\$ 349,039.18
	Excavate & fill to internal bunds	m³	\$ 12.70	-	\$ -	1,560.00	\$ 25,126.41	1,560.00	\$ 25,628.93	1,560.00	\$ 26,141.51	1,560.00	\$ 26,664.34
	Sub-Total				\$ -		\$ 434,784.47		\$ 447,815.96		\$ 456,608.03		\$ 462,381.55
3	Cell Development - Basal Liner System												
	Prepare surface to receive GCL	m²	\$ 1.50	-	\$ -	17,363.46	\$ 33,031.60	20,715.18	\$ 40,195.94	15,590.70	\$ 30,857.40	14,595.18	\$ 29,464.79
	Supply and install GCL	m²	\$ 10.00	-	\$ -	17,363.46	\$ 220,210.66	20,715.18	\$ 267,972.94	15,590.70	\$ 205,715.98	14,595.18	\$ 196,431.91
	Supply and install 2mm textured HDPE geomembrane	m²	\$ 10.00	-	\$ -	17,363.46	\$ 220,210.66	20,715.18	\$ 267,972.94	15,590.70	\$ 205,715.98	14,595.18	\$ 196,431.91
	Supply and install protection geotextile	m²	\$ 9.00	-	\$ -	17,363.46	\$ 198,189.59	20,715.18	\$ 241,175.65	15,590.70	\$ 185,144.38	14,595.18	\$ 176,788.72
	Supply and install 300mm leachate collection layer	m²	\$ 36.00	-	\$ -	4,927.82	\$ 224,988.20	4,841.53	\$ 225,469.36	4,483.51	\$ 212,972.36	4,241.47	\$ 205,504.37
	Excavate anchor trench for HDPE & Geotextile	m	\$ 25.60	-	\$ -	385.00	\$ 12,499.79	478.00	\$ 15,829.61	370.00	\$ 12,498.10	307.50	\$ 10,594.68
	Supply and install 225mm HDPE primary pipe	m	\$ 170.00	-	\$ -	200.00	\$ 43,120.22	200.00	\$ 43,982.63	200.00	\$ 44,862.28	200.00	\$ 45,759.52
	Supply and install 180mm HDPE secondary pipe	m	\$ 155.00	-	\$ -	527.00	\$ 103,596.33	527.00	\$ 105,668.26	527.00	\$ 107,781.62	527.00	\$ 109,937.26
	Sub-Total				\$ -		\$ 1,055,847.05		\$ 1,208,267.33		\$ 1,005,548.09		\$ 970,913.14
4	Cell Development - Leachate Extraction												
	Supply and install 63mm HDPE leachate rising main pipe	m	\$ 100.00	-	\$ -	-	\$ -	-	\$ -	170.00	\$ 22,431.14	-	\$ -
	Supply and install 450mm HDPE inclined riser	m	\$ 812.00	-	\$ -	25.00	\$ 25,745.31	25.00	\$ 26,260.21	25.00	\$ 26,785.42	25.00	\$ 27,321.13
	Supply and install 450 headwall for inclined riser	No	\$ 3,000.00	-	\$ -	1.00	\$ 3,804.73	1.00	\$ 3,880.82	1.00	\$ 3,958.44	1.00	\$ 4,037.61
	Supply and install pump and connect to header	No	\$ 2,000.00	-	\$ -	1.00	\$ 2,536.48	1.00	\$ 2,587.21	1.00	\$ 2,638.96	1.00	\$ 2,691.74
	Supply and install cut off valve	No	\$ 10,750.00	-	\$ -	1.00	\$ 13,633.60	1.00	\$ 13,906.27	1.00	\$ 14,184.40	1.00	\$ 14,468.08
	Sub-Total				\$ -		\$ 45,720.12		\$ 46,634.52		\$ 69,998.35		\$ 48,518.55
5	Cell Development - Surface Water Management												
	Excavate and line perimeter ditch	m	\$ 63.55	-	\$ -	77.00	\$ 6,205.95	-	\$ -	77.00	\$ 6,456.67	320.00	\$ 27,369.58
	Supply and install 600mm headwall	No	\$ 743.00	-	\$ -	2.00	\$ 1,884.61	2.00	\$ 1,922.30	2.00	\$ 1,960.75	2.00	\$ 1,999.96
	Supply and install 600mm culvert	No	\$ 2,796.00	-	\$ -	1.00	\$ 3,546.00	1.00	\$ 3,616.92	1.00	\$ 3,689.26	1.00	\$ 3,763.05
	Sub-Total				\$ -		\$ 11,636.56		\$ 5,539.22		\$ 12,106.68		\$ 33,132.59
6	Capping - Earthworks												
