



BARKLY REGIONAL COUNCIL TENNANT CREEK WASTE MANAGEMENT FACILITY

WASTE MANAGEMENT STRATEGY

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APPENDIX A - CONCEPT MASTER PLAN

1 INTRODUCTION

1.1 PURPOSE

This waste management and disposal strategy (WMS) has been developed as part of the commitment Barkly Regional Council (Council) has made to provide suitable waste management and resource recovery solutions within the Tennant Creek community. The WMS provides strategies and measurable actions to be undertaken by Council in the short, medium and long terms to guide landfill development and improve current waste management and resource management practices with specific focus on the Tennant Creek Waste Management Facility.

1.2 REPORT STRUCTURE

This Waste Management Strategy will comprise of the structure outlined in **Table 1**.

TABLE 1 - WASTE MANAGEMENT STRATEGY STRUCTURE

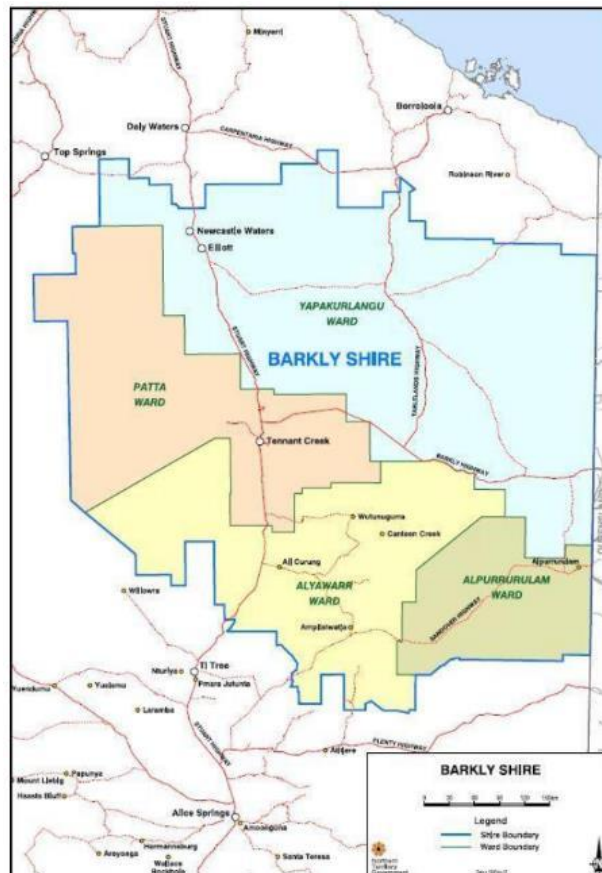
Section	Description
Section 2	Provides an overview of the Barkly Regional Council area, existing conditions, climate, geology and topography.
Section 3	Provides context for the strategy including relevant legislation, best practices documents and key challenges for Barkly Regional Council.
Section 4	Provides discussion around strategy, constraints, considerations and proposed outcomes.
Section 5	Outlines the Strategy Action Plan.

2 BACKGROUND

2.1 OVERVIEW OF BARKLY SHIRE

Barkly Regional Council is located in the Northern Territory (NT) in central Australia, 1,000km south of Darwin and approximately 500km north of Alice Springs. Tennant Creek is the principal town of the Barkly Shire Council region and has a population of approximately 6,650 residents (3,000 in Tennant Creek) with the primary industries being mining and tourism. A map of Barkly Shire Council is provided below in **Plate 1**.

PLATE 1 - BARKLY REGIONAL COUNCIL



Source: Barkly Regional Council

2.2 SITE OVERVIEW

The Tennant Creek Waste Management Facility (WMF) provides a waste disposal site for the township and immediate community of Tennant Creek. As the only licenced landfill in the vicinity, it receives a combination of Municipal Solid Waste (MSW), Commercial and Industrial waste (C&I) and Construction and Demolition waste (C&D).

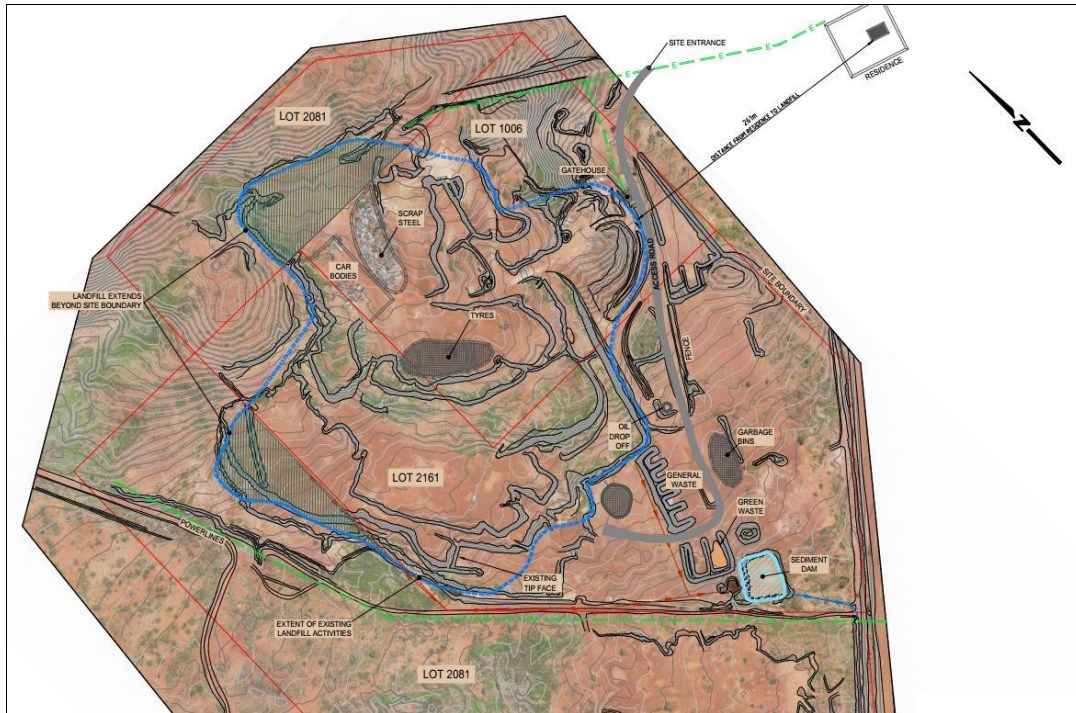
The site consists of a landfill and a transfer station to allow for separation of material and reduce traffic at the tip face. Barkly Regional Council also manages the removal of cover soil from an adjacent property (Lot 2081), which is planned to be used for resource recovery and long term storage.

Waste from the Tennant Creek area is collected via collection trucks and deposited at the landfill with approximately 1,000 bins collected each week. Tennant Creek currently does not have a kerbside comingled recycling collection service or green waste collection service but does separate and recover green waste and steel at the landfill facility.

2.3 SITE LOCATION

Tennant Creek WMF is located predominately within Lot 1006 and Lot 2161, at 79 Fazaldeen Road. The landfill extends into Lot 2081 and partially into Lot 2082 (entry road). Lot 1006 is held under a Crown Lease in Perpetuity to Tennant Creek Town Council. Lot 2161 is a new freehold lot. Lots 2081 and 2082 are Vacant Crown Land. An aerial image and layout of Tennant Creek WMF is provided in **Plate 2** and lot extends are attached in **Drawing 1** in **Appendix A**.

PLATE 2 - SITE LAYOUT



2.4 RAINFALL AND CLIMATE

Tennant Creek is located 376m above sea level with climate considered to be arid in nature with evaporation exceeding rainfall. Temperatures in the summer range from average lows of ~24°C and average highs of 37°C with winter temperature averages ranging from 12°C to 28°C.

The average annual rainfall statistics for Tennant Creek (BoM - Station 015135) have been provided below in **Table 2**.

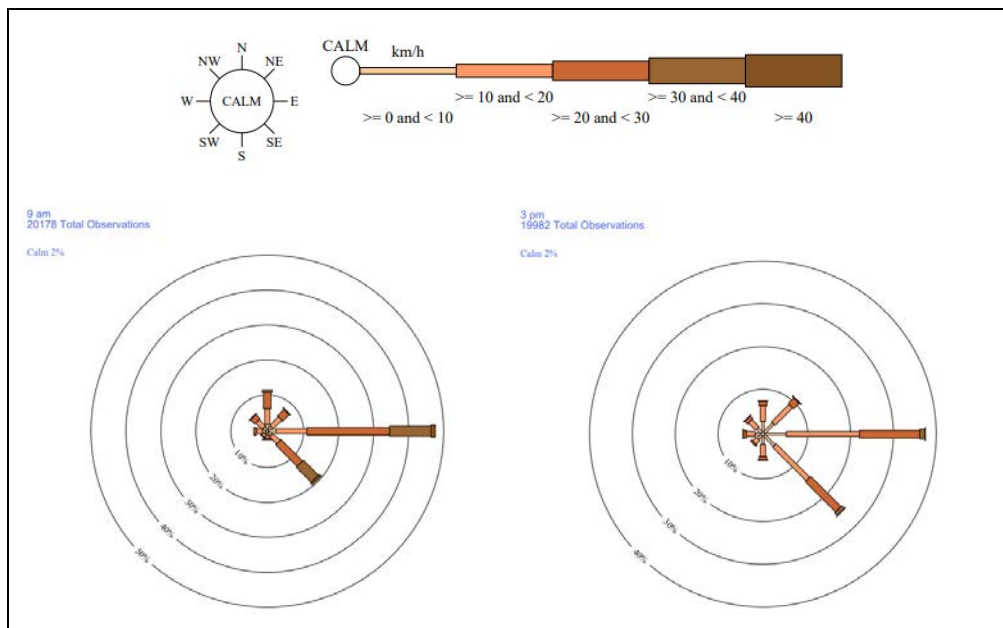
TABLE 2 - MEAN RAINFALL AND EVAPORATION

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Rainfall (mm)	116	117	54	16	8	5	5	2	7	19	40	74	465
Evaporation (mm pan)	381	314	347	324	267	216	233	288	348	406	405	400	3,942
Difference (mm)	365	196	293	308	258	211	227	286	341	388	365	326	3,477
Ratio of Evaporation to Rainfall	3.3	2.7	6.4	20.5	32.5	40.8	45.6	125.3	47.0	21.8	10.1	5.4	8.5

The average pan evaporation statistics were calculated using the mean daily evaporation data for Tennant Creek (BoM – Station 015135) and multiplied by the corresponding number of days for that month (Non-Leap year). The average annual pan evaporation is over 8 times the average rainfall, with evaporation in winter months between 40 to 125 times higher than the respective monthly rainfall and approximately 3 to 5 times higher in summer months.

The Wind Rose data for Tennant Creek Airport shown in **Plate 3** indicate predominantly easterly winds in both the morning and the afternoon.

PLATE 3 - WIND ROSE DATA FROM TENNANT CREEK AIRPORT



2.5 SITE TOPOGRAPHY

The landfill site is saddled against a natural rise in the topography with this rise seen at peak height of RL390m. The landfill site slopes from north to south east with the lowest point of the site at RL 365m. A topographical map is shown in **Plate 4**.

