Site & Soil Evaluation Report

Site and Soil Evaluation for Onsite Sewage Management

Lot 72 (#1530) Lion Street, Mount Helena

Prepared for: Shire of Mundaring
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Document History

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Contents

1. Introduction

1.1 The Consultant

The field investigation and report have been undertaken and overseen by the following suitably experienced staff.

Geotechnical Technician – Tony Broadway

10 years' field experience at Structerre Consulting working across a wide range of site and soil conditions.

Civil Engineer – Farhad Silwanagh

Civil and Geotechnical Engineer

10 years' experience in civil and geotechnical engineering at Structerre Consulting. Experience includes the design consultation for various sized waste water treatment applications to include; single residence, mixed use commercial developments.

Geotech Division Manager – Mel Castle

Mel Castle has been involved in civil construction inspection and testing for in excess of 35 years. Experienced in earthworks construction monitoring – residential & commercial, site supervision – earthworks, field and laboratory testing & inspection in construction materials including soils, aggregates, concrete, brick and block, rocks and pavements.

1.2 Report Summary

Structerre Consulting (Structerre) has been engaged to undertake a Site-and-Soil Evaluation (SSE) for a subdivision of an approximately 20,259m² at Lot 72 (#1530) Lion Street, Mount Helena.

This report details an onsite sewage management system and is to accompany an application to install an Onsite Sewage System and submitted to Shire of Mundaring. This document provides information about the site and soil conditions. It also provides a detailed SSE for a 20,259m² comprising 2 lot subdivision and includes a conceptual design for a suitable onsite sewage management system, including recommendations for monitoring and management requirements. As sufficient land area is available for effluent disposal, the recommendations of these findings are:

- To the proposed new sub-divided (Lot 306), provide a primary level treatment wastewater system approved by the Department of Health (DOH). Effluent to be applied to Land Application Area (LAA) via inverted leach drain effluent disposal system with minimum land application area of 339m.
- The septic system for the existing residence (Lot 305) shall remain operational and in place. However, should the new dividing lot boundary interfere with maintaining the minimum required setbacks, it is recommended that the existing system shall be replaced with new to comply with the latest governing requirements as outlined herein this report.
- All manufactured products selected as part of future detailed design shall be listed on the Department of Health approved products.

2. Site and Development Description

At the time of the field investigation, there was an existing dwelling located on the Northeast section of the site, with the remainder of the site was covered light vegetation and trees scattered throughout the Lot. Table 1 provides a summary of the proposed development.

Table 1: Description of development

Development Characteristic	Description
Site Address	1530 Lion Street, Mount Helena WA 6082
Owner/Developer	Paul Tana
Postal Address	1530 Lion Street, Mount Helena WA 6082
Contact/Mob	Paul Tana / 0488 660 892
Local Government	Shire of Mundaring
Zoning	No R Code (Rural)
Proposal & Lot sizes	2 lot sub-division – (Lots 305 – 10,772m^2) & Lot 306 – 9,500m^2)
Water Supply	Existing water Mains
Anticipated Wastewater Load	Lot 306 shall consist of 5 bedrooms with a daily hydraulic load of 900L/day (150L/Person/Day to AS1547)
Availability of Sewer	The area is currently unsewered and unlikely to be serviced by reticulated sewerage within the next 10-20 years due to low development density in the area and high cost associated with any extension.

3. Site and Soil Assessment

3.1 Site Assessment

Structerre Consulting undertook the site investigation on 09.08.2023.

The assessment of the suitability of this site to retain on-site sewage and the recommendations in this report are based on on-site investigations, laboratory testing and desktop study of available geological and topographic published sources relevant to the lot.

On-site investigation of the site including visual inspection, borehole sampling, percolation testing and soil identification. The desktop study involved the review of publically available publications from various government agencies relating to the geological setting, water table monitoring and topography of the site.

Based on the results of the site and soil assessment, the overall land capability of the site for onsite wastewater disposal is constrained, however the proposed sewage system is able to be designed and installed to satifactory meet the requirements of AS 1547 and the Health Regulations 1974 (treatment of Sewage and Disposal of Effluent and Liquid Waste).