	Fill 500mm thick compacted clay layer	m³	\$ 10.00	9,354.50	\$ 116,311.45	-	\$ -	9,354.50	\$ 121,010.43	8,112.50	\$ 107,042.71	8,112.50	\$ 109,183.57
	Fill 500mm thick soil subbase	m³	\$ 5.00	9,354.50	\$ 58,155.72	-	\$ -	9,354.50	\$ 60,505.22	8,112.50	\$ 53,521.36	8,112.50	\$ 54,591.78
	Fill 200mm thick topsoil	m³	\$ 5.00	3,741.80	\$ 23,262.29	-	\$ -	3,741.80	\$ 24,202.09	3,245.00	\$ 21,408.54	3,245.00	\$ 21,836.71
	Sub-Total				\$ 197,729.46		\$ -		\$ 205,717.73		\$ 181,972.61		\$ 185,612.07
7	Capping - Restoration												
	Revegetation	m²	\$ 3.00	19,083.18	\$ 71,182.61	-	\$ -	19,083.18	\$ 74,058.38	16,549.50	\$ 65,510.14	16,549.50	\$ 66,820.34
	Sub-Total				\$ 71,182.61		\$ -		\$ 74,058.38		\$ 65,510.14		\$ 66,820.34
8	Capping - Surface Water Management												
	Berm	m	\$ 63.55	233.00	\$ 18,410.83	-	\$ -	233.00	\$ 19,154.63	233.00	\$ 19,537.72	233.00	\$ 19,928.47
	Upper and Lower Chambers; including 300mm precast circular segment and slab	No	\$ 560.00	2.00	\$ 1,392.58	-	\$ -	2.00	\$ 1,448.84	2.00	\$ 1,477.82	2.00	\$ 1,507.37
	Concrete precast pipes with protective mesh	m	\$ 315.00	75.00	\$ 29,374.72	-	\$ -	75.00	\$ 30,561.46	75.00	\$ 31,172.69	75.00	\$ 31,796.14
	Excavate natural soil for surface water lagoon	m³	\$ 7.19	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -
	Sub-Total				\$ 49,178.13		\$ -		\$ 51,164.92		\$ 52,188.22		\$ 53,231.99
9	Capping - Landfill Gas Management System												
	Gas Management System	m²	\$ 5.00	12,500.00	\$ 77,710.89	-	\$ -	12,500.00	\$ 80,850.41	15,000.00	\$ 98,960.91	15,000.00	\$ 100,940.13
	Sub-Total				\$ 77,710.89		\$ -		\$ 80,850.41		\$ 98,960.91		\$ 100,940.13
	Works Sub-Total												
	Cell Development				\$ -		\$ 1,547,988.20		\$ 1,708,257.03		\$ 1,544,261.15		\$ 1,514,945.84
	Capping				\$ 395,801.09		\$ -		\$ 411,791.46		\$ 398,631.89		\$ 406,604.52
	Total				\$ 395,801.09		\$ 1,547,988.20		\$ 2,120,048.49		\$ 1,942,893.04		\$ 1,921,550.36
	Contingency and Local Loading												
	Professional Fees and Services		8%		\$ 31,664.09		\$ 123,839.06		\$ 169,603.88		\$ 155,431.44		\$ 153,724.03
	Local Loading		30%		\$ 118,740.33		\$ 464,396.46		\$ 636,014.55		\$ 582,867.91		\$ 576,465.11
	Contingency		20%		\$ 79,160.22		\$ 309,597.64		\$ 424,009.70		\$ 388,578.61		\$ 384,310.07
	Total Cost				\$ 625,365.73		\$ 2,445,821.35		\$ 3,349,676.61		\$ 3,069,771.00		\$ 3,036,049.57
	Cost in Year 1 Dollars (\$)				\$ 502,958.54		\$ 1,928,513.44		\$ 2,589,408.97		\$ 2,326,502.77		\$ 2,255,829.55

Legend:	Colour	Cell Development	Cell Capping
Exsting Landfill			
Mass		N/A	18/11/2019
Cell 1		17/02/2019	28/07/2021
Cell 2		27/10/2020	12/04/2023
Cell 3		12/07/2022	2/12/2024
Cell 4		3/03/2024	26/05/2026
Cell 5		25/08/2025	5/12/2027
Cell 6		6/03/2027	21/05/2029
Cell 7		21/08/2028	15/09/2030
Cell 8		15/12/2029	22/12/2031
Cell 9		23/03/2031	19/03/2033
Cell 10		18/06/2032	7/06/2034
Cell 11		6/09/2033	8/08/2035
Cell 12		8/11/2034	1/10/2036

Landfill Lifetime Financial Model