PLATE 4 - TOPOGRAPHIC MAP



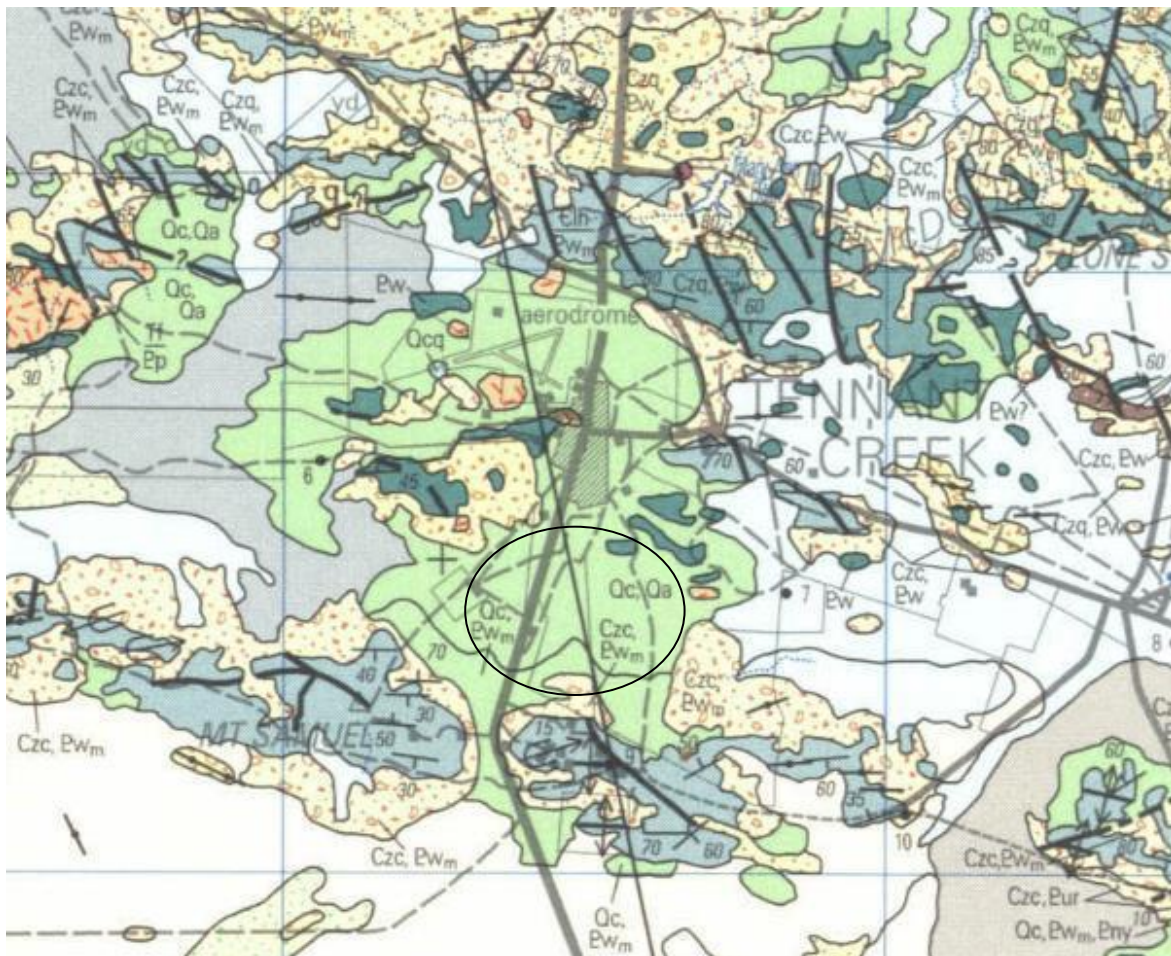
Source: <http://en-au.topographic-map.com/places/Tennant-Creek-9489749/>

2.6 GEOLOGY

A 1:100,000 geological map was sourced from Geoscience Australia as shown below in **Plate 5** which indicates geology of Carraman Formation of the Early Proterozoic Warramunga Group. Site soils consist of a gravelly clay material near the surface tending to be more clay extending beneath the surface with this evident in the sediment dam and new landfill trench excavations.

On site excavations conducted by Council show uniform brown clayey soils overlaying the Carraman Formation which appears to have the capacity to effectively isolate the landfill area from deeper aquifers. The existing natural soil formation (clayey soils) is estimated to have an approximated permeability of 10^{-6} to 10^{-8} m/sec. If confirmed, soils excavated to create future waste cells and leachate containment ponds, are suitable for construction of low permeability earthen waste cell liners and final capping.

PLATE 5 - SITE GEOLOGY



2.7 SITE HYDROLOGY

Groundwater hydrological conditions cannot be confirmed due the absence of groundwater monitoring boreholes and associated data on site and in the local area. The following historical monitoring boreholes were checked in-field by Council staff in April 2021, with the aim to obtain groundwater level data (all bores were reported to be abandoned, decommissioned and/or unusable):

- RN013251;
- RN002099;
- RN016253; and
- RN001048.

Anecdotal evidence from a variety of sources and historical reporting in the Tennant Creek area indicates that the water table is at least 60 metres below ground level and that it is low yielding and of a quality unsuitable for domestic or agricultural use. Due to the groundwater conditions in the township area, the main water supply is sourced some distance south at the Kelly Well Borefields. It is also noted that the Tennant Creek WMF site is not located within the constraints imposed by a coastal estuarine or groundwater recharge area (*Hydrology of Australia, 1987*).

Groundwater in the wider regional area is deep and located beneath indurated Warramunga sediments, which are anticipated to be highly impervious, meaning groundwater contamination from landfilling is unlikely. Additionally, the aquifer which the town's main water supply is approximately 20km south, meaning landfilling activities are very unlikely to impact this specific aquifer. Furthermore, the installation of groundwater monitoring bores to depths between 60m – 100m on site is economically unfeasible based on discussions with Council.

It has been previously established in the 2006 EMP that the deep groundwater table, coupled with the low permeability soils encountered at the site, makes groundwater contamination “not likely to be a significant concern” (Tennant Creek Town Council).

2.8 SITE BOUNDARIES

GreenTec undertook a test pit investigation in March 2021 which determined the approximate depths and extents of landfilling which has occurred outside the boundary of Lot 2161 and into Lot 2081. No remediation works have been undertaken on the waste located outside the boundaries.

It was previously recommended for Council to liaise with NT EPA to discuss possible solutions. It is understood that approval is being sought from the Central Land Council (CLC) to acquire approximately 25 hectares of land within the adjacent Lot 2081 for landfilling activities which would include this area. It is anticipated that landfilling would not extend any further into this adjacent Lot, but this area would be used for excavation of cover and capping soils and potential for future resource recovery operations.

2.9 FLORA AND FAUNA

As described previously, both Lots 1006 and 2161 have been used historically for disposal of domestic, commercial and industry waste for many decades.

Despite historic use, native flora had re-established across most of the area, including the capped and stabilised parts of the landfill form. From anecdotal information and observations on the site native fauna consists of various bird species, including Hawks, and reptiles indigenous to the area, including snakes and lizards. Kangaroos and wallabies have also been observed from time to time.

No negative environmental impact from landfill activities have been observed on the wider flora and fauna so far, and future management endeavours to keep the impact negligible in the future.

2.10 LANDFILL ACCEPTANCE CRITERIA

The Tennant Creek WMF is currently operating under NT EPA Environmental Protection Licence EPL 281 for the following activities;

- a) *“Operating premises for the disposal of waste by burial that service, or are designed to service, the waste disposal requirements of more than 1,000 persons.”*
- b) *Collecting, transporting, storing, re-cycling, treating or disposing of a listed waste (as per Table 1) on a commercial or fee for service basis, other than in or for the purpose of sewerage treatment plant.”*
- c) *“Operating premises, other than a sewerage treatment plant, associated with collecting, transporting, storing, recycling, treating or disposing of a listed waste (as per Table 1) on a commercial or fee for services basis.”*

The landfill is defined as Municipal Solid Waste landfill and accepts a range of waste materials from the local domestic and commercial sectors.

2.11 EXISTING WASTE MANAGEMENT

Tennant Creek WMF is owned and operated by Barkly Regional Council and currently services 3,000 local and surrounding residents. Waste from the Tennant Creek area is collected via collection trucks and deposited at the landfill with approximately 1,000 bins collected each week. Tennant Creek currently does not have a kerbside comingled recycling collection service or green waste collection service.

2.11.1 Fees and charges

A list of “dump charges” is presented on Council’s website which is reviewed on an annual basis with an excerpt of current residential charges presented below in **Plate 6**.

PLATE 6 - RESIDENTIAL DUMP CHARGES

Waste Type	Description	Rate
Recyclable Waste Types/Loads		
1	All Green Waste (any size-no mixed loads)	\$Free
2	All Cardboard (any size-no mixed loads)	\$Free
3	All metal (any size-no mixed loads)	\$Free
4	Clean fill free (No rubbish, rubble, stone, rocks etc.)	\$Free
Residential Waste Types/Loads		
1R	Sedan/ Station wagon/ motorcycles	\$Free
2R	Small trailer up to 4'*6'	\$Free
3R	Utes (up to 1 tonne capacity)	\$Free
4R	Standard box trailer (7'*5')	\$Free
5R	Standard box trailer (7'*5') with gates	\$Free
6R	Large trailer (Grater than 7'*5')	\$Free
7R	Large trailer (Grater than 7'*5') with gates	\$Free
Tyre Waste Types/Loads		
5	Car/motor cycle tyres	\$20.00 each
6	Small truck/4WD tyres	\$25.00 each
7	Large truck/semi-trailer tyres	\$45.00 each
8	Plant (Tractor, loader, grader etc)tyres	\$65.00 each
Other Waste Types/Loads		
9	Car Body (drained)	\$180.00 each
10	Car Body (undrained)	\$280.00 each
11	Stove	\$5.00 each
12	Whitegoods (Fridge/freezer – degassed/doors removed)	\$20.00 each
13	Air Conditioners (Degassed only)	\$20.00 each
14	Effluent (dumped by Contractors per litre)	\$0.15 per litre
15	E-Waste (per kg)	\$10.00 per kg
16	Oil (Hydrocarbon) Disposal (per litre)	\$2.50 per litre
17	Oil (Cooking)	\$2.50 per litre

2.11.2 Current Landfill Operations

The current site layout is shown on **Drawing 1** in **Appendix A** and consists of a customer interception point at the entrance to the facility where tokens are collected, customers are then directed to one of the following areas being for disposal or resource recovery:

- Tyre stockpile;
- Car bodies area;
- Various drop off bays for waste separation and resource recovery (see **Plate 7**);
- Batteries;
- Gas bottles; and
- Green waste.

Drop off bays are shown below in **Plate 7**.

PLATE 7 - DROP OFF BAYS



The waste types accepted at the site are managed as outlined in **Table 3**.

TABLE 3 - EXISTING WASTE TYPE MANAGEMENT TECHNIQUES

Site Area	Managed
Commercial Tip Face	Waste material directed to the active tip face(s) is end dumped into the unlined disposal area where it is typically left open until it has reached capacity, where it will be compacted and covered with site soils.
Tyre stockpile	Tyres are stockpiled onsite, currently they are not collected or recycled.
Car bodies area	Car bodies are directed to the upper plateau of the landfill where they are stored until sufficient quantity for collection by metal recycler.
Drop off bays	Waste such as white goods, oil, electronics, wood chips and steel are deposited in bunded pits located off the main access road.
Batteries	Batteries are collected and stored at the entrance to the facility and are sent to a battery recycler.
Gas bottles	Gas bottles are collected and stored at the entrance to the facility where and are sent to a gas bottle recycler.

Site Area	Managed
Green waste	Green waste is collected in bunded area where it is stored and burnt once area is full.

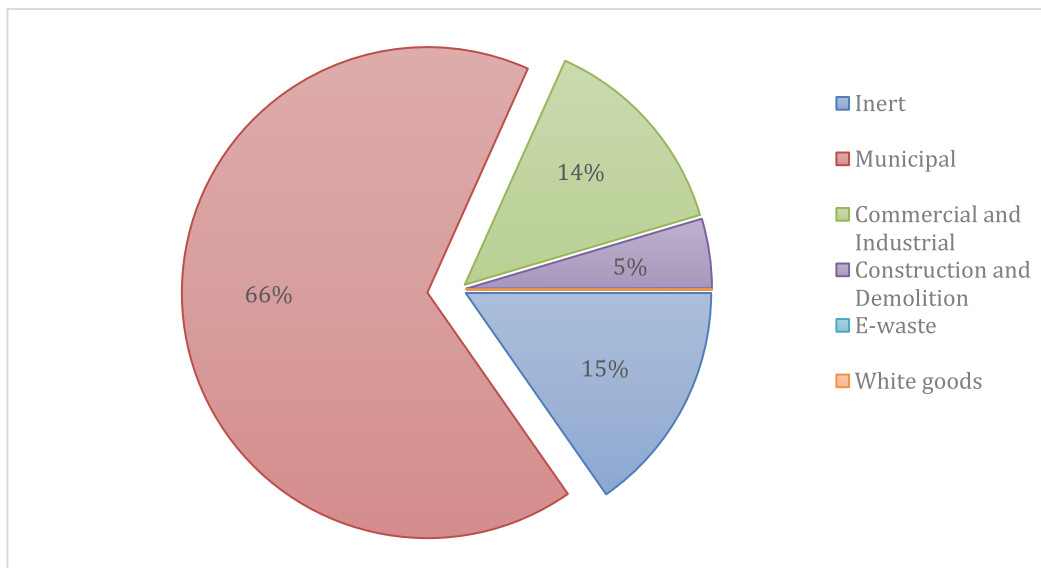
Landfilling at the tip face generally occurs via filling in lifts across the whole site, once a lift is completed another lift will be undertaken on top of the previous lift. Landfilling is currently being undertaken outside the limits of the site northern and western boundaries as shown on the **Drawing 1** in **Appendix A**.