SITE KEY FEATURES

Table 2 summarises the key features of the site in relation to effluent management proposed for the site.

NOTE:

- The site is not in a sewage sensitive area as per PlanWA online mapping.
- There are no Private bores within property.
- The site is not inside a public drinking water source area as per Public drinking water source areas (PDWSA) online mapping.
- The site is not located in Floodplains as per online mapping.
- The risk of effluent transport offsite is low.

Figure 1: Locality Plan

Table 2: Site characteristics and mitigation measures

Feature	Description	Level of Constraint	Mitigation Measures
Climate	Annual rainfall to July 2023 428.4 mm Station Chidlow No. 9007. Average annual pan evaporation is 1,800 mm (derived from BOM Annual Average PAN Evaporation Map).	Low	NN
Exposure	Trees are located throughout the the lot, the site is considered to have high exposure to sun and wind.	Low	NN
Vegetation	Open grassland, no hydrophillic vegetation in the proposed effluent management area or surrounds.	Low	NN
Landform & Drainage	No visible signs of water ponding at time of assessment.	Low	NN
Slope	The lot slopes from East to the West Site, (<10% slope).	Low	NN
Fill	No signs of imported fill material observed at time of assessment.	Low	NN
Surface Gravel and Rock Outcrops	No surface gravel or rock outcrops observed.	Low	NN
Erosion Potential	No evidence of sheet or rill erosion; No evidence of landslip and landslip potential is low due to the small slope of site.	Low	NN
Vertical Separation From Groundwater	Groundwater/Perched water was not encountered in BH01 – BH4 up to 2.4m below surface level. The Perth Groundwater Atlas (Waters & Rivers Commission) has no available information for the groundwater levels for this site. The Landgate website indicates the ground surface level at this site was approximately 289-298m Australian Height Datum (AHD) falling from Northeast to Southwest.	Low	Ensure Minimum 1.5m separation between maximum groundwater level and discharge point of primary treated-site sewage system.
Public Drinking Water Source Areas & Sewage Sensitive Areas	The site is not located in a sewage sensitive area. The site is not located in a public drinking water source area as per public drinking source areas (PDWSA) online mapping.	Low	NN

Surface Waters and Separation From Water Resources	No natural water courses located within 100m of the site	Low	NN
Rainfall Run-on and Seepage	No evidence of stormwater run-on to the proposed LAA observed.	Low	NN
Flood Potential	The lot is not located within the floodplains.	Low	NN
Horizontal Setback Distances	All relevant setback distances to the LAA are achievable for proposed lot.	Low	NN
Available Land Application Area (LAA)	Considering all the constraints and buffers, the site has ample suitable land for a LAA for primary treated effluent disposal. The proposed effluent management area is as nominated in Figure 2.	Low	NN

*NN: not needed
**LAA: Land Application Area

3.2 Soil Assessment

A geotechincal site investigation was conducted across 4 locations on 09.08.2023. A soil retrieval probe was used to sample the soil by bore holes up to 2.4m in depth or refusal due to dense gravel. Constant head permability testing was carried out as per AS1547:2012. This was sufficient to adequately characterise the soils expected throughout the area of interest. Soil profile descriptions for the bore hole are provided in the appendix. The site geotechnical assessment and percolation test results are consistent with Soil Permeability Category 1: Sands and Gravels – Structureless (massive) as per AS 1547-2012. Table 3 below provides an assessment of the characteristics of boreholes 1- 4 to the proposed LAA locations. All supporting logs and documentation can be found in the appendix of this report.