				2032-33		2033-34		2034-35		2035-36		2036-37	
No	Item	Unit	Rate	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount
	Sub-Total				\$ -		\$ -		\$ -		\$ -		\$ -
2	Cell Development - Earthworks												
	General Site Clearance and rationalising surface	m²	\$ 1.00	-	\$ -	22,538.94	\$ 31,559.96	21,179.28	\$ 30,249.23	-	\$ -	-	\$ -
	General removal of spoil	m³	\$ 10.00	-	\$ -	1,850.00	\$ 25,904.47	1,650.00	\$ 23,566.06	-	\$ -	-	\$ -
	Excavation and Place	m³	\$ 9.40	-	\$ -	3,330.63	\$ 43,838.58	3,330.63	\$ 44,715.35	-	\$ -	-	\$ -
	Import and Place from Borrow	m³	\$ 14.00	-	\$ -	18,524.38	\$ 363,140.36	18,524.38	\$ 370,403.17	-	\$ -	-	\$ -
	Excavate & fill to internal bunds	m³	\$ 12.70	-	\$ -	1,560.00	\$ 27,741.58	-	\$ -	-	\$ -	-	\$ -
	Sub-Total				\$ -		\$ 492,184.95		\$ 468,933.81		\$ -		\$ -
3	Cell Development - Basal Liner System												
	Prepare surface to receive GCL	m²	\$ 1.50	-	\$ -	22,538.94	\$ 47,339.94	21,179.28	\$ 45,373.84	-	\$ -	-	\$ -
	Supply and install GCL	m²	\$ 10.00	-	\$ -	22,538.94	\$ 315,599.57	21,179.28	\$ 302,492.27	-	\$ -	-	\$ -
	Supply and install 2mm textured HDPE geomembrane	m²	\$ 10.00	-	\$ -	22,538.94	\$ 315,599.57	21,179.28	\$ 302,492.27	-	\$ -	-	\$ -
	Supply and install protection geotextile	m²	\$ 9.00	-	\$ -	22,538.94	\$ 284,039.62	21,179.28	\$ 272,243.04	-	\$ -	-	\$ -
	Supply and install 300mm leachate collection layer	m²	\$ 36.00	-	\$ -	4,887.13	\$ 246,353.62	4,437.31	\$ 228,152.36	-	\$ -	-	\$ -
	Excavate anchor trench for HDPE & Geotextile	m	\$ 25.60	-	\$ -	410.00	\$ 14,696.93	317.50	\$ 11,608.79	-	\$ -	-	\$ -
	Supply and install 225mm HDPE primary pipe	m	\$ 170.00	-	\$ -	200.00	\$ 47,608.21	200.00	\$ 48,560.37	-	\$ -	-	\$ -
	Supply and install 180mm HDPE secondary pipe	m	\$ 155.00	-	\$ -	527.00	\$ 114,378.72	527.00	\$ 116,666.29	-	\$ -	-	\$ -
	Sub-Total				\$ -		\$ 1,385,616.19		\$ 1,327,589.25		\$ -		\$ -
4	Cell Development - Leachate Extraction												
	Supply and install 63mm HDPE leachate rising main pipe	m	\$ 100.00	-	\$ -	350.00	\$ 49,008.45	-	\$ -	-	\$ -	-	\$ -
	Supply and install 450mm HDPE inclined riser	m	\$ 812.00	-	\$ -	25.00	\$ 28,424.90	25.00	\$ 28,993.40	-	\$ -	-	\$ -
	Supply and install 450 headwall for inclined riser	No	\$ 3,000.00	-	\$ -	1.00	\$ 4,200.72	1.00	\$ 4,284.74	-	\$ -	-	\$ -
	Supply and install pump and connect to header	No	\$ 2,000.00	-	\$ -	1.00	\$ 2,800.48	1.00	\$ 2,856.49	-	\$ -	-	\$ -
	Supply and install cut off valve	No	\$ 10,750.00	-	\$ -	1.00	\$ 15,052.60	1.00	\$ 15,353.65	-	\$ -	-	\$ -
	Sub-Total				\$ -		\$ 99,487.15		\$ 51,488.28		\$ -		\$ -
5	Cell Development - Surface Water Management												
	Excavate and line perimeter ditch	m	\$ 63.55	-	\$ -	120.00	\$ 10,678.24	360.00	\$ 32,675.42	-	\$ -	-	\$ -
	Supply and install 600mm headwall	No	\$ 743.00	-	\$ -	2.00	\$ 2,080.76	2.00	\$ 2,122.37	-	\$ -	-	\$ -
	Supply and install 600mm culvert	No	\$ 2,796.00	-	\$ -	1.00	\$ 3,915.08	1.00	\$ 3,993.38	-	\$ -	-	\$ -