2.11.3 Waste Generation

The site currently does not have a weighbridge, however, an airspace assessment conducted by GreenTec in 2021 established that the average landfilling rate is approximately 14,250m³ per year. This rate was estimated by comparing the current survey (2021) to a survey conducted in 2016 by Terramap and by subtracting out the assumed cover soil volume over the period.

Waste composition was estimated through visual observations of operations staff. Tonnages were obtained by assuming an average compaction rate of 0.8t/m³. The breakdown of waste to landfill is shown in **Plate 8**. Most of the deposited waste is municipal waste, meaning it is important to maintain daily and intermediate cover and progressively cap the site in a timely manner.

PLATE 8 - WASTE TO LANDFILL BREAKDOWN



Based on the breakdown provided in **Plate 8**, the municipal waste stream is the largest contributor to landfill, followed by inert material and then commercial and industrial. However, it is noted that waste type varies significantly from year to year. Based on visual observations at the active tip face, it is believed that a large proportion of the landfilled waste is recyclable or recoverable. Using the waste stream breakdown presented in **Plate 8** and the annual waste quantities, the breakdown of waste has been estimated in tonnes, as shown in **Table 4**.

TABLE 4 - ANNUAL WASTE BREAKDOWN

Waste Type	Weight (t)
Inert	1,745
Municipal	7,570
Commercial and Industrial	1,562
Construction and Demolition	522

Waste Type	Weight (t)
E-waste	0.19
White goods	1
TOTAL	11,400

2.11.3.1 Landfill Development

A previous airspace assessment conducted by Tonkin (2014) indicated that there is between 2 years (short term option) through to 35 years (long term option) of life left at the Tennant Creek WMF. Moving all landfill operations to a new site (Juno Site) was considered as Council believed that space was limited at the current Tennant Creek Waste Management Facility and that it required expansion into adjacent properties, or the move to a new site altogether.

Compaction of the waste occurs on a daily basis and is covered at the end of each day using daily cover. Cover material is sourced from an adjacent property, from a location called the “gravel pits”. This material is won by using a loader with only shallow soft soils being able to be acquired.

2.11.3.2 Stormwater Management

Water is generally directed around the site with any water falls within the site is directed towards the sediment dam in the south of the site as shown on **Drawing 1 in Appendix A**. There are no formal drains in place to drain water from top of batters to sediment dam and no sediment and erosion control in place with evidence of erosion on batters.

2.11.3.3 Leachate Management

The landfill is unlined and there are currently no landfill liner and associated leachate management systems in place. It is noted that others have determined that liners are not required for this site due to the depth to groundwater and the low permeability soils present onsite. Leachate generation is minimal with evaporation far exceeding rainfall.

2.12 EXISTING INFRASTRUCTURE

The site currently has a shed used as an office and lunchroom at the entrance of the facility. Public drop off bays are located at the southern end of the site.

2.12.1 Existing Equipment

Tennant Creek WMF currently has the following equipment:

- JCB 426 rubber tyred loader;
- Case 590 Super R backhoe; and
- Caterpillar 816F landfill compactor.

3 STRATEGIC CONTEXT

3.1 LEGISLATION

This waste management strategy has been developed to ensure that the objectives and targets of the Federal and Territory Government legislation and policies will drive and influence waste management in the community and can be implemented at a local level. The key principles underpinning the WMS are the objectives, and in particular the resource management options, described under the NT Waste Management and Pollution Control Act (2016), as listed below:

- (a) *To protect, and where practicable to restore and enhance the quality of the Territory environment by:*
 - (i) *preventing pollution;*
 - (ii) *reducing the likelihood of pollution occurring;*
 - (iii) *effectively responding to pollution;*
 - (iv) *avoiding and reducing the generation of waste;*
 - (v) *increasing the re-use and re-cycling of waste; and*
 - (vi) *effectively managing waste disposal;*
- (b) *to encourage ecologically sustainable development; and*
- (c) *to facilitate the implementation of national environment protection measures made under the National Environment Protection Council (Northern Territory) Act.*

In addition to the objectives outlined in the Act there are general principles that provide a simple best practice model in the form of the waste management hierarchy, as shown in **Plate 9**.

PLATE 9 - WASTE MANAGEMENT HIERARCHY



3.2 RELEVANT GUIDELINES AND DOCUMENTATION

Relevant documentation applicable to Tennant Creek WMF management and operations, and which has been reviewed during preparation of this strategy are listed below:

- Guidelines for the siting, design and management of solid wastes disposal sites (NT EPA, 2013);
- Waste management strategy for the Northern Territory 2015 – 2022 (NT EPA, 2015);
- Waste management guidelines for small communities in the Northern Territory – working towards best practice (LGANT, 2009); and
- The Central Australia remote landfill operating manual for use in communities of Barkly, Macdonnell and Central Desert Regional Councils.

3.2.1 Guidelines for the Siting, Design and Management of Solid Wastes Disposal Sites

These guidelines provide direction to landfill owners and operators within the NT and provide them with the relevant tools to manage their landfills effectively. This document has been prepared by the NT EPA and should be used in decision making for all landfill planning, design and operations.

3.2.2 NT Waste Management Strategy 2015-2022

This strategy is aimed at improving the management of waste across the NT. The strategy highlights the current management issues and provides strategies and actions for managing these issues. The strategy was prepared by NT EPA and is aimed at all residents in the NT including Local Government, Territory Government Agencies, commercial operators, and residents.

3.2.3 Waste Management Guidelines for Small Communities in the Northern Territory

These guidelines have been prepared by Local Government Association of Northern Territory and the packaging Stewardship Forum. These guidelines are aimed at small towns and communities, which is what most of the Northern Territory comprises of. These guidelines provided a number of options for landfill aspects ranging from best practices (typically in accordance with Landfill Guidelines **Section 3.2.1** above) through to manageable scenarios for communities and towns where resources and funding is limited.

3.2.4 The Central Australia Remote Landfill Operating Manual for Use in Communities of Barkly, Macdonnell and Central Desert Regional Councils

This manual provides local government and landfill operators with tools and relevant information required to run landfill sites. This manual is written for central Northern Territory conditions and aimed with smaller towns and communities in mind with most of the solutions provided able to be scaled and implemented in a range of community sizes.

3.3 COUNCIL REQUIREMENTS

Barkly Regional Council is committed to the implementation and effective management of waste within the confines of the resources of the Council. The location, remoteness and demographic of the Barkly Regional Council provides limited resources and funding for Council to utilise in landfill operations. To this end, Council is looking to adopt best practice where possible within the resources available to the Council.

3.4 ENVIRONMENTAL PROTECTION LICENCE

The Tennant Creek WMF is a prescribed site under the Environmental Protection Act 1989 and as such is managed in accordance with an operating licence issued by the Northern Territory Environmental Protection Authority (NT EPA) Environment Regulation. As of July 2019, the Tennant Creek WMF is governed by Licence Number (EPL 281).

3.5 COMMUNITY EXPECTATIONS

Although no community engagement was undertaken during the preparation of this document, community expectations typically align with the objectives of the Waste Management Act where community expects that waste will be managed effectively, in a manner that protects the environment as well as their current standard of living.

3.6 KEY CHALLENGES

One of the key challenges for Barkly Regional Council at Tennant Creek WMF is meeting the standards set out in the NT EPA Guidelines for Siting, Design and Management of Solid Waste Disposal Sites, as these standards often include the use of expensive lining materials for areas where an engineered landfill liner may not be required.

The other key challenge is getting funding to service these operations, with a small rate payer base and limited commercial operations, funding is limited. In addition, there is no specific waste manager within Council whose job it is to manage strategy implementation, day to day operations and future planning.

It is also noted that Council's turnover of staff is very high, which is likely due to the Council's remote location. A number of reports, scoping studies and operations plans have been prepared over the years, but with high turnover of staff, implementation of these documents has been difficult for Barkly Regional Council.

4 STRATEGIC CONSIDERATIONS

Based on the background information, the current situation and the relevant legislative requirements, the following strategic aspects have been considered.

4.1 RESOURCE RECOVERY

Resource recovery at Tennant Creek Waste Management Facility is currently limited to scrap steel, batteries, gas bottles and tyres with potential for additional resources to be recovered with the implementation of the strategy outlined below.

4.1.1 General

Tennant Creek WMF currently has a bunded bay area for the public to drop off waste materials safely out of the way of landfill equipment. Waste that is not recycled from the drop off bays is transported by landfill operators using a JCB 426 wheeled loader and taken to the active tip face.

There is a large amount of potentially recoverable material being landfilled such as paper, cardboard and comingled recyclables, as shown below in **Plate 10**.

PLATE 10 - ACTIVE TIP FACE



4.1.2 Scrap Steel

Scrap steel is currently recovered and stockpiled at the landfill which is collected by the steel contractor (currently Sell and Parker) on a periodical basis when stockpile quantities warrant collection. Removal of scrap steel from the landfill tip face reduces unnecessary damage to the landfill compactor, which site staff had indicated was occurring on a regular basis. In non-remote towns and cities, the collection of scrap steel yields a fee for Council with this fee unlikely for Barkly Regional Council due to transport costs, but the collection and removal should be able to be negotiated for little to no cost to Council.

4.1.3 Paper and Cardboard

Paper and cardboard is currently not recovered separately in the kerbside collection service or separated from self-haul or commercial operators. There is potential to collect these resources but there is no recycling or paper recycling companies within a distance that would make recycling viable. It is however recommended that this material is diverted from the landfill.

4.1.4 Comingled Recyclable (Glass, Plastic Bottles, Steel and Aluminium Cans)

As with paper and cardboard there are few local and/or viable commercial recycling services in proximity to Tennant Creek. There is however potential to utilise the container deposit scheme present in Northern Territory to collect and store sufficient quantities to yield a fee to offset the recovery of comingled recycling.

4.1.5 Tyres

Tyres are currently collected and stockpiled onsite, with Council liaising with contractors to organise the removal of tyres to an offsite facility for recycling. When tyre stockpiles reach certain heights, they pose a fire risk and once tyres stockpile catch on fire, they are often difficult to extinguish and pose a health hazard from the smoke given off. Tyre stockpiles on site are kept small and separated to minimise the risk of a fire. It is also understood that tyres are currently shredded on site.

4.1.6 Green waste

Green waste is currently stockpiled in a bunded area. There are few viable recoverable options for green waste in the Tennant Creek community unless Council wanted to use it on Parks and gardens or resale to the public. This would, however, require some sort of processing including shredding and pasteurisation. Council are currently in the process of procuring funding for a chipper in order to process, re-use and potential sell processed green waste. Burning of green waste is no longer permitted on site, as outlined in EPL 281 Condition 27, but was the previous method of disposal.

4.1.7 Electronic Waste

Electronic waste is currently being separated and stockpiled. No end use has been established for this waste. Council is currently looking for electronic waste recyclers to take electronic waste from site. However, it is understood that electronic waste is transported and disposed of in the active landfilling on an as required basis. The quantity of electronic waste is very small, making collection from a third party difficult to justify given the remote nature of the site.

4.1.8 Wood and Timber

Wood and timber are currently being separated and stockpiled. No end use has been established for this waste. It is understood that wood is disposed of in the active landfilling on an as required basis. Wood could be turned to wood chips and could be sold to the general public, but it is noted that in March 2021 the 'wood chips' bay was empty.

4.1.9 White Goods

White goods are currently being separated and stockpiled. It is understood that Council are currently recycling received white goods.