Table 3: Soil Assessment

Feature	Assessment	Level of Constraint	Mitigation Measures
Profile Depths	0-100mm Topsoil. 100-1400mm SAND: fine to medium grained, non-plastic, trace gravel, grey 1400-2500mm: sandy CLAY: fine to medium grained, medium plasticity, pale grey Refusal between 0.7m to 1.4m at BH's 1, 3 &4 4..	Moderate	Provide primary treatment to systems with large daily hydraulic loads.
Depth to Water Table	Groundwater/Perched water was not encountered in BH01 – BH4 up to 2.4m below surface level. The Perth Groundwater Atlas (Waters & Rivers Commission) has no available information for the groundwater levels for this site. The Landgate website indicates the ground surface level at this site was approximately 289-298m Australian Height Datum (AHD) falling from Northeast to Southwest	Low	Ensure Minimum 1.5m separation between maximum groundwater level and discharge point of primary treated-site sewage system.
Particle Size distribution	100% passing the 19 mm sieve	Low	NN
Soil Colour	Yellow soil.	Low	NN
Soil Permeability & Design Loading Rates	Soil Permeability Category 1: Gravels and sands–Structureless (massive) to AS1547. Design Loading Permeability 3.3 m/day using the Constant head method as required.	Low	Installation of primary treatment system with leach drain effluent disposal system.

Table 4: Permeability Test Results

Test Location	Testing Depth	Soil Type	Permeability
BH2	0 – 0.6m	SAND	3.2m/day
BH3	0 – 0.6m	SAND	3.1m/day
BH4	0 – 0.6m	SAND	3.6m/day

OVERALL LAND CAPABILITY OF THE SITE

Based on the results of the site and soil assessment tabled above and provided in the appendices, the overall land capability of the proposed onsite sewage system is constrained. However, the proposed onsite sewage system is able to be designed and installed to satifactory meet the requirements of AS 1547 and the Health (treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974.

4. Wastewater Management System

The following sections provide an overview of a suitable onsite sewage system, with sizing and design considerations and justification for its selection. Final detailed design for the system should be undertaken at the time of the building application and submitted to Local Government to seek approval.

4.1 Treatment System

A standard primary treatment septic system consisting of septic tanks and leach drain type effluent disposal.

Refer to the DOH website for the list of approved manufacturers of septic tanks and leach drain section http://ww2.health.wa.gov.au/. The property owner has the responsibility for the final selection of the treatment system and will include the details of it in the Onsite sewage system Approval to Install application form for local government approval.

4.2 Land Application System

A range of possible land application systems have been considered, such as absorption trenches and subsurface irrigation. The preferred system is leach drain type disposal system for proposed Lot 306.

Sizing of Land Application Area

Sized, according for disposal of the calculated daily hydraulic load, the soil classification and quality of effluent being disposed.

Data to be used in the sizing of irrigation disposal area:

- Estimated Daily Hydraulic Load (5-bedroom residence);
  - Maximum 6 Residents = 900L
  - Totalling 900L/day Hydraulic Load (from Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste)1974)
- Soil Classification – Category 1: Gravels and sands–Structureless (massive) to AS1547-2012.
- Provide for 'DS Water Management' similar and/or equal approved flatbed type leach drains.

Area of LAA as per Government Sewage Policy 2019
Secondary treatment for Soil category 1 – Gravels and sands = 180m^2

Note: Application for the new effluent system is to be sized in accordance with current governing regulations.

Siting and configuration of the proposed leach drain disposal system

- Not be used for purposes that compromise the effectiveness of the system or access for future maintenance purposes.

- Be used only for effluent application.
- Have boundaries clearly delineated by appropriate border.
- Have no run-off or seepage of effluent beyond the designated area.

Buffer distances

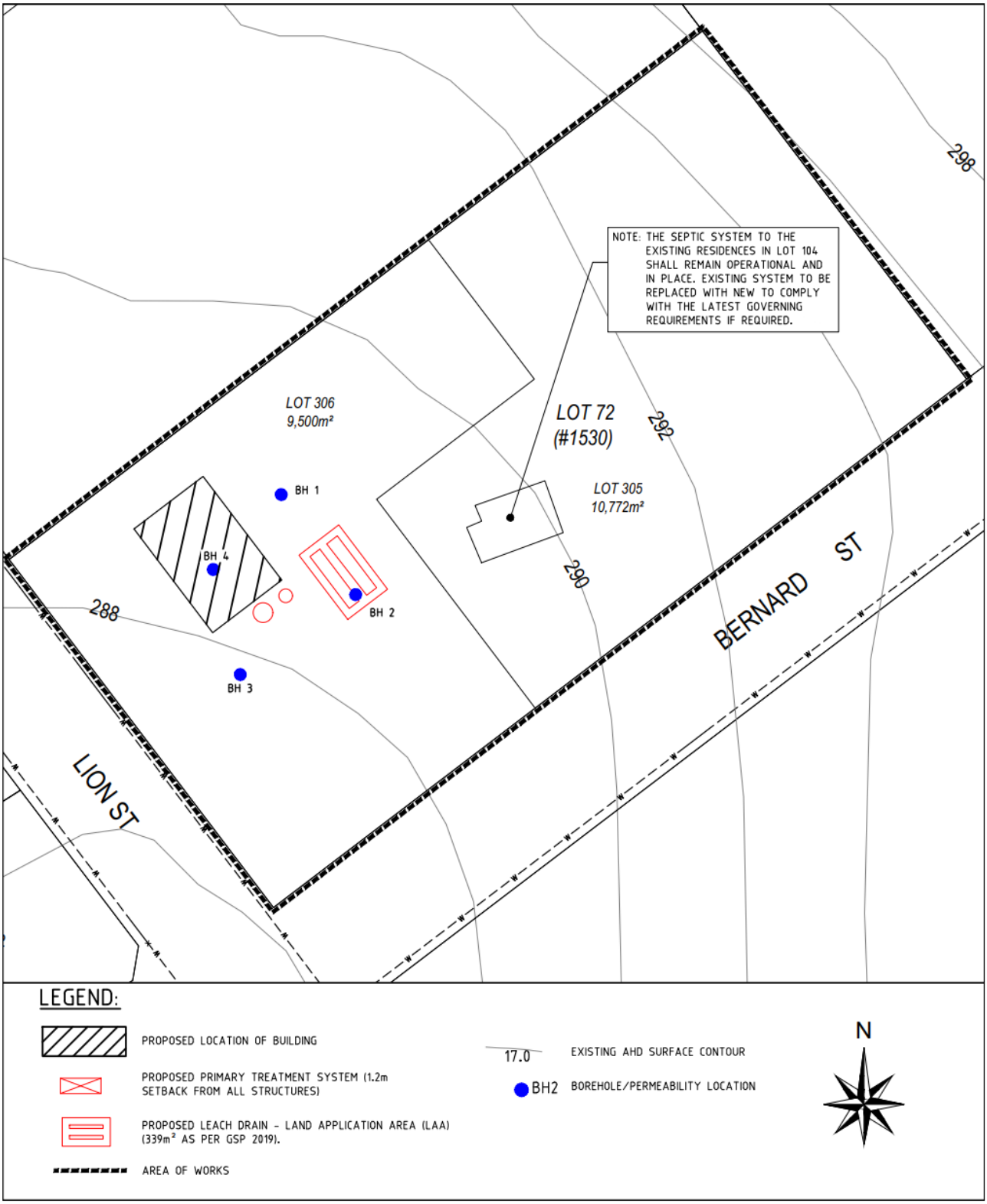
Setback buffer distances from effluent land application areas and treatment systems are required to help prevent human contact, maintain public amenity and protect sensitive environments. The relevant buffer distances for this site are:

- The disposal system should maintain minimum horizontal setbacks of:
  - 100m from high water mark of a reservoir or any bore used for public drinking, reservoir, waterways, significant wetlands and not within a waterway foreshore area or wetland buffer (the separation distance is to be measured from of riparian or wetland vegetation).
  - 30m from potable private bore intended for consumption
  - 1.8m downslope from property boundaries (may be dependent on local authority guidelines)
  - 1.2m from driveways and paved surfaces
  - 6.0m from any stormwater drainage systems
  - 1.8m from building footings
- 1.5m separation from discharge point of the primary treated onsite sewage system to the highest groundwater level.