	Sub-Total				\$ -		\$ 16,674.07		\$ 38,791.17		\$ -		\$ -
6	Capping - Earthworks												
	Fill 500mm thick compacted clay layer	m³	\$ 10.00	-	\$ -	8,112.50	\$ 113,594.59	8,112.50	\$ 115,866.48	8,112.50	\$ 118,183.81	8,112.50	\$ 120,547.48
	Fill 500mm thick soil subbase	m³	\$ 5.00	-	\$ -	8,112.50	\$ 56,797.29	8,112.50	\$ 57,933.24	8,112.50	\$ 59,091.90	8,112.50	\$ 60,273.74
	Fill 200mm thick topsoil	m³	\$ 5.00	-	\$ -	3,245.00	\$ 22,718.92	3,245.00	\$ 23,173.30	3,245.00	\$ 23,636.76	3,245.00	\$ 24,109.50
	Sub-Total				\$ -		\$ 193,110.79		\$ 196,973.01		\$ 200,912.47		\$ 204,930.72
7	Capping - Restoration												
	Revegetation	m²	\$ 3.00	-	\$ -	16,549.50	\$ 69,519.89	16,549.50	\$ 70,910.28	16,549.50	\$ 72,328.49	16,549.50	\$ 73,775.06
	Sub-Total				\$ -		\$ 69,519.89		\$ 70,910.28		\$ 72,328.49		\$ 73,775.06
8	Capping - Surface Water Management												
	Berm	m	\$ 63.55	-	\$ -	233.00	\$ 20,733.58	233.00	\$ 21,148.26	233.00	\$ 21,571.22	233.00	\$ 22,002.65
	Upper and Lower Chambers; including 300mm precast circular segment and slab	No	\$ 560.00	-	\$ -	2.00	\$ 1,568.27	2.00	\$ 1,599.64	2.00	\$ 1,631.63	2.00	\$ 1,664.26
	Concrete precast pipes with protective mesh	m	\$ 315.00	-	\$ -	75.00	\$ 33,080.70	75.00	\$ 33,742.32	75.00	\$ 34,417.16	75.00	\$ 35,105.51
	Excavate natural soil for surface water lagoon	m³	\$ 7.19	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -
	Sub-Total				\$ -		\$ 55,382.56		\$ 56,490.21		\$ 57,620.01		\$ 58,772.41
9	Capping - Landfill Gas Management System												
	Gas Management System	m²	\$ 5.00	-	\$ -	20,000.00	\$ 140,024.14	28,500.00	\$ 203,525.09	28,500.00	\$ 207,595.59	26,500.00	\$ 196,888.03
	Sub-Total				\$ -		\$ 140,024.14		\$ 203,525.09		\$ 207,595.59		\$ 196,888.03
	Works Sub-Total												
	Cell Development				\$ -		\$ 1,993,962.36		\$ 1,886,802.50		\$ -		\$ -
	Capping				\$ -		\$ 458,037.38		\$ 527,898.59		\$ 538,456.57		\$ 534,366.22
	Total				\$ -		\$ 2,451,999.74		\$ 2,414,701.10		\$ 538,456.57		\$ 534,366.22
	Contingency and Local Loading												
	Professional Fees and Services		8%		\$ -		\$ 196,159.98		\$ 193,176.09		\$ 43,076.53		\$ 42,749.30
	Local Loading		30%		\$ -		\$ 735,599.92		\$ 724,410.33		\$ 161,536.97		\$ 160,309.87
	Contingency		20%		\$ -		\$ 490,399.95		\$ 482,940.22		\$ 107,691.31		\$ 106,873.24
	Total Cost				\$ -		\$ 3,874,159.60		\$ 3,815,227.73		\$ 850,761.37		\$ 844,298.63
	Cost in Year 1 Dollars (\$)				\$ -		\$ 2,766,779.75		\$ 2,671,267.47		\$ 583,988.78		\$ 568,188.78

Legend:	Colour	Cell Development	Cell Capping
Exsting Landfill			
Mass		N/A	18/11/2019
Cell 1		17/02/2019	28/07/2021
Cell 2		27/10/2020	12/04/2023
Cell 3		12/07/2022	2/12/2024
Cell 4		3/03/2024	26/05/2026
Cell 5		25/08/2025	5/12/2027
Cell 6		6/03/2027	21/05/2029
Cell 7		21/08/2028	15/09/2030
Cell 8		15/12/2029	22/12/2031
Cell 9		23/03/2031	19/03/2033
Cell 10		18/06/2032	7/06/2034
Cell 11		6/09/2033	8/08/2035
Cell 12		8/11/2034	1/10/2036