

Report Name: HELENA VALLEY DEVELOPMENT
Project No: PC21219
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Lots 5, 250, 253 and 254 Helena Valley Road



Prepared by:	Brody Beven
Position:	Civil Engineer
Signed:	BB
Date:	11/08/2022

Approved by:	Oleg Omelchuk
Position:	Civil Manager
Signed:	
Date:	11/08/2022

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Peritas Group Pty Ltd

ABN: 56 165 417 407

74 Goodwood Parade

Burswood WA 6100

PO Box 134,

Burswood WA 6100

Telephone: +61 8 6336 9299

Facsimile: +61 8 6336 9288

Internet: www.peritasgroup.com.au

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EXECUTIVE SUMMARY

Key constraints and recommendations of this report are summarised as follows:

Risk Matrix

Consequence	Insignificant	Minor	Moderate	Major	Severe
Likelihood					
<u>Remote</u>	Insignificant	Insignificant	Low	Low	Medium
<u>Unlikely</u>	Insignificant	Low	Low	Medium	Medium
<u>Possible</u>	Low	Low	Medium	Medium	High
<u>Likely</u>	Low	Medium	Medium	High	High
<u>Almost Certain</u>	Medium	Medium	High	High	Extreme

Qualitative Measures of Likelihood or Frequency

Scale	Criteria to be used to establish rating
Almost Certain	Will occur. Circumstances or situations are likely to arise often throughout the planning / project period in which provide the opportunity for crystallization of risk. Expect frequent, regular occurrences.
Likely	Likely to occur more than once in the planning period but not an 'everyday' occurrence. Preconditions will arise at times throughout the period.
Possible	Likely to occur at least once but not expected to occur much more than this in the planning period.
Unlikely	Not likely to occur in the planning period. A small, but remote chance of occurrence due to circumstances/situations that could arise.
Remote	Would only occur in highly exceptional circumstances that are unlikely to exist in any planning period. Extremely remote chance of occurrence in planning period. 'Once in a lifetime' event.

Qualitative Measures of Impact – Consequence Severity

Impact	Consequence Criteria
Severe	Near impossible to develop subject site and expected development viability is very low. E.g., Significant Habitat, Major floodway within site etc. Requires comprehensive development viability analysis and specialist input.
Major	Very difficult to develop subject site and expected development viability is low, will involve significant investigations, very expensive major service relocations, many significant trees of excellent health etc. Requires development viability analysis and specialist input as required.

Moderate	Challenging to develop subject site, expected development viability is adequate, will involve further investigations, costly service relocations, many registered trees of excellent health etc. Specialist input as required.
Minor	Relatively simple challenges to develop site, expected development viability is good. Minor upgrades to existing services are required to develop site.
Insignificant	No challenges or risk to program in developing site.

Degree of Risk

Risk Rating	Definition of Risk Rating
Insignificant	Certain development prospect, no foreseeable challenges.
Low	Site is developable with only minor works or investigations required. It is advised to progress to continue the development process.
Medium	Site is developable with significant works or investigations required. It is advised to progress to continue the development process.
High	Site is developable with major works or investigations required. No further investigation recommended without cost benefit analysis first being undertaken.
Extreme	Site is undevelopable or unviable.

Key Site Risks

VEHICULAR ACCESS

Risk Description: Currently the subject site obtains vehicular access from Helena Valley Road. Construction of the internal shared road network for the development, as well as the proximity of the existing intersections (which may need additional treatment) can result in additional costs and possible delay in approvals for the subdivision.

Risk: **MEDIUM**

Recommendation: Investigation and liaison with the Shire of Mundaring and Main Roads WA as to the potential access points and allowable locations will be required upon realisation of the ultimate development layout.

Refer to **Sections 3.1** for further information.

BUSHFIRE

Risk Description: The current online bushfire mapping listed on the Department of Fire & Emergency Services (DFES) website demonstrates that the subject site is within a Bushfire Prone Area. Additional planning and building requirements may apply to the proposed development.

Risk: **MEDIUM**

Recommendation: Additional planning and building requirements may apply to the proposed subdivisional development in accordance with Schedule 2 Part 10A of the Planning and Development (Local Planning Schemes) Regulations 2015, State Planning Policy 3.7, WA Guidelines for planning in Bushfire Prone Areas, and the Building Code of Australia.

Refer to **Section 2.4** for further information.

SITE GRADING AND EARTHWORKS

Risk Description: Site grading will generally be determined by the proposed building pads, servicing requirements and environmental and geotechnical constraints of the site to ensure a sustainable as well as economic development. Bulk Earthworks will be dictated by building pads and vehicle access point. All stormwater is required by the Shire of Mundaring to be retained and disposed of within the site boundary. To accurately assess stormwater requirements further information is required in regard to the site geotechnical properties. These requirements may incur additional costs and result in potential delays in timeframe for the proposed development.

Risk: **MEDIUM**

Recommendation: The subject site earthworks will mainly be determined by the site vegetation, drainage requirements, wastewater servicing requirements, and the building pads as per the proposed development. Lot 5 and Lot 254 generally slope from the southwest to the northeast from approximately 19m AHD to 10m AHD, and Lot 250 and Lot 253 generally slope from southeast to northwest from approximately 22m AHD to 18m AHD. The water table is estimated to be as shallow as 2.35m below the natural ground surface, therefore it may have an effect on stormwater drainage of the proposed development. It is recommended that a detailed geotechnical assessment be undertaken to accurately assess the site.

Refer to **Section 2.7** for further information.

TRAFFIC CONDITIONS

Risk Description: The proposed development is for approximately 135 residential lots as well as a POS area. The proposed development will introduce new traffic flow to the local vicinity, which may cause disruption to the existing local traffic network.