Installation of the leach drain disposal system

Installation of the leach drain disposal system must be carried out by a suitably qualified and licensed plumber or drainer experienced with onsite sewage disposal systems. Figure 2 shows the preliminary siting of the proposed wastewater disposal system in line with the required setbacks. This plan may differ based on the final number of occupants per building, dwelling location and any other intended developments on site.

Figure 2: Site Plan – Proposed Effluent Disposal



5. Stormwater Management

Stormwater run-on is not expected to be a concern for the proposed effluent disposal area, as it is expected that run-off from the developed site will be managed and maintained within the proposed lot.

All site civil and stormwater works to be designed to the Shire of Mundaring requirements and approvals, with proposed criteria of 1 in 20-year ARI 5 minute duration event (subject to council approval) for proposed Lot 306.

Lot size	9,500m^2
Approximate Impervious Area	300m^2
Required Retention	3.75m^3 Volume

Stormwater collected from roofs and other impervious surfaces must not be disposed of into the wastewater treatment system or onto the land application system.

Note: design of the stormwater drainage will be done by others.

6. Monitoring, Operation and Maintenance

Maintenance is to be carried out in accordance with the manufacturers instructions and to AS/NZS 1547-2012 Section 6, Appendix T & U. The treatment system will only function adequately if appropriately and regularly maintained.

<u>To ensure the treatment system functions adequately, residents must:</u>

- Scrape dishes and remove fats and solids before washing.
- Not dispose solids, sanitary napkins and other hygine products in the system.
- Not use a food waste disposal unit.
- Use household cleaning products that are suitable for septic tanks.
- Keep as much fat and oil out of the system as possible.
- Conserve water (AAA rated fixtures and appliances are recommended).

<u>To maintain adequate performance of the system, residents must ensure:</u>

- Septic tanks and biosolids settling vessels undergo regular pump-out by licensed waste contractors to remove accumulated sediment.
- No structures and/or paths are constructed over the LAA, vehicles avoid access to the LAA to prevent damage.
- Primary septic system to undergo maintenance servicing by a provider approved by the Department of Health as required.

7. Conclusions

As a result of our investigations we conclude that a sustainable onsite sewage management system can be installed to meet the needs of the proposed development at Lot 72 (#1530) Lion Street, Mount Helena. Specifically, we recommend the following:

- The site is not in a sewage sensitive area as per PlanWA online mapping.
- To the proposed development) provide primary level treatment as per Government Sewage Policy 2019 (GSP) requirements.
- Installation of primary treated effluent system, by a suitable DOH-approved treatment system of volume required for final calculated daily hydraulic load.
- LAA level for Lot 306 can be set at the existing ground level and maintain minimum 1.5m clearance from maximum recorded ground water.
- Positioning of LAA for the proposed residential building is to be minimum 100m of waterways at all times.
- At the time of site inspection on 09.08.2023 groundwater was not encountered at 2.5m below surface level.
- The Soil Category for this lot is classified as “Category 1: Gravels & sands– Structureless (massive) as per AS 1547-2012” with inverted leach drain disposal method for primary treatment to be minimum land application area of 180m².
- Operation and management of the treatment and disposal system in accordance with the manufacturers instructions and to AS/NZS 1547, the DOH Approval and the recommendations made in this report.

8. References

Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974

Government of Western Australia (2019). *Government Sewerage Policy.*

Standards Australia/Standards New Zealand (2012). AS/NZS 1547:2012 *On-site domestic-wastewater management*.

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Government of Western Australia, Department of Planning, Lands and Heritage. *PlanWA* *https://espatial.dplh.wa.gov.au/PlanWA/Index.html?viewer=PlanWA*

Government of Western Australia, Department of Water and Environmental Regulation. *Western Australia floodplain mapping*

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Government of Western Australia, Department of Industry and Resources. *Geology and landforms of the Perth region.*

Government of Western Australia, Department of Mines, Industry Reglation and Safety. *GeoVIEW.WA* *https://geoview.dmp.wa.gov.au/geoview/?Viewer=GeoView*

Government of Western Australia, Department of Water. *Lower Serpentine Hydrological Studies – Conceptual Model Report*
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9. Appendix

STRUCterre consulting engineers

Project Lot 72 #1530 Lion Street, Mount Helena
Client Paul Tana

Test No. **BH01**

Project No.	D318688	**Logged By**	Tony Broadway	**Machine**	Soil Retrieval Probe	**Easting**	426428
Job No.	J437420	**Date**	09/08/2023	**Hole Dia.**	65mm	**Northing**	6472627

Depth	Graphic	Stratum Description	Consistency	Samples		Moisture	Water Level
				Depth	Type		
		Topsoil:	L			M	
		SP: SAND: fine to medium grained, non-plastic, trace gravel, grey (Colluvium)	L - MD			M to W	
		Terminated at 0.70 m					
1							
2							
3							

Remarks
1. Termination reason: Refusal - interpreted on dense gravel
2. Hole stability: Hole stable
3. Samples taken: None
4. Co-ordinate system: WGS 84

STRUCterre consulting engineers

Project Lot 72 #1530 Lion Street, Mount Helena

Client Paul Tana

Test No. **BH02**

Project No.	D318688	**Logged By**	Tony Broadway	**Machine**	Soil Retrieval Probe	**Easting**	426446
Job No.	J437420	**Date**	09/08/2023	**Hole Dia.**	65mm	**Northing**	64726015

Depth	Graphic	Stratum Description	Consistency	Samples		Moisture	Water Level
				Depth	Type		
		Topsoil:	L			M	
		SP: SAND: fine to medium grained, non-plastic, trace gravel, grey (Colluvium)	L - MD			M to W	
1							
		Cl: Sandy CLAY: fine to medium grained, medium plasticity, pale grey (Colluvium)	F			W	
2							
		Terminated at 2.50 m					
3							

Remarks

1. Termination reason: Target depth
2. Hole stability: Hole stable
3. Samples taken: None
4. Co-ordinate system: WGS 84

STRUCterre consulting engineers

Project Lot 72 #1530 Lion Street, Mount Helena

Client Paul Tana

Test No. **BH03**

Project No.	D318688	**Logged By**	Tony Broadway	**Machine**	Soil Retrieval Probe	**Easting**	426424
Job No.	J437420	**Date**	09/08/2023	**Hole Dia.**	65mm	**Northing**	6472584

Depth	Graphic	Stratum Description	Consistency	Samples Depth	Samples Type	Moisture	Water Level
		Topsoil:	L			M	
		SP: SAND: fine to medium grained, non-plastic, trace gravel, grey (Colluvium)	L - MD			M to W	
		Terminated at 0.90 m					
1							
2							
3							

Remarks

1. Termination reason: Refusal - interpreted on dense gravel
2. Hole stability: Hole stable
3. Samples taken: None
4. Co-ordinate system: WGS 84

STRUCterre consulting engineers

Project Lot 72 #1530 Lion Street, Mount Helena

Client Paul Tana

Test No. **BH04**

Project No.	D318688	**Logged By**	Tony Broadway	**Machine**	Soil Retrieval Probe	**Easting**	4264402
Job No.	J437420	**Date**	09/08/2023	**Hole Dia.**	65mm	**Northing**	6472611

Depth	Graphic	Stratum Description	Consistency	Samples		Moisture	Water Level
				Depth	Type		
		Topsoil:	L			M	
		SP: SAND: fine to medium grained, non-plastic, trace gravel, grey (Colluvium)	L - MD			M to W	
		CI: Sandy CLAY: fine to medium grained, medium plasticity, trace gravel, pale grey (Colluvium)	St			W	
		Terminated at 1.40 m					

Remarks

1. Termination reason: Refusal - interpreted on dense gravel
2. Hole stability: Hole stable
3. Samples taken: None
4. Co-ordinate system: WGS 84

Appendix B: Boreholes site photos

Borehole 1

Borehole 2

Borehole 3

Appendix C: Site photos