4.1.10 Other Waste Streams

There are a number of other waste types that would typically be recovered but would not be viable for Barkly Regional Council. These waste streams are inclusive of, but not limited to, polystyrene, liquid waste, and concrete waste. Introduction of recovery of these waste streams would be financially unviable for Barkly Regional Council largely due to the distance to send the products to market.

4.1.11 Tip Shop

If resource recovery operations are improved there is potential to introduce a tip shop operation which involves the recovery and resale of items destined to landfill. To have a variable tip shop, these items need to be recovered by Staff on entrance to the facility or at the new Resource Recovery and Stockpile area with this operation requiring constant supervision. The material entering the facility needs to be suitable in nature for resale and further investigation may be required to assess the viable nature of a tip shop in this area.

If viable, items recovered need to be placed in the 'shop' (shed or similar) for sale to the public. Tip shops can be run by Council, by a contractor or by a charity organisation, but to ensure positive outcomes for Council, the development and implementation of this program requires an experienced waste management consultant experienced in tip shop operations to ensure its success.

4.1.12 Education

Currently there is little education when it comes to recycling in Tennant Creek, and with the lack of recycling services there is little need to roll out a large education program unless Council intends on implementing a recycling collection service. With respect to the landfill, better signage and direction by landfill staff will lead to more resources being recovered.

4.2 LANDFILL DEVELOPMENT

4.2.1 Overfilling

Landfilling has occurred outside of the landfill boundary and Council is in the process of acquiring additional land from adjacent Lot 2081 for operations. Site boundaries have been marked out on site to prevent further overfilling. Council has two options for the waste located outside of the boundary;

- Excavate all waste and place within the confines of the landfill boundary and all future landfilling to be conducted with the landfill site boundary; or
- Any waste already placed outside the boundary is to be capped and rehabilitated and all future landfilling to be conducted with the landfill site boundary. This approach would need to be confirmed with NT EPA and other landholders involved.

It is recommended that Council liaise with the NT EPA to investigate options and agree on an approach that satisfies the licence conditions, NT Lands department and adjacent property owners. Based on the extents and depths of the waste determined in the test pit investigation (GreenTec, 2021) it is recommended to cap and rehabilitate the areas outside the boundary as opposed to removal, however, this approach will need to be confirmed with relevant stakeholders.

4.2.2 Landfill Liner

The NT Guidelines for the siting, design and management of solid wastes disposal sites (2013) state that:

“New and lateral extensions of existing landfills need to provide an appropriate level of retention to protect the environment from adverse effects of leachate entering the groundwater and surface waters”.

Groundwater at the site is expected to be deep (>60mbgl), overlain with low permeability clay soils and the site evaporation far exceeds rainfall. Therefore, the use of an engineered liner has not been adopted, with the likelihood of any contamination reaching groundwater very low. Additionally, groundwater in the area is not suitable for agriculture or domestic use.

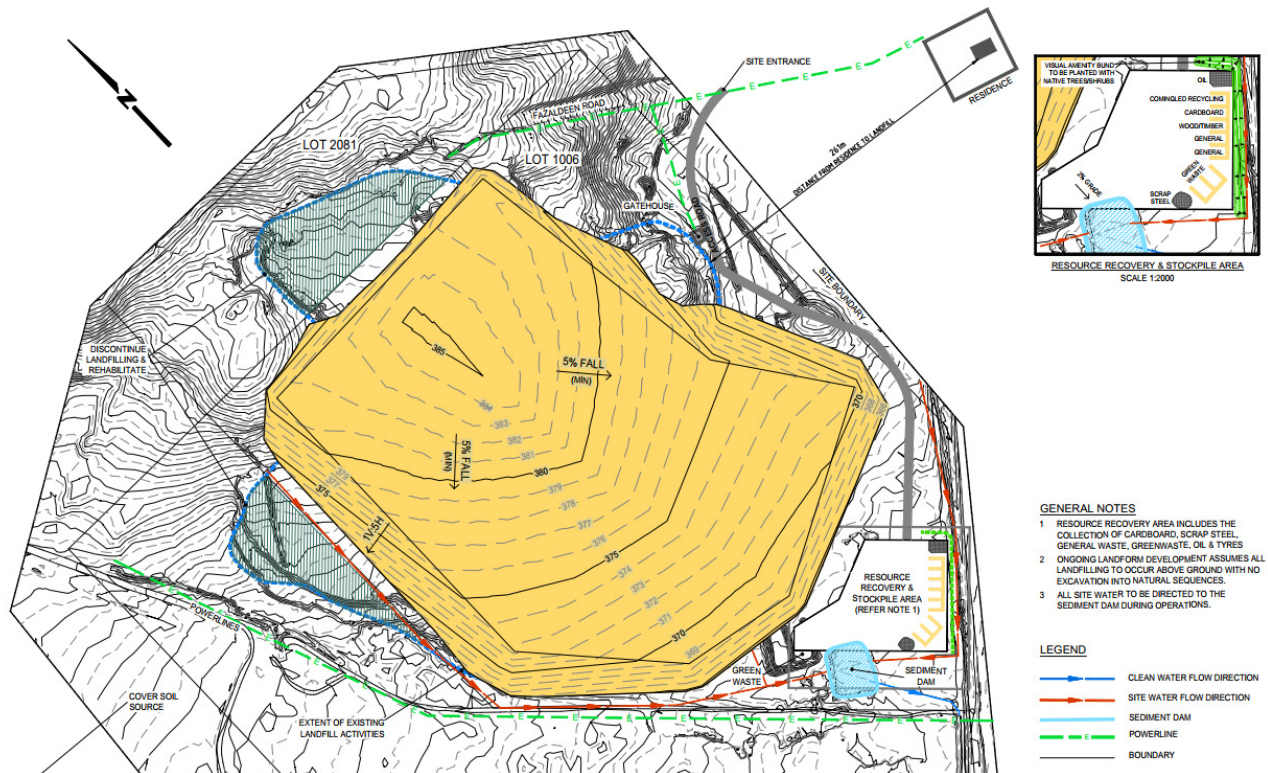
It is noted however that leachate and stormwater controls can be improved to reduce potential for contamination of stormwater discharged offsite.

Using landfilling techniques such as bunding or trenching in the active tip face will retain leachate and reduce stormwater contamination. Regarding stormwater management, the formalisation of vegetation or rock lining of site water drains connected to the sediment dam will also result in cleaner water being discharged in high rainfall events.

4.2.3 Final Landform

The final landform is discussed as part of the Landfill Closure Management Plan (GreenTec, 2021). An airspace assessment and Master Plan conducted by GreenTec (2021), has shown that there is a significant amount of airspace still available at Tennant Creek WMF, with an estimated 26.5 years of landfilling remaining. The conceptual final landform allows for current and future site infrastructure, access roads and stormwater infrastructure. Landfilling undertaken with batters at 5 (H) to 1(V) for 2-5m and then a plateau of 5% minimum rising to a height of RL385m.

PLATE 11 - CONCEPT FINAL LANDFORM



Council has confirmed adoption of the concept landform shown above and as such, a staged concept Master Plan showing landform development overtime has been prepared and provided in **Appendix A**.

It is recommended that the Landfill Closure Management Plan for Tennant Creek WMF, developed by GreenTec Pty Ltd (2021) be followed which includes a landfill closure risk assessment, final landform rehabilitation design, defines lining system and capping profile designs, surface water management systems and design, landfill gas management and monitoring and erosion and sediment controls.

4.2.3.1 Site Infrastructure

Site infrastructure is currently spread across a number of locations on the site, however, with the centralisation of this infrastructure providing the public/customers with an easier interface to interact with, encourages further resource recovery. Council could benefit greatly from the implementation of a weighbridge on site, however, this would require grants or additional funding. At present, conducting airspace assessments and regular surveys is required to assess waste volumes and tonnages. The master plan proposes that all infrastructure be located in the southern end of the site for the following reasons:

- This area is outside of the proposed landfill development footprint.
- It is at the lowest point of the site and therefore drains and sediment dam are currently located in the south.
- It provides a buffer for the residents located in the north from drop off operations and impacts including odour and noise.

To this end, the south location was chosen for the centralisation of all site infrastructure with various aspects coming online as shown in **Appendix A** and detailed in **Table 5** below.

TABLE 5 - ESTIMATED AIRSPACE FOR EACH STAGE OF LANDFILL DEVELOPMENT

STAGE	VOLUME	LIFESPAN*
Stage 1	98,778 m ³	6.9
Stage 2	102,112 m ³	7.2
Stage 3 (Final)	177,515 m ³	12.4
Total	471,550 m³	26.5

*Calculated based on current landfilling rate of 14,250m³ per annum. This rate doesn't include cover soil or capping volume.

Based on the landfill development and relocation of the transfer station and resource recovery area the access road will also have to be moved. A gravel access road will suffice for the limited amount of traffic movement at Tennant Creek WMF.

4.3 LANDFILLING OPERATIONS

4.3.1 Landfilling Extent

It is recommended that surveys be conducted on a regular basis (e.g. yearly) so that airspace assessments and filling plans can be prepared for the following year.

4.3.2 Litter Management

There are no litter controls present on site with litter spread across the site and adjacent properties as shown below in **Plate 12**. Prevailing winds are from the east to south east with potential for wind breaks (bunds 2m high) to be placed on the south eastern boundary of the site particularly around the transfer station and resource recovery area.

PLATE 12 - LITTER AT BOUNDARY AND ON ADJACENT PROPERTY



In addition, widespread dispersion of litter caused from tip face operations can be reduced by bunding around or trenching in the active tip face, use of litter fences in windy conditions or boundary fences placed around the entire facility. Application of a cover to the active tip face will also reduce litter, with the current active tip face not covered properly as shown below in **Plate 13**.

PLATE 13 - ACTIVE TIP FACE LEFT EXPOSED AND UNCOMPACTED



Supplementary to bunds, trees and shrubs can also be used to provide wind breaks, as well as providing a visual amenity buffer between surrounding residents and landfill operations. Plants used should be native to the area.

4.3.3 Compaction of Waste

Compaction of waste is currently undertaken on a daily basis.

Compaction of the waste at the tip face should be occurring every day with a minimum of 4 passes by the landfill compactor. This will not only yield more airspace and allow for more revenue in the long term, but it makes the tip face easier to cover, reduces windblown litter and is considered to be best practice landfill operation.

Currently there is one operational tip face on site used for commercial and residential disposal. The general public use the resource recovery bays as outlined in **Section 4.1** and stockpile areas, rather than directly accessing the tip face. A single tip face approach has been adopted (as recommended in the previous strategy), to reduce equipment and staff costs associated with the management of two tip faces.

4.3.4 Daily and Intermediate Capping of Waste

Waste at the active tip face is generally covered daily, however, exposed waste has been observed at the leading edge of the waste face as shown on **Plate 14**.

PLATE 14 - EXPOSED WASTE



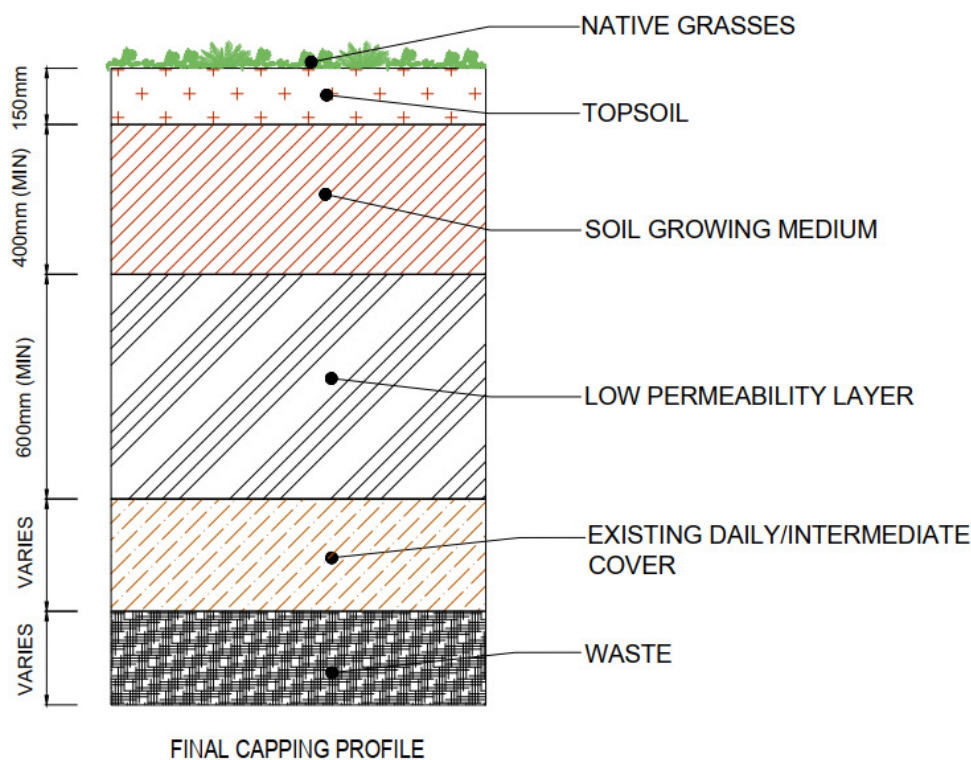
NT EPA landfill guidelines state that daily cover consisting of a soil material applied at a thickness of 150mm should be applied to the active tip face in areas where landfilling will occur within a 3

month period. Areas where landfilling will not occur within a 3 month period require intermediate capping which consists of a soil layer a minimum thickness of 300mm. It is noted that a significant quantity of soil was observed during test pit investigations, which indicates that Council are generally exceeding compliance with cover thicknesses. However, daily cover needs to be applied to exposed tip faces at the end of each day.

4.3.5 Final Capping

Final capping will be constructed over areas where landfilling has reached final profile height. A landfill closure management plan has been prepared for the Tennant Creek Waste Management Facility which details the type of capping specific to site conditions. The design profile reflects the site-specific risk presented by the WMF, NT EPA guidelines and local factors. The appropriate design profile is shown in **Plate 15** Error! Reference source not found..

PLATE 15 - PROPOSED CAPPING PROFILE



4.3.6 Equipment

Tennant Creek WMF currently has a JCB 426 wheeled loader, a Caterpillar 816 landfill compactor and a Case 590 Super R backhoe. The landfill compactor appears to be in operational condition and is fit for purpose. The loader is believed to be used for pushing up waste stockpiles and excavating cover materials. Using the loader to excavate cover soils restricts digging to the softer shallow soils. This combined with no teeth present on the loader restricts the use of loader on site. A backhoe exists on site that has a maximum reach of approximately 3m which can be used for excavation purposes. However, an excavator would be more efficient and can be used for bund construction, drain construction, resource recovery and batter trimming. Purchasing or hiring an 8 tonne excavator with quick hitch grab, general purpose bucket with teeth and a batter bucket would serve multiple purposes for landfill operations. The current site backhoe can be used instead of an excavator but shall be noted that it is not as efficient as an excavator. It was also noted that there were no trucks on site, however, it is assumed that the Council would have dump trucks or steel body trucks that could be used for landfill operations when necessary.

4.3.7 Fire Management and Prevention

Refer to the Tennant Creek Waste Management Facility Emergency Response Management Plan (GreenTec, 2021). Currently there is water available on site in a sediment dam, but it is noted that this dam is dry for most of the year and that capacity is limited.

4.3.8 Utilities

Power is currently supplied to the site office/shed and should remain in place. There is no internet currently onsite, however, there is almost no need for it as there is no weighbridge open circuit CCTV. At this stage, with little internet access required it is recommended that a wireless system is setup rather than running communications lines to the landfill site with the wireless system used for emails and daily reporting by landfill operations staff.

4.4 EDUCATION, COMMUNICATION AND MANAGEMENT

4.4.1 Staff Training

It is recommended that all operations and management staff are trained in waste management operations, resource recovery and water management of landfills. This training needs to be tailored for site specific conditions and work with Council's current OHS and waste management systems. It is recommended that Council engages a waste consultant to undertake the training with no specific waste management and landfilling engineering experience within Council currently.

4.4.2 Community Education

It is recommended that Council engage a consultant to develop and implement a community education program to educate and encourage residents about effective waste management and recycling. This program could also be completed by a Council Waste Management officer but would require someone with specific experience in waste program development and implementation. The community education programs should be aimed at whole community and its various groups including school children via lessons conducted by Council, adults via community workshops, newspaper articles and through specific engagement with indigenous communities.

4.4.3 Signage and Public Liaison

Signage on site is clear, appropriate and easy to understand. Advertising campaigns through TV, radio or newspaper sources can be beneficial in educating residents on new changes and encourage increased resource recovery, where they can be achieved using little or no funds.

4.4.4 Waste Management Officer / Consultant

In order for the strategy implementation to be effective, it is vital that management at Barkly Regional Council fully embrace this strategy, its actions, and recommendations. Due to the size of Barkly Regional Council, having a full time waste management officer is not viable. This combined with a high number of management staff turnover leads to poor strategy implementation, future planning and operational management. To this end, it may be beneficial to employ/engage a waste management officer/consultant to help deliver the strategy, operational changes and plan for future operations. As a fulltime position, may not be viable it is recommended that other remote Councils in the area could also benefit from shared use of an employee or consultant with neighbouring Councils such as Central Desert Shire and Macdonnell Shire Councils.

The use of a consultant rather than an employee provides specific waste management expertise without locking in long term employment contracts, with the consultant being able to provide either increased or decreased services as conditions or council requirements change. An example of a suitable timeframe might be that a consultant is onsite for a week to a month to implement strategy and improve site operations and undertake reporting.

4.4.5 Fees and Charges

A review of fees and charges was undertaken which indicated that the current fees are considered reasonable and consistent with a landfill of similar size in a remote location. The fees and charges are appropriate for the waste types entering the facility, with these compared to neighbouring Councils and found that rates are comparable. It is noted that there is no landfill competing for waste materials in the area and therefore comparing rates to other Council or facilities non-advantageous. To this end, it is recommended that a full cost accounting approach is undertaken for each item entering the facility, including processing, transport, disposal and operational costs to determine the best fee structure.

5 STRATEGY ACTION PLAN

The following provides an action plan for each of the key strategy aspects:

Actions	Provides a summary of the actions required to fulfil the strategy.		
Timeframe	Immediately		
	Short	1-3 years	
	Medium	3-5 years	
	Long Term	5+ years	
Responsibility	Defines the responsible person.		
	Manager	-	Waste management officer or equivalent
	Council	-	Landfill Operations team
	Consultants	-	Waste Management Consultant
	Surveyor	-	Registered Surveyor
Estimated Budget	Provides budget estimate when outside of normal operations budget (i.e. Council staff hours).		

5.1 RESOURCE RECOVERY

RESOURCE RECOVERY STRATEGY				
Purpose	To deliver waste and recycling collection services that are efficient, provide value for money, have minimal environmental impact, and are designed to facilitate best practice resource recovery for both the domestic and commercial waste streams.			
Actions		Timeframe	Responsibility	Estimated Budget
1.1	Undertake waste stream audit to determine potential resources to be recovered. Engage consultant to undertake a waste audit and reporting to be conducted under representative conditions.	Short Term	Consultant	\$10,000
1.2	Divert paper and cardboard from landfill waste stream.	Short Term	Council	Operations Budget
1.3	Introduce comingled recycling stream. - Research container deposit scheme in NT. - If viable, engage contractor to collect and process comingled recycling.	Short Term	Manager	Operations Budget
1.4	Find disposal/treatment/recycling method for tyres. - Tyres could be used onsite or around town for retaining walls, shredded and as subsoil drainage material. - Tyres can be transported to a tyre recycler.	Short Term	Manager	Operations Budget
1.5	Combine resource recovery and stockpile areas in the one location to make segregation of resources easier for the public. Refer to master plan for preferred location of resource recovery and stockpile area.	Medium Term	Council	Operations Budget
1.6	Tip Shop - Engage consultant to assess the viability of tip shop develop program if viable. - Tip shop construction or upgrade of shed. - Ongoing management of shop.	Short Term	Consultant & Council	\$10,000 \$25,000 - Operations budget

5.2 LANDFILL DEVELOPMENT

LANDFILL DEVELOPMENT				
Purpose		To provide a facility that is fit for purpose, is easy to use, protects the environment is consistent with natural topography and is in accordance with relevant guidelines.		
Actions		Timeframe	Responsibility	Estimated Budget
2.1	Remediate/cap areas where waste has been placed outside of Lot 2161. The recommended action is to apply final capping as per the Landfill Closure Management Plan (LCMP).	Short Term	Council & Surveyor	Subject to outcomes with NT EPA
2.2	Implement landfilling capping techniques to capture all leachate within the cell window.	Short Term	Manager & Council	Operations Budget
2.3	Formalise water infrastructure to reduce potential for sediment-laden water discharge offsite and improve water quality leaving site. - Excavate drains in locations outlined on master plan. - Rehabilitate drains with turf or line with rock or crushed concrete to reduce sediment movement offsite in high rainfall events. Note: Council have recently undertaken maintenance on the dam and associated channels leading to the dam to prevent discharge offsite and improve drainage conditions on site.	Short Term	Council	Operations Budget
2.4	Relocate tyre and scrap steel stockpiles to new resource recovery area.	Short Term	Council	Operations Budget

5.3 LANDFILL OPERATIONS

LANDFILL OPERATIONS				
Purpose	To provide a facility that is fit for purpose, is easy to use, protects the environment encourages resource recovery and best management practice.			
Actions		Timeframe	Responsibility	Estimated Budget
3.1	Commence remediation of landfilling that has occurred outside the site boundary (as stated in Section 5.2 – Landfill Development).	Short term	Council	Operations budget.
3.2	Operations planning: - Undertake annual aerial surveys - Undertake annual airspace assessments - Review master plan annually and makes changes where relevant.	Ongoing	Consultant & Surveyor	\$15,000 pa
3.3	Introduce better litter management - Bund/trench tip face - Compact waste regularly - Shield waste from prevailing winds - Plant trees for visual amenity at boundaries.	Short Term	Manager and Council	Operations budget
3.4	Daily and Intermediate Capping: - Cover tip face on daily basis - Daily cover 150mm - Intermediate capping 300mm (min)	Ongoing	Council	Operations budget
3.5	Final Capping Closure plan and capping design to be developed including capital costings.	Short Term	Consultant	\$35,000
3.6	Equipment Purchase 8t excavator with attachments (optional – backhoe will suffice but excavator will increase operational efficiency).	Short Term	Manager	\$120,000
3.7	Implement landfill operations plan.	Short Term	Manager	Operations budget

5.4 EDUCATION, COMMUNICATION AND MANAGEMENT

EDUCATION AND COMMUNICATION AND MANAGEMENT				
Purpose	To implement an effective waste management strategy, support operations and provide a vital community service, staff management and community must be trained, informed and managed appropriately.			
Actions		Timeframe	Responsibility	Estimated Budget
4.1	Staff Training - All staff are to be across waste management strategy and initiatives. - All operations staff are to be trained in waste management operations.	Short Term	Consultant	\$5,000
4.2	Community Education - Engage consultant to develop education program. - Undertake classes at schools conducted twice a year every year (all age levels). - Advertise in Council newspapers monthly. - Community workshops.	Short Term	Consultant	\$8,000 \$10,000 pa ~ \$3,000 pa \$3,000 per workshop
4.3	Signage and Public Liaison - Ensure all staff direct public to appropriate drop off area. - Engage with community via advertising.	Short Term	Council	- Operations budget - TBC
4.4	Employ a waste officer OR engage a waste consultant on a contract basis. Officer/ Consultant could be shared with Macdonnell and Central Desert Councils if more viable.	Short Term	Council	TBC
4.5	Undertake a full cost accounting assessment to determine if fees and charges are meeting Councils costs.	Short Term	Consultant	\$5,000

6 REFERENCES

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APPENDIX A

25 May 2021

Chief Executive Officer
Barkly Regional Council
41 Peko Road
Tennant Creek, NT, 0860

Attention: Damian Carter

RE: TENNANT CREEK WASTE MANAGEMENT FACILITY CONCEPT MASTER PLAN

Dear Damian,

In relation to the above project, GreenTec provides the following supporting information for the preparation of the Master Plan for the Tennant Creek Waste Management Facility.