Risk: **MEDIUM**

Recommendation: It is anticipated that the proposed development may have an impact on the level of service of the local road network in the immediate vicinity, it is therefore recommended that a Traffic Impact Assessment Report be undertaken. The Shire of Mundaring has indicated that the Shire currently does not have a 'development contribution plan'. However, the Shire will generally request as part of a condition of subdivision approval a proportionate contribution to upgrading Helena Valley Road to account for additional traffic generated by subdivision. This will need discussion with the relevant road authorities and may incur additional costs for the development.

Refer to **Sections 3** for further information.

SEWER

Risk Description: The subject site is currently not shown to be by serviced by a sewer connection. Additional wastewater infrastructure will be required for the development. Due to the distance to existing sewer and the natural ground surface levels, the sewer wastewater may incur significant additional costs to service the proposed development.

Risk: **HIGH**

Recommendation: Confirm proposed layout of the development and assess the impact on the existing sewer. Contact Water Corporation to confirm the requirement for works in the vicinity of the existing

infrastructure. Verification with Water Corporation will also be required to confirm serviceability of the site based on the ultimate design of the development.

Refer to **Sections 5** for further information.

POTABLE WATER

Risk Description: The closest potable water connection to the subject site is approximately 350m southeast of the proposed development. Potable water requirements of the proposed development will need to be assessed to determine if provision of additional potable water reticulation infrastructure will be required for the proposed development. All internal potable water reticulation pipework is to be designed and constructed to the Australian standards and requirements of the Water Corporation of Western Australia.

Risk: MEDIUM

Recommendation: Confirm the existing potable water infrastructure's connection, alignment, and size. Correspondence with Water Corporation has confirmed that the current existing water infrastructure is sufficient to accommodate the proposed development without any required upgrades. All internal potable water reticulation pipework is to be designed and constructed to the standards and requirements of the Water Corporation of Western Australia. Standard Water Corporation water headwork charges will apply. Verification with the Water Corporation will also be required to confirm serviceability of the site based on the ultimate design of the development.

Refer to **Sections 6** for further information.

STORMWATER DRAINAGE

Risk Description: The subject site does not currently have any known stormwater infrastructure within the site area. Drainage in the area is by on-site retention and soakage. Construction of on-site stormwater drainage infrastructure will be required for the proposed development which may incur additional costs and potential delays in timeframe.

Risk: MEDIUM

Recommendation: The Shire of Mundaring require that retention devices are to be sized for 5% AEP (1 in 20 ARI), for the critical stormwater duration, if lot levels are above the road level and 1% AEP (1 in 100 ARI), critical stormwater duration, if lot levels are below the road level. A Local Water Management Strategy (LWMS) or Urban Water Management Plan (UWMP) will be required for the proposed development subject to final development layout and completion of a detailed geotechnical investigation.

Refer to **Sections 4** for further information.

GAS

Risk Description: DBYD information and review of the Atco gas network coverage map shows that there is no reticulated gas services available in the immediate surrounding area. The closest gas services is a medium pressure gas main approximately 350m to the southeast of the subject sites. Upgrade of gas service infrastructure is unlikely to be required.

Risk: LOW

Recommendation: Confirm the existing gas service infrastructure's connection, alignment and size.

Refer to **Sections 7.3** for further information.

PEDESTRIAN ACCESS

Risk Description: There is currently no existing Pedestrian Path located in the general vicinity of the subject site. There are two bus stop locations located in close proximity to the subject site. The provision of pedestrian infrastructure upgrades or modifications if required may incur additional costs for the development.

Risk: LOW

Recommendation: Peritas recommend undertaking a condition report of the existing bus stops surrounding the site prior to award of the contract to the builder. Any damages during the construction to be rectified by the builder.

Refer to **Section 3.1** for further information.

ENVIRONMENTAL CONTAMINATION

Risk Description: A contaminated land search on the DWER website indicates the site is not within known contaminated sites, however geotechnical investigations completed by Galt Geotechnics on the subject site show traces of PACM within stockpiles in the subject site. There is no known Acid Sulfate Soils (ASS) in the subject site, however Lot 250 is on the border of having moderate to low ASS disturbance risk (<3m from the surface) so additional testing may need to be undertaken.

Risk: HIGH

Recommendation: Further actions from an environmental contamination perspective may be required for the proposed development site, it is recommended to allow for some contingency to cover the possibility that PACM may be found within the subject site and required to be disposed of. Future development plans, including the depth of excavation and any dewatering for sewer installation, would determine whether further investigation and ASS management is required.

Refer to **Section 2.3** and **2.5** for further information.

ELECTRICAL AND STREETLIGHTING

Risk Description: Western Power distribution infrastructure in the area comprises of HV and LV and there is an existing 132KV transmission line running through Lot 250 and Lot 253 that would likely affect these lots. The provision of relocating the O/H electrical service infrastructure will be required for the proposed development which will incur significant additional costs and result in potential delays in timeframe.

Risk: HIGH

Recommendation: Confirm the existing electrical service infrastructure's connection, alignment, and size. Extracts from the 2021 and 2031 Western Power Network Capacity Forecast indicates that less than 5MVA remaining capacity is available for both the 2021 and 2031 forecast. Initial correspondence with UPD has indicated that the total load requirement for the proposed development is 635 kVA and the load is to be connected into the existing aerial network. Any relocation, whether aerial or below ground will require approvals from adjoining landowners. Refer to **Sections 7.1** for further information.

FLOOD

Risk Description: The major surface water feature in close proximity to the subject site is the Helena River, located approximately 100m to the northeast of site. The Helena River Flood study shows a small part of the Lot 5 and Lot 254 are affected by flooding during major river flows with the 1 in 100 (1%) AEP flood levels estimated to be 10.8 m AHD.