1 BACKGROUND

As part of the Master Plan and Waste Management Strategy project, GreenTec has also undertaken the following:

- Site visit and test pit investigation;
- Airspace assessment to determine volume of void space consumed and determine remaining airspace under current operating conditions; and
- Preparation of an Environmental Management Plan, Leachate Management Plan, Emergency Response Management Plan and Landfill Closure Management Plan.

The items presented above provide background for the Master Plan provided below.

2 MASTER PLAN

A concept Master Plan in the form of drawings has been presented in **Attachment 1**, with the Master Plan consisting of 3 major stages of landfill development with the following assumptions and outcomes provided for each stage. The Master Plan provides an insight into landfill development and infrastructure changes over the life of the landfill facility.

2.1 OVERALL MASTER PLAN CONCEPT/ASSUMPTIONS

The following concepts/assumptions have been adopted throughout all stages of landfill development:

- The Master Plan presented is concept only and may change at the time of detailed design or during operations.
- All clean water is diverted around landfill and reports to the south. This is largely done by the landfills being saddled against a rise in the local topography.
- All site water to drain to a sediment dam located in the south of the site for treatment prior to release via a series of drains and batter chutes.
- Assumes that all future landfilling will remain within site boundaries.
- Assumes that landfilling can occur to the full extent of the site boundaries.
- The concept stages presented are to top of capping.
- Landfill batters to be no steeper than 5 (H): 1 (V)
- Landfill plateau grade to have at least 5% fall to shed water off the landform.
- Landforms will generally grade to the south to promote drainage to sediment dam and minimise additional drainage infrastructure.

The following concepts/assumptions are specific for each stage of landfill development.

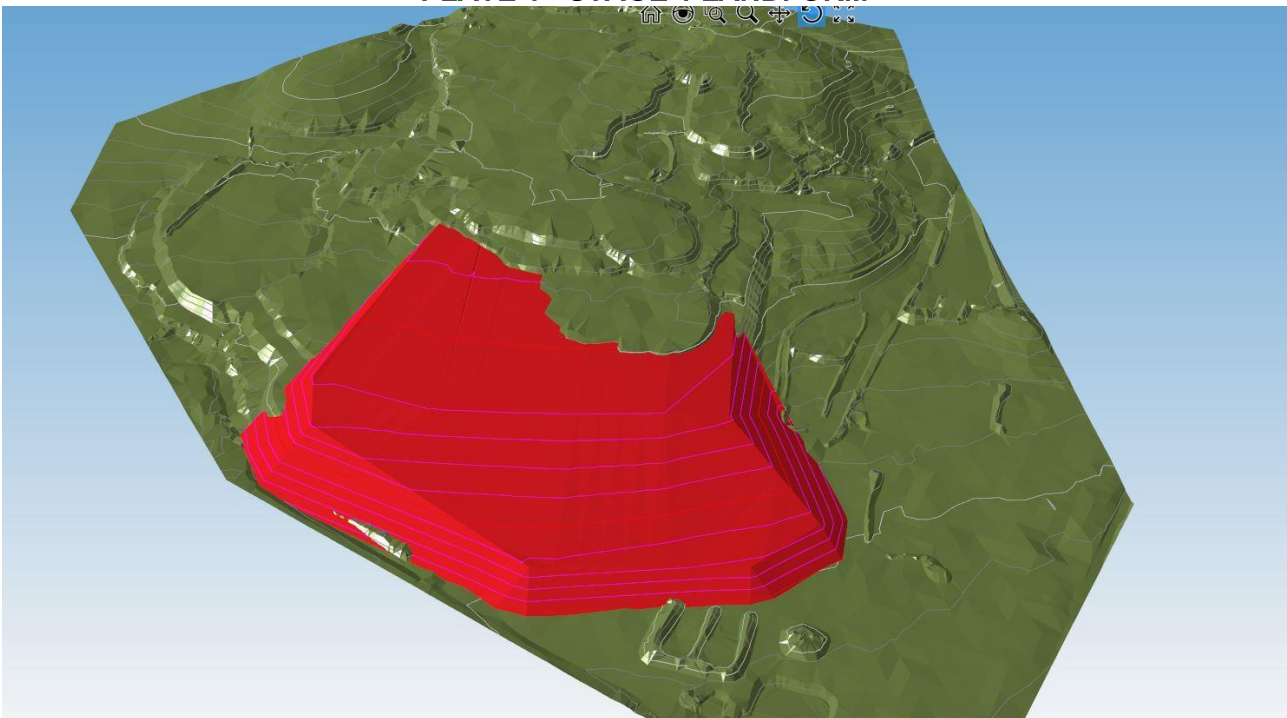
2.2 STAGE 1 - CONCEPT/ASSUMPTIONS

The following concepts/assumptions have been adopted for Stage 1 of landfill development:

- Stage 1 landform will tie into existing landfill as shown on **Plate 1**;
- Any stored waste in this area (such as tyres) will need to be relocated; and
- The estimated volume for Stage 1 is 98,778m³ which is estimated to be 6.9 years of landfill life.

A model output showing Stage 1 has been provided below in **Plate 1**.

PLATE 1 - STAGE 1 LANDFORM



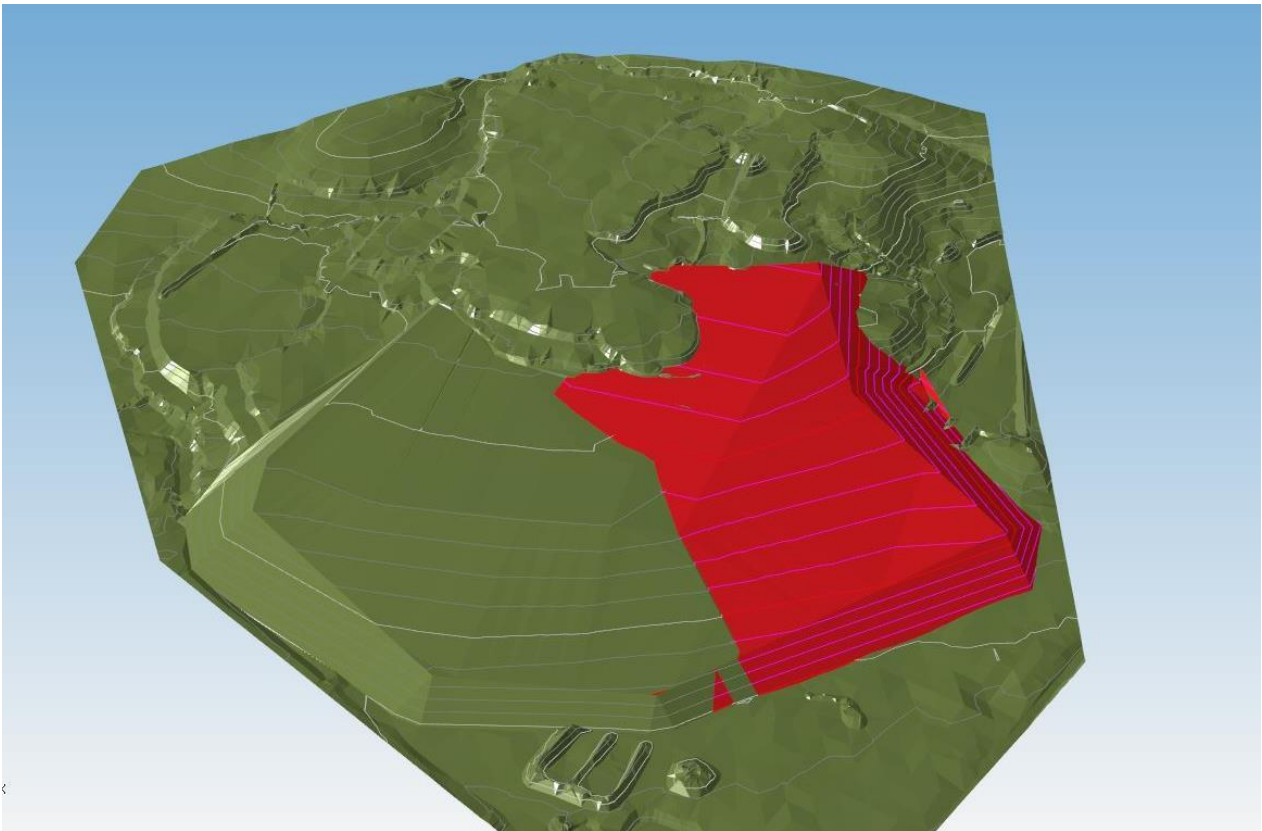
2.3 STAGE 2 - CONCEPT/ASSUMPTIONS

The following concepts/assumptions have been adopted for Stage 2 of landfill development;

- Stage 2 landform will tie into existing landfill and connect to Stage 1 landform, as shown in **Plate 2**;
- The current area for general waste and green waste will be relocated to new resource recovery and stockpile area during this period to allow for ongoing landfill works;
- The estimated volume for Stage 2 is 102,112m³ which is estimated to be 7.1 years of landfill life; and
- Sediment dam and site water drainage channels to be upgraded to accommodate landfilling expansion.

A model output showing Stage 2 has been provided below in **Plate 2**.

PLATE 2 – STAGE 2 LANDFORM



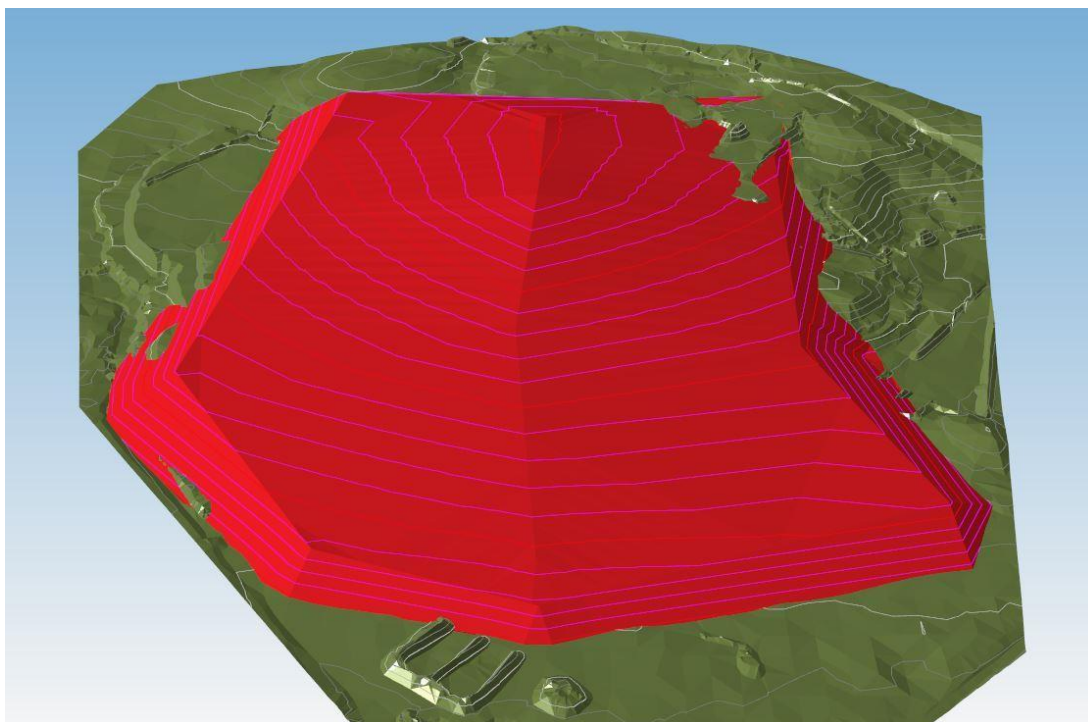
2.4 STAGE 3 (FINAL LANDFORM) - CONCEPT/ASSUMPTIONS

The following concepts/assumptions have been adopted for Stage 3 (final landform) of landfill development:

- Stage 3 landform will see landfill occurring over all previous stages to form final landform profile;
- The estimated volume for Stage 3 is 177,515m³ which is estimated to be 12.4 years of landfill life;
- Site water drainage changes to suit ongoing landfilling operations; and
- Areas where final landform profile has been completed are to be capped and rehabilitated as per the Landfill Closure Management Plan.

A model output showing Stage 4 has been provided below in **Plate 3**.

PLATE 3 - STAGE 3 LANDFORM



3 MASTER PLAN SUMMARY

Based on the concept landforms modelled and shown in **Section 2** above, the following information has been summarised as shown in **Table 1**.

TABLE 1 - MASTER PLAN SUMMARY

Stage	Volume	Lifespan	Infrastructure Changes
Stage 1	98,778 m ³	6.9	• Relocate any stockpiles in the area. • Formalise site water drainage.
Stage 2	102,112 m ³	7.2	• Greenwaste stockpile moved. • New resource recovery area located in the south of the site. • Formalise site water drainage. • Move access road.
Stage 3 (Final)	177,515 m ³	12.4	Landfilling to occur over stages 1 and 2 and existing landfill.
Total	378,405 m³	26.5	

#based on current landfilling rate of some 14,250m³ per annum. This rate is not expected to increase.

It is also noted that this landfilling rate does not include cover soils or capping.

In summary, a concept Master Plan has been developed to show landfill development and infrastructure changes over time to be used in conjunction with Waste Management Strategy for the landfill facility. This Master Plan shows that there is a significant amount of airspace available at the Tennant Creek Facility, with an estimated 26.5 years at ideal landfill conditions and at current landfill disposal rates. The Master Plan shows infrastructure changes mainly concerned with resource recovery and customer interface, with the location of the current infrastructure to be consumed by ongoing landfilling in Stage 1 and 2 of the landfill development.

Should you have any queries in relation to the above, please don't hesitate to contact the undersigned.

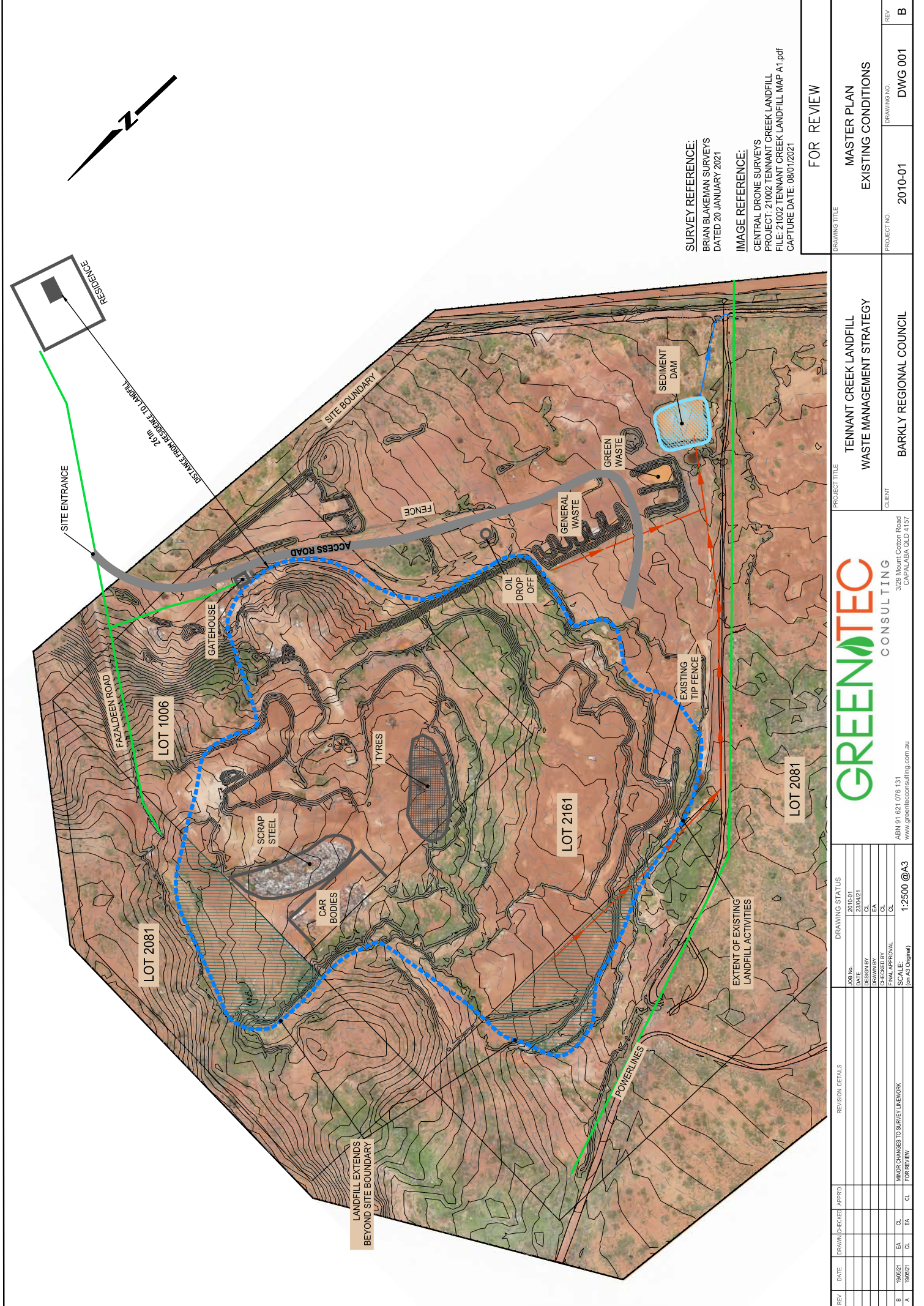
Yours sincerely,

A handwritten signature in black ink, appearing to read "Christian Lisle".

Christian Lisle
Senior Engineering Consultant
GreenTec Pty Ltd

Enclosed: Attachment 1 – Concept Master Plan Drawings

ATTACHMENT 1



SURVEY REFERENCE:
BRIAN BLAKEMAN SURVEYS
DATED 20 JANUARY 2021

IMAGE REFERENCE:
CENTRAL DRONE SURVEYS
PROJECT: 21002 TENNANT CREEK LANDFILL
FILE: 21002 TENNANT CREEK LANDFILL MAP A1.pdf
CAPTURE DATE: 08/01/2021

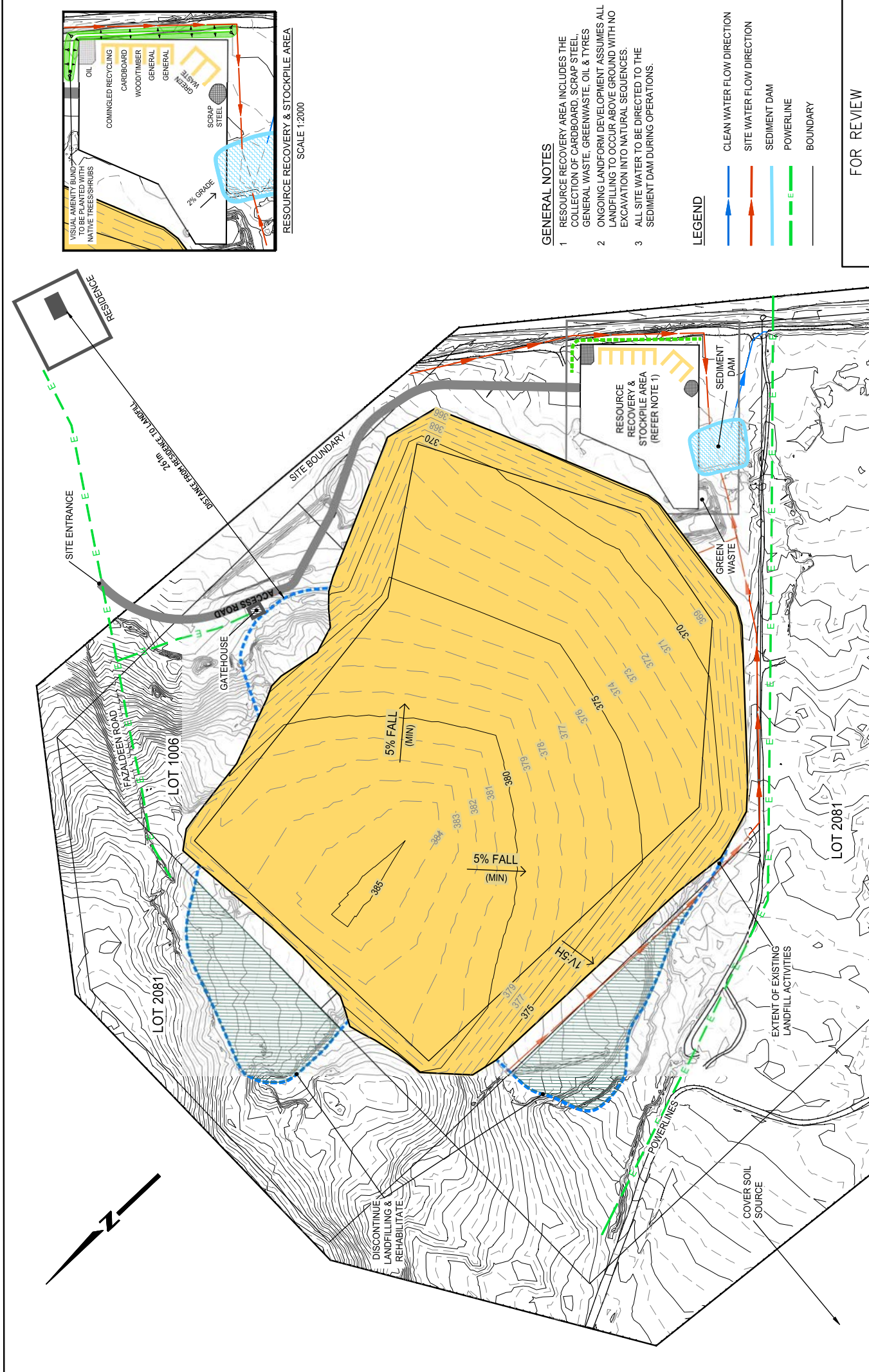
FOR REVIEW	
DRAWING TITLE	MASTER PLAN
PROJECT NO	EXISTING CONDITIONS
2010-01	DWG 001
REV	B



329 Mount Cotton Road
CAPALABA QLD 4157
ABN 91 621 076 131
www.greenotecconsulting.com.au

PROJECT TITLE	TENNANT CREEK LANDFILL
CLIENT	BARKLY REGIONAL COUNCIL
WASTE MANAGEMENT STRATEGY	

REVISION DETAILS		DRAWING STATUS	
REV	DATE	DRAWN	CHECKED
		DATE	DATE
		DESIGN BY	23/04/21
		DRAWN BY	CL
		CHECKED BY	EA
		FINAL APPROVAL	CL
B	18/05/21	EA	CL
A	18/05/21	CL	EA
MINOR CHANGES TO SURVEY UNDERWORK		1:2500 @A3	
FOR REVIEW		(not A3 Original)	



REVISION DETAILS		DRAWING STATUS		REVISION DETAILS		DRAWING STATUS	
REV	DATE	DRAWN	CHECKED	APPROVED	JOB NO.	DATE	DATE
					1201001	23/04/21	
					DESIGN BY	CL	
					DRAWN BY	EA	
					CHECKED BY	CL	
					FINAL APPROVAL	CL	
					SCALE:	1:2500 @A3	
					(or A3 Original)		
A	19/05/21	CL	EA	CL	FOR REVIEW		

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3729 Mount Cotton Road
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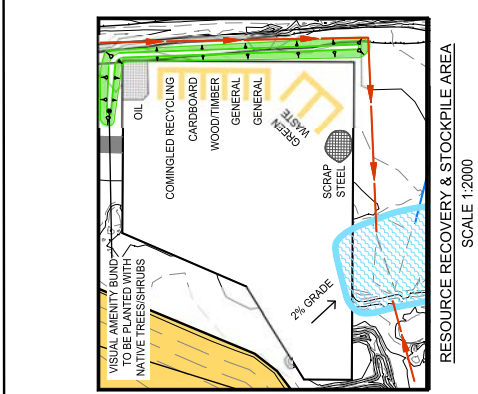
ABN 91 621 076 131
www.greenotecconsulting.com.au

PROJECT TITLE		CLIENT	
TENNANT CREEK LANDFILL WASTE MANAGEMENT STRATEGY		BARKLY REGIONAL COUNCIL	

DRAWING TITLE		FOR REVIEW	
MASTER PLAN FINAL LANDFORM			

PROJECT NO.		DRAWING NO.	
2010-01		DWG 002	

REV		A	
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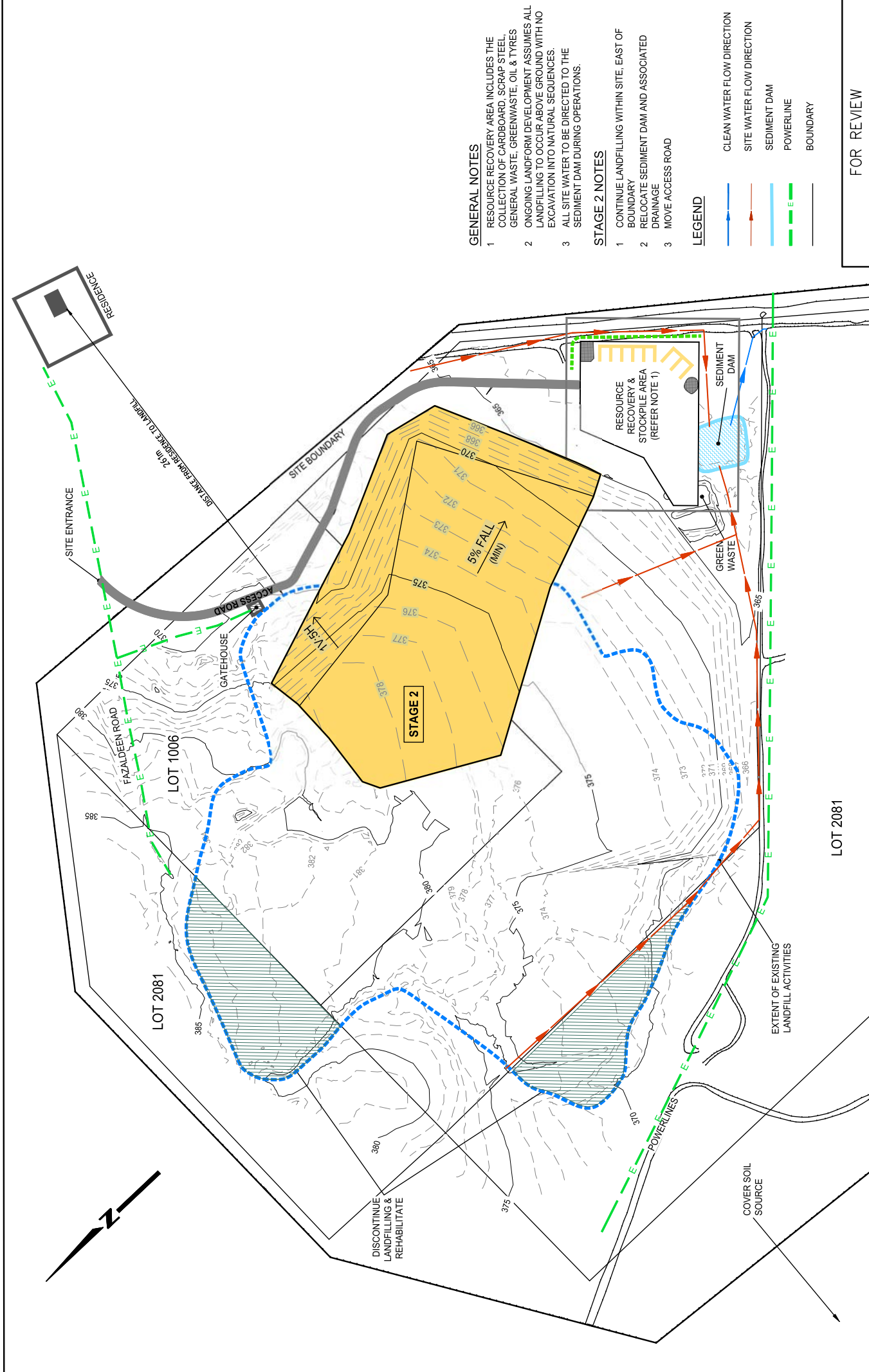
RESOURCE RECOVERY & STOCKPILE AREA
SCALE 1:2000

GENERAL NOTES

- 1 RESOURCE RECOVERY AREA INCLUDES THE COLLECTION OF CARDBOARD, SCRAP STEEL, GENERAL WASTE, GREENWASTE, OIL & TYRES
- 2 ONGOING LANDFORM DEVELOPMENT ASSUMES ALL LANDFILLING TO OCCUR ABOVE GROUND WITH NO EXCAVATION INTO NATURAL SEQUENCES.
- 3 ALL SITE WATER TO BE DIRECTED TO THE SEDIMENT DAM DURING OPERATIONS.

LEGEND

- CLEAN WATER FLOW DIRECTION
- SITE WATER FLOW DIRECTION
- SEDIMENT DAM
- POWERLINE
- BOUNDARY



GENERAL NOTES

- 1 RESOURCE RECOVERY AREA INCLUDES THE COLLECTION OF CARDBOARD, SCRAP STEEL, GENERAL WASTE, GREENWASTE, OIL & TYRES
- 2 ONGOING LANDFORM DEVELOPMENT ASSUMES ALL LANDFILLING TO OCCUR ABOVE GROUND WITH NO EXCAVATION INTO NATURAL SEQUENCES.
- 3 ALL SITE WATER TO BE DIRECTED TO THE SEDIMENT DAM DURING OPERATIONS.

STAGE 2 NOTES

- 1 CONTINUE LANDFILLING WITHIN SITE, EAST OF BOUNDARY
- 2 RELOCATE SEDIMENT DAM AND ASSOCIATED DRAINAGE
- 3 MOVE ACCESS ROAD

LEGEND

- CLEAN WATER FLOW DIRECTION
- SITE WATER FLOW DIRECTION
- SEDIMENT DAM
- POWERLINE
- BOUNDARY

FOR REVIEW

REVISION		REVISION DETAILS		DRAWING STATUS	
REV	DATE	DRAWN	CHECKED	APPROD	JOB NO.
					1201001
					DATE
					23/04/21
					DESIGN BY
					CL
					DRAWN BY
					EA
					CHECKED BY
					CL
					FINAL APPROVAL
					CL
					SCALE
					1:2500 @A3
					(not A3 Original)
A	19/05/21	CL	EA	CL	FOR REVIEW

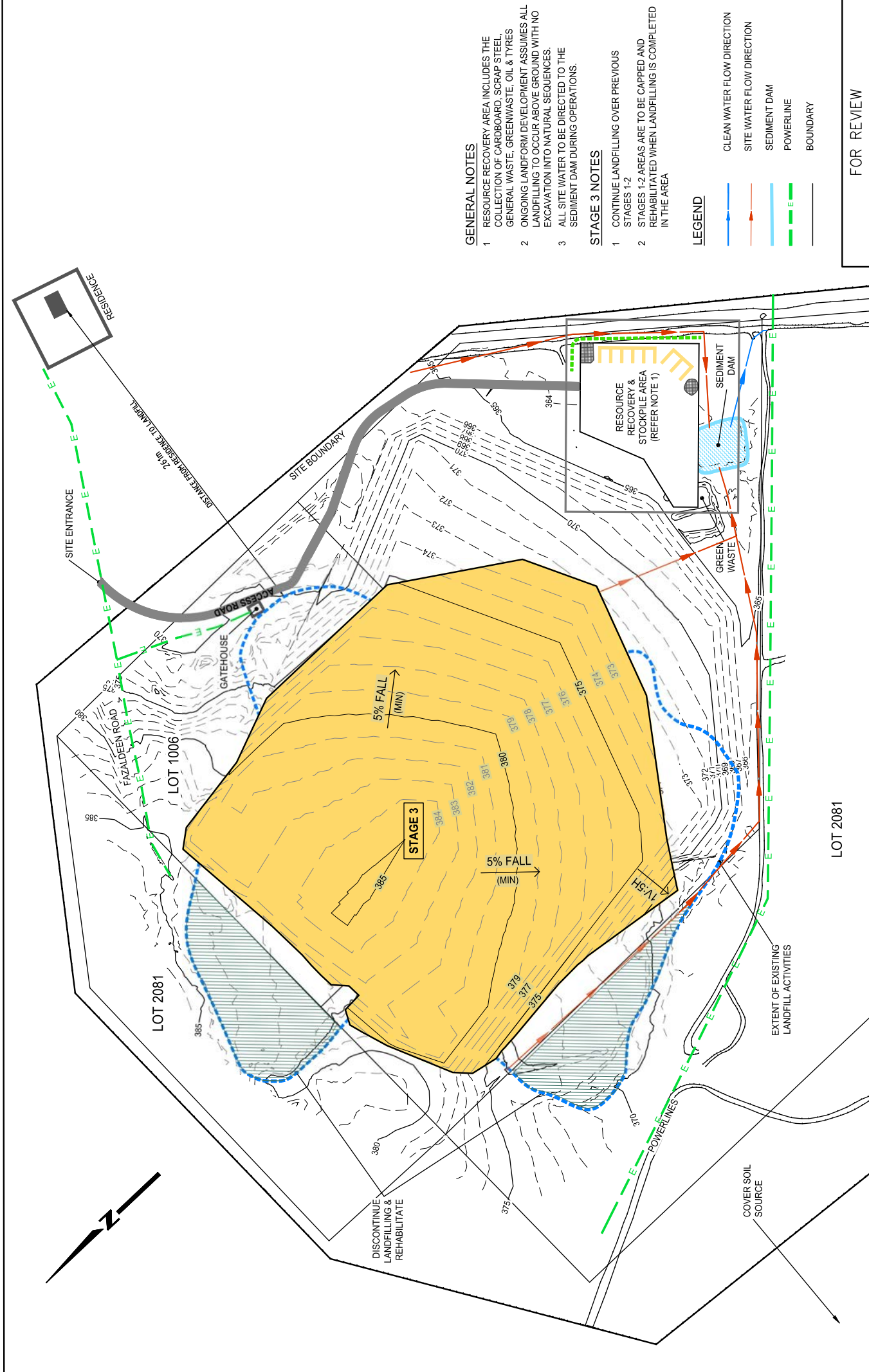
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PROJECT TITLE		TENNANT CREEK LANDFILL
WASTE MANAGEMENT STRATEGY		
CLIENT		BARKLY REGIONAL COUNCIL
DRAWING TITLE		MASTER PLAN
STAGE 2 LANDFORM		
PROJECT NO	2010-01	DWG NO
REV		A



GENERAL NOTES

- 1 RESOURCE RECOVERY AREA INCLUDES THE COLLECTION OF CARDBOARD, SCRAP STEEL, GENERAL WASTE, GREENWASTE, OIL & TYRES
- 2 ONGOING LANDFORM DEVELOPMENT ASSUMES ALL LANDFILLING TO OCCUR ABOVE GROUND WITH NO EXCAVATION INTO NATURAL SEQUENCES.
- 3 ALL SITE WATER TO BE DIRECTED TO THE SEDIMENT DAM DURING OPERATIONS.

STAGE 3 NOTES

- 1 CONTINUE LANDFILLING OVER PREVIOUS STAGES 1-2
- 2 STAGES 1-2 AREAS ARE TO BE CAPPED AND REHABILITATED WHEN LANDFILLING IS COMPLETED IN THE AREA

LEGEND

- CLEAN WATER FLOW DIRECTION
- SITE WATER FLOW DIRECTION
- SEDIMENT DAM
- POWERLINE
- BOUNDARY

FOR REVIEW

REVISION		REVISION DETAILS		DRAWING STATUS	
REV	DATE	DRAWN	CHECKED	APPROD	JOB No
					1201001
					DATE
					23/04/21
					DESIGN BY
					CL
					EA
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					CL
					SCALE
					1:2500 @A3
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A	19/05/21	CL	EA	CL	FOR REVIEW

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PROJECT TITLE

TENNANT CREEK LANDFILL
WASTE MANAGEMENT STRATEGY

CLIENT

BARKLY REGIONAL COUNCIL

DRAWING TITLE

MASTER PLAN
STAGE 3 LANDFORM

PROJECT NO

2010-01

DRAWING NO

DWG 005

REV

A



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