Risk: LOW

Recommendation: DWER provided advice that the proposed development (ie, filling, building, etc) that is located outside of the floodway is considered acceptable with respect to major flooding. A minimum habitable floor level of 0.5 metre above the adjacent 1% AEP flood level is recommended to ensure adequate flood protection (e.g. 11.3 m AHD). No new buildings are acceptable in the floodway. The lowest point of the natural surface level of the proposed development area is 14m AHD which is significantly above the 1% AEP flood level as advised by DWER and shouldn't be an issue for the proposed development.

Refer to **Section 2.6** for further information.

This Engineering Services Report is for information only. Developers are required to undertake their own assessments of the site prior to forwarding a Development Application with WAPC.

TABLE OF CONTENTS

EXECUTIVE SUMMARY 3

1. INTRODUCTION10

1.1. PROPOSED DEVELOPMENT11

2. SITE EVALUATION11

2.1. SITE TOPOGRAPHY11

2.2. SITE GEOLOGY12

2.3. GROUND WATER AND ACID SULFATE SOILS14

2.4. BUSHFIRE15

2.5. ENVIRONMENTAL AND CONTAMINATION16

2.6. FLOOD17

2.7. SITE GRADING & BULK EARTHWORK17

2.8. LAND STABILISATION AND DUST SUPPRESSION18

3. ROAD NETWORK & TRAFFIC CONSIDERATIONS18

3.1. VEHICULAR AND PEDESTRIAN ACCESS18

4. STORMWATER DRAINAGE19

5. WASTEWATER DISPOSAL20

6. POTABLE WATER SUPPLY20

7. POWER, TELECOMMUNICATION & GAS20

7.1. WESTERN POWER20

7.2. TELECOMMUNICATION SERVICES21

7.3. GAS SUPPLY21

8. CONCLUSIONS & RECOMMENDATIONS22

9. PRELIMINARY ORDER OF COST MAGNITUDE22

APPENDIX A– ZONING MAP 24

APPENDIX B – CONCEPT PLAN 25

APPENDIX C – GALT GEOTECHNICS BOREHOLE MAP 26

APPENDIX D – 1% AEP FLOOD MAP 27

APPENDIX E – WATER CORPORATION SEWER & WATER SERVICES 28

APPENDIX F – UPD REPORT 29

APPENDIX G – DBYD MAPS 30

1. INTRODUCTION

Peritas Group was commissioned by Dynamic Planning and Developments to review the engineering constraints and servicing requirements associated with the Development of the subject site.

The subject site comprises of Lot 5, Lot 250, Lot 253 and Lot 254 Helena Valley Road, Helena Valley with areas of 4.85ha, 1.91ha, 2.99ha, and 4.31ha respectively, with a combined total area of 14.06ha. Both Lots 250 and 253 are bound by Helena Valley Road to the north and by vacant land to the south. Lots 5 and 254 are bound by Helena Valley Road to the south and vacant land to the north as shown in **Figure 1** below.



Figure 1 Aerial View

The majority of the land that is going to be developed is clear of vegetation, with thick vegetation outside of the proposed development area. Lot 5 and Lot 253 have existing structures on the site that will require to be demolished.

In summary, this report highlights:

- The subject land is capable of sustaining development in keeping with the proposed residential development.
- The land is capable of being connected to and provided with all essential services to sustain residential development (based on current and future service authority planning).
- The proponent's strategy for the subject land will complement the natural landform by careful design of the bulk excavation, site grading and landscaping.

This report has been compiled based on the following terms of reference:

- Briefing discussions and a meeting with the client.
- Site inspection and site walkover.
- Numerous discussions with Local Government Agencies.
- Site data and documents included on this report.
- Servicing concepts and Regional Strategic Infrastructure planning by the regulatory authorities.

The subject site is currently zoned as Rural Residential, with a small portion of Lot 253 zoned as Urban Development Zone. It is proposed that the subject site is rezoned with all four lots re-zoned as Urban, see **Appendix A** for more details.

1.1. PROPOSED DEVELOPMENT

The proposed development comprises of a 135 residential lot subdivision split over four contributing lots. Lot 5 consists of 49 residential lots, Lot 250 consists of 23 residential lots, Lot 253 consists of 41 residential lots, and Lot 254 will consist of 22 residential lots. The proposed subdivision layout can be seen in **Appendix B**.

2. SITE EVALUATION

Within this section, a detailed summary of the existing services and constraints information has been compiled and summarised for the subject site. The detailed analysis includes review of Dial Before You Dig (DBYD) information, aerial photography, review of DWER and DPLH Databases, Water Corporation records and correspondence obtained from service authorities.

2.1. SITE TOPOGRAPHY

Lot 5 is generally mild sloping from west to east for the majority of the proposed development area with some steeper grades in the northeast of the site. The natural surface is approximately 19m AHD in the southwest of the site and 11m AHD in the northeast of the site towards the Helena River.

Lots 250 and 253 are generally flat to mild sloping from west to east for the whole of the proposed development area. The natural surface is approximately 22m AHD in the southeast of Lot 253 and 18m AHD in the northwest of Lot 250.

Lot 254 is generally moderate sloping from southwest to northeast for the whole of the proposed development area. The natural surface is approximately 19m AHD in the southwest and 10m AHD in the north of the site.

Subject to final development layout the land might require bulk earthworks to be completed to regrade the site to suit building footprint. See **Figure 2** below for more information on site topography.

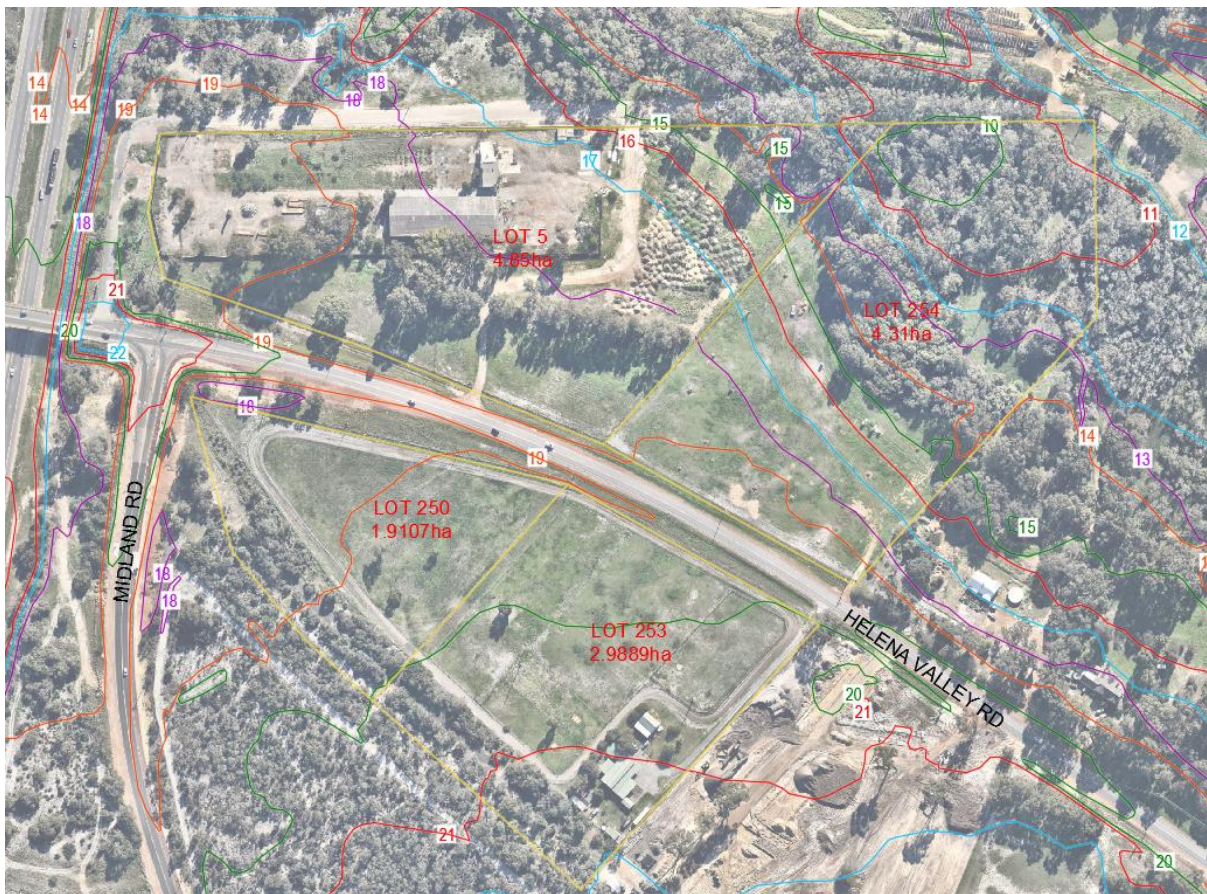


Figure 2 Natural Surface Level Contours (Water Corporation ESInet 22)

2.2. SITE GEOLOGY

The subject site geology can be seen in **Figure 3** on the next page, which shows that the majority of the subject site is associated with pebbly silt with the majority of the southern portion of Lot 253 associated with sand. Pebbly Silt (Mgs1) can be classified as strong brown silt with common, fine to occasionally coarse-grained, sub-rounded laterite quartz, heavily weathered granite pebble, some fine to medium-grained quartz sand, of alluvial origin. S10 Sand (S10) can be classified as S8 over sandy clay to clayey sand of the Guildford Formation of eolian origin.

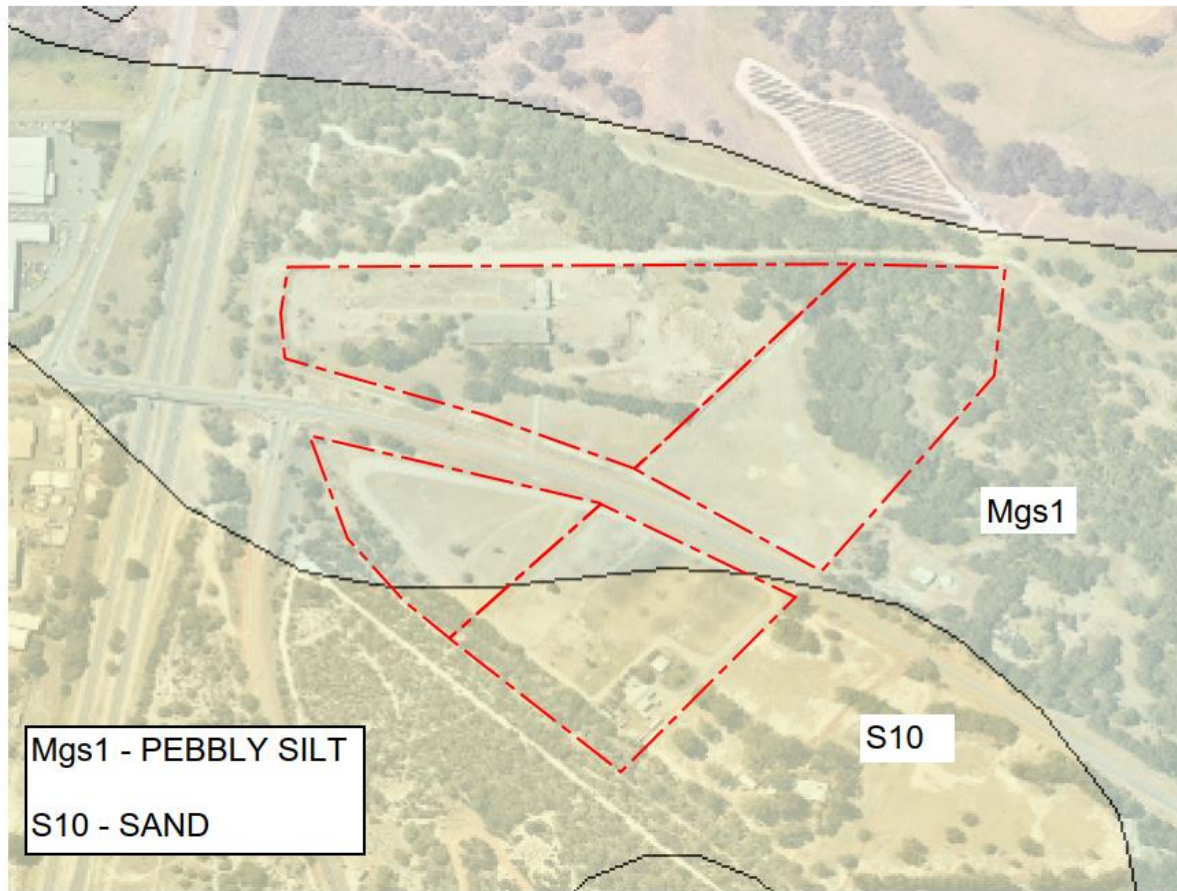


Figure 3 Site Soil Classification (DMIRS 21)

On 6 October 2021 Galt Geotechnics undertook a due diligence level geotechnical investigation on Lot 5 and Lot 250. The geotechnical investigation found that the thickness of Bassendean Sand over the site is thicker than that indicated on the geological map. Surficial fill layers were also encountered and are associated with previous development of the site

The subsurface condition and groundwater are summarised in Table 1 from the Galt Geotechnical report shown below. The borehole locations can be found in **Appendix C**.

Table 1: Summary of Tests

Test Name	Test Depth (m)	Depth to Groundwater (m)	Stratigraphy
BH01	3.0	GNE ¹	ASPHALT; overlying BASE COURSE; overlying FILL: SAND; overlying SAND
BH02	1.5	GNE	FILL: SANDY GRAVEL; overlying SAND
BH03	2.0	GNE	TOPSOIL ORGANIC SAND; overlying SAND
BH04	3.0	2.35	FILL: GRAVEL / SANDY GRAVEL; overlying SAND
BH05	3.0	2.70	TOPSOIL ORGANIC SAND; overlying SAND
BH06	1.5	GNE	UNCONTROLLED FILL: SANDY GRAVEL; overlying SAND
BH07	3.0	GNE	UNCONTROLLED FILL: SANDY GRAVEL / SAND; overlying SAND; overlying CLAYEY SAND; overlying SANDY CLAY
BH08	1.5	GNE	TOPSOIL ORGANIC SAND; overlying SAND
BH09	3.0	2.45	
BH10	1.5	GNE	
BH11	1.5	GNE	FILL SANDY GRAVEL; overlying SAND

Notes: All boreholes reached target depth. ¹GNE = Groundwater was not encountered.

The subject site will require further investigation during specific development phases with due regard to the proposed building pads and drainage requirements.

2.3. GROUND WATER AND ACID SULFATE SOILS

Maximum historical groundwater level information for the subject site was not available from the Department of Water & Environmental Regulation (DWER) at the time of this report, however the Geotechnical Investigation completed by Galt Geotechnics mentioned above provides some information on ground water levels.

The results from Galt Geotechnics field investigations show that the Ground Water Level (GWL) in Lot 250 is approximately 2.45m below the natural surface and in Lot 5 the GWL varies from 2.35m to more than 3.0m below the natural surface. The depth to GWL could have negative implications on the stormwater drainage of the development and should be investigated further during specific development phases.

Based on the information from DWER groundwater database and shown in **Figure 4** below there is no known Acid Sulfate Soils (ASS) in Lot 5 and Lot 254, however the southern portions of Lot 250 and Lot 253 have moderate to low ASS disturbance risk (<3m from the surface). It is recommended that additional testing to be undertaken to determine any potential ASS. Based on information from the DWER database, groundwater salinity is between 250-500mg\L.

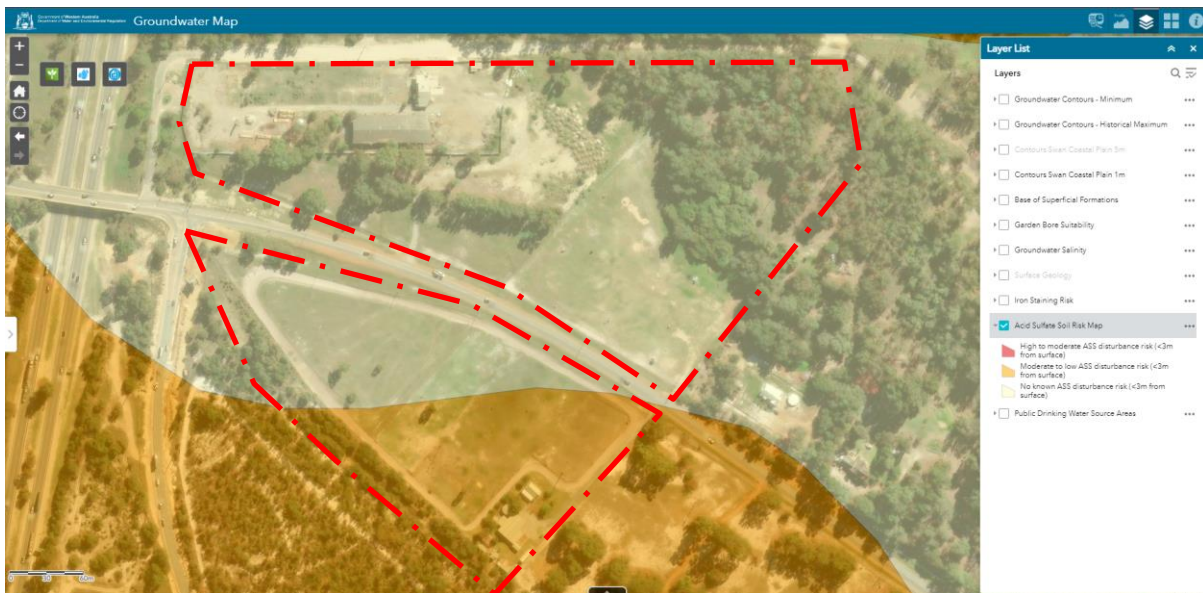


Figure 4 DWER Acid Sulfate Soils

2.4. BUSHFIRE

The current online bushfire mapping listed on the Department of Fire & Emergency Services (DFES) website demonstrates that the subject site is within a Bushfire Prone Area, as shown in **Figure 5** below. Additional planning and building requirements may apply to the proposed subdivisional development in accordance with Schedule 2 Part 10A of the Planning and Development (Local Planning Schemes) Regulations 2015, State Planning Policy 3.7, WA Guidelines for planning in Bushfire Prone Areas, and the Building Code of Australia.

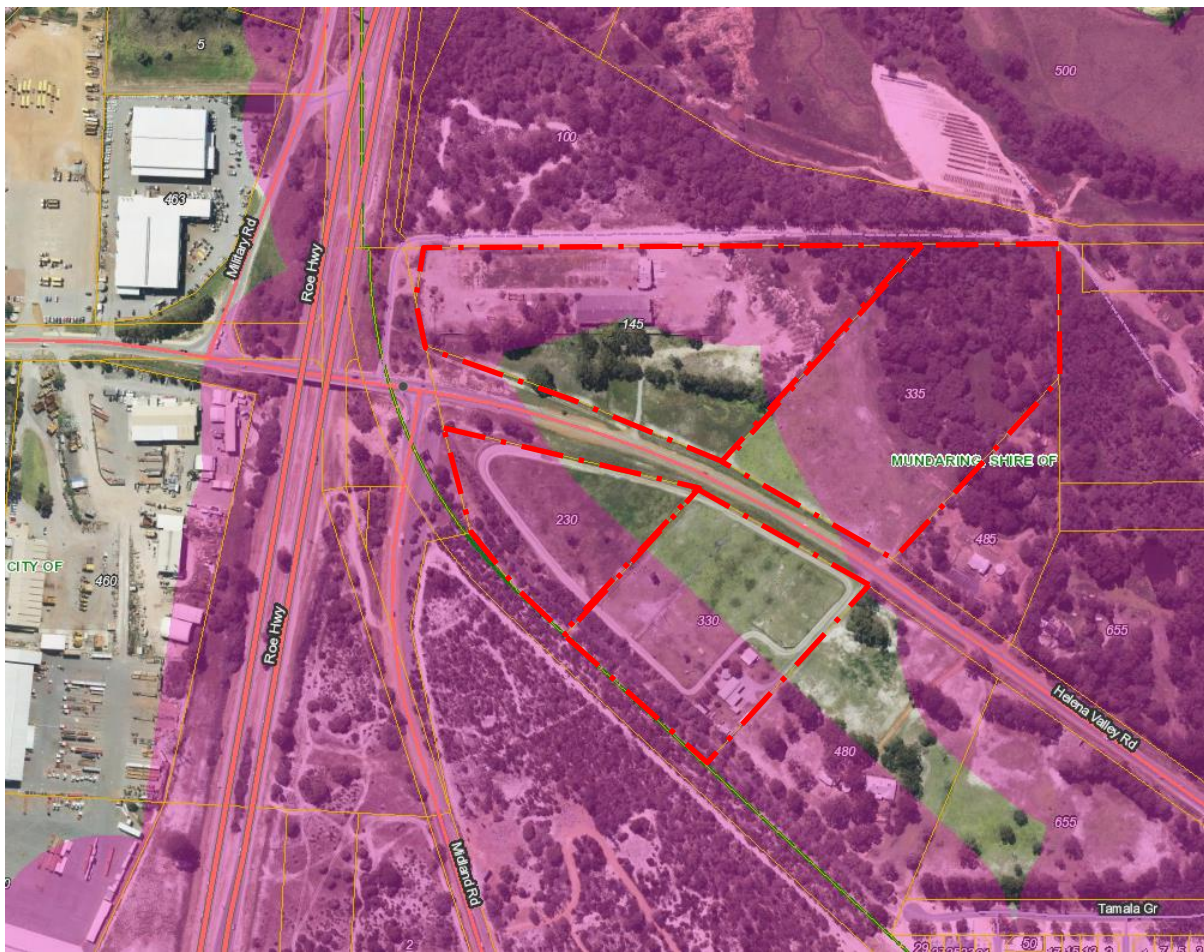


Figure 5 DFES Bushfire Prone Map 2021

2.5. ENVIRONMENTAL AND CONTAMINATION

A contaminated land search on the DWER website indicates the site is not within known contaminated land, however, Galt Geotechnics undertook a due diligence level geotechnical investigation on the site and found some presence of PACM within the existing stockpiles. Galt provided the following recommendations:

- *stockpiled material will require further assessment prior to re-use;*
- *that any future personnel operating in close proximity to the existing structures wear a P2 mask and note the presence of PACM on job hazard analysis (JHA) documentation;*
- *appropriate signage be erected the site to advise of the presence of asbestos;*
- *a detailed asbestos assessment may be undertaken as part of the DSI that will be required to support the future development; and*
- *removal of any PACM from the site should be undertaken by a suitably licenced contractor.*

2.6. FLOOD

The major surface water feature in close proximity to the subject site is the Helena River, located approximately 100m to the northeast of site.

The Helena River Flood study shows a small part of the Lot 5 and Lot 254 are affected by flooding during major river flows, with the 1% AEP flood levels estimated to be 10.8 m AHD. The following advice was provided by DWER:

“The Helena River Flood study shows a small part of the Lot 5 is affected by flooding during major river flows with the 1 in 100 (1%) AEP flood levels estimated to be 10.8 m AHD.

Based on our floodplain management strategy for the area:

- *Proposed development (ie, filling, building, etc) that is located outside of the floodway is considered acceptable with respect to major flooding. However, a minimum habitable floor level of 0.5 metre above the adjacent 1% AEP flood level is recommended to ensure adequate flood protection (e.g. 11.3 m AHD).*
- *Proposed development (ie, filling, building, etc) that is located within the floodway (marked yellow on the map) and is considered obstructive to major flows is not acceptable as it would increase flood levels upstream. No new buildings are acceptable in the floodway.*

Please note that this advice is related to major river flooding only and does not include local stormwater.

Other planning issues, such as local stormwater, environmental and ecological considerations, may also need to be addressed.”

The lowest point of the natural surface level of the proposed development area is 14m AHD which is significantly above the 1% AEP flood level as advised by DWER and shouldn't be an issue for the proposed development. Refer to **Appendix D** for flood mapping details.

2.7. SITE GRADING & BULK EARTHWORK

Site grading and remodelling should be kept to minimum limits wherever possible but will be required to form roadworks, building pads for future development, and associated works within the following parameters:

- Creation of the building pads for the proposed development.
- Contouring of land to suit servicing requirements for the development, in particular wastewater reticulation and stormwater drainage requirements.
- Clearing of trees and vegetation.
- Possible 1% AEP flood protection requirements based on final proposed development layout.

Site grading will generally be determined by the proposed building pads, servicing requirements and environmental and geotechnical constraints of the site to ensure a sustainable as well as economic development.

Peritas anticipate that the bulk earthwork operations will be partly completed using material available from the area. If importation of sand is required, it will be sourced from existing sand mining operations within

the locality.

Preparatory works prior to earth working should be limited to the following:

- Removal of existing trees and vegetation.
- Demolition and disposal of existing buildings.
- Removal of fencing and other improvements as necessary.
- Stripping and grubbing of areas to be earth worked to the depth 700mm below existing ground level.
- Strip and disposal of topsoil.
- Cut to fill operations and imported fill to selected areas to suit design layout.
- Stabilisation of any areas to be landscaped or where topsoil has not been respread on verges and embankments.

Site levels shall be set in accordance with the following parameters:

- Geotechnical and soil parameters to ensure that the site is capable of the development.
- Fill levels to provide clearance to groundwater (AAMGL and as prescribed by authority approvals).
- Finished building pad levels are to be 0.5m above 1% AEP flood levels.
- If required finished transformer site pad levels are to be set at least 1.0m above 1% AEP flood event.

Upon completion of bulk earthworks, any disturbed areas shall be stabilised either by respraying the stockpiled topsoil from the bulk earthwork operations or via hydro mulching stabilisation as appropriate or in accordance with the requirements of the local authority.

2.8. LAND STABILISATION AND DUST SUPPRESSION

Prior to construction taking place, a construction water supply will be established to provide water for dust suppression, temporary sand stabilisation and irrigation during the construction phases. Water trucks and spray equipment will be on site throughout the construction programme to damp down exposed sand surfaces until the surface is physically stabilised. In the event that adjacent occupied homes or trafficked roads are affected by sand drift, a sand trapping fence will be constructed fronting the affected section of the development.

In the event of strong winds blowing towards adjacent properties that cause blown sand to reach those properties, earthworks, including the stripping or respraying of topsoil, will be temporarily suspended and dust suppression measures immediately implemented.

Stabilisation of the soil surface will be carried out, as required, immediately following topsoil re-spreading and minor regrading. Soil stabilisation will be maintained until such time as the building construction commences.

3. ROAD NETWORK & TRAFFIC CONSIDERATIONS

3.1. VEHICULAR AND PEDESTRIAN ACCESS

Currently all four lots obtain vehicular access from Helena Valley Road which has an approximate 9m seal width with a unsealed shoulder on either side of varying width.

Lot 5 Currently has two sealed driveway or access points for access onto the subject site, neither of which will be used for access to the proposed development, access will instead be through the development on Lot 254, which will gain access from Helena Valley Road. Lot 250 currently gains access through an unsealed road that goes through lot 253, access to the proposed development will still be obtained through Lot 253 when it is developed, and Lot 253 will gain access from Helena Valley Road. The existing internal unsealed

road network within Lot 5, Lot 250, and Lot 253 is to be removed during the bulk earthworks and re-grading of the site.

There are four bus stop locations located in close proximity to the subject site. The approximate locations of the bus stops are circled in red in **Figure 6** below.



Figure 6 Existing Pedestrian and Public Transport Infrastructure

4. STORMWATER DRAINAGE

The following existing stormwater drainage information has been compiled from DBYD information:

- The subject site does not currently have any known stormwater infrastructure within the site area.
- There is a creek that runs through the northeast corner of Lot 254 that connects to Helena River.
- Based on historical aerial imaging drainage in the area is assumed to be by on-site retention and surface runoff towards Helena River.
- There is limited drainage infrastructure at road intersections as water is conveyed to verges for direct infiltration.

Shire of Mundaring Stormwater Design Guidelines for Subdivisional and Property Development

The Shire of Mundaring Stormwater Design Guidelines indicate that the stormwater drainage method is either via Onsite Retention (OSR) or Onsite Detention (OSD) based on the results of a geotechnical investigation. Given the results of the Geotechnical Investigation completed by Galt Geotechnics the subject site is likely to be drained via OSR, which for a residential development shall be designed as follows:

- Retention devices are to be sized for 5% AEP (1 in 20 ARI), critical stormwater duration, if lot levels are above the road level.

- Retention devices are to be sized for 1% AEP (1 in 100 ARI), critical stormwater duration, if lot levels are below the road level.
- A combination of below and above ground storage can be considered for battle axe or common access driveways. Underground retention is to be sized for a minimum of 5% AEP (1 in 20 ARI) events. The maximum inundation depth for above ground storage is 50mm.
- If the development is land-locked, the minimum pad level is to be set at 150mm above the lowest lid point of the inlet pit.
- All storage devices are to be connected at or near the top of the device.
- Developers are encouraged to introduce water quality improvement devices such as rainwater gardens, vegetated swales and biofiltration.

A Local Water Management Strategy (LWMS) or Urban Water Management Plan (UWMP) will be required for the proposed development subject to final development layout and completion of a detailed geotechnical investigation.

5. WASTEWATER DISPOSAL

Preliminary information from the WA Water Corporation indicates that there is no reticulated sewer service network within the immediate area.

There is a DN150 sewer main located approximately 350m down Helena Valley Road to the southeast of Lot 253. The Inver Level (IL) of the sewer main is 13.49m AHD and the ground level towards the subject site slopes up to 20 m AHD, this would require approximately 5m trenching or boring through the hill to service the proposed development. There is potential issues with cover to sewer mains at the furthest most lots meaning that additional fill may be required, however it is unlikely given the initial depth.

Peritas have also investigated another option which involves connecting to a deeper DN225 sewer main at IL 10.41 m AHD approximately 350m to the east of Lot 254 that will go around the hill. See **Appendix E** for more details on wastewater reticulation and see the two possible locations to connect to existing sewer from.

All works in the vicinity of the existing sewer should be completed in accordance with Water Corporation Technical Guidelines for working near Water Corporation assets.

6. POTABLE WATER SUPPLY

Preliminary information from the WA Water Corporation indicates that there is a potable water supply network in the area. A 250P-12 potable water pipe is located approximately 350m to the southeast of the subject site along the northern verge of Helena Valley Road. The potable water main will need to be extended to the subject site to service the proposed development. See **Appendix E** for more details.

The requirements of the subject site will need to be confirmed prior to development to ensure that the current existing water infrastructure is sufficient to accommodate the proposed development without any required upgrades.

7. POWER, TELECOMMUNICATION & GAS

7.1. WESTERN POWER

The proposed development currently has overhead HV and LV infrastructure in the subject site vicinity. Initial correspondence with UPD (Underground Power Development) has indicated that the total load

requirement for the proposed development is 635 kVA and the load is to be connected into the existing aerial network. see **Appendix F** for UPD Servicing Report.

There is an existing 132KV transmission line running through Lot 250 and Lot 253 that would likely affect the lots. Peritas is currently investigating the options of aerial and underground diversion of the power infrastructure. Costs may be prohibitive and may require the lots to be designed out via a POS or other non-habitable lot if the costs prove significant.

7.2. TELECOMMUNICATION SERVICES

There is existing comms infrastructure along Helena Valley Road, Midland Road, and along the sealed road that runs along the north boundary of Lot 5. See **Appendix G** for further information.

The selected provider will install telecommunication facilities to the proposed development, subject to the developer paying connection fees.

Some additional cost may be applicable for relocation of existing pits and pipes subject to the development layout.

7.3. GAS SUPPLY

According to DBYD there is no reticulated gas services available in the immediate surrounding area. The closest gas service is a 160 PE 3.9MP 70kPa medium pressure gas main approximately 350m to the southeast of the subject site as seen in **Appendix G**.

Gas connection will be provided as on the application from the builder.

8. CONCLUSIONS & RECOMMENDATIONS

Peritas does envisage some possible major servicing constraints for the proposed development and has allowed appropriate costs for major servicing infrastructure upgrades based on a stand-alone site development of the subject land.

The site is capable of being serviced with all essential services, has possible major identifiable problematic soil conditions based on preliminary inspection of the site and with careful considered design would result in a high quality development.

It is recommended that additional detailed work be undertaken in conjunction with the regulatory authorities and service providers at development application stage to determine the land requirements associated with the necessary infrastructure changes as described in the report above. This would include the following:

1. Undertake detailed geotechnical site investigation to confirm the extent of PACM on site within existing stockpiles and allow appropriate contingency to cover.
2. Liaise with Water Corporation in regard to proposed sewer and water connections.
3. Liaise with Western Power in regard to relocation of existing overhead powerline infrastructure.
4. Undertake traffic assessment report and conform with the Shire of Mundaring advice and allow contributions for upgrades to Helena Valley Road if required.
5. Liaise with Main Roads WA for any potential impacts by future upgrades at the intersection of Roe Highway.
6. Liaise with the Shire of Mundaring to confirm stormwater requirements.

Additionally, the major service authorities should be approached to formally confirm further details of any upgrade requirements so that the early planning major infrastructure can be undertaken and forward work construction programmed.

9. PRELIMINARY ORDER OF COST MAGNITUDE

Peritas Consulting has no control over the cost of labour, materials, equipment or services furnished by others, neither has it control over contractors methods for determining prices, competitive bidding or market conditions. The opinion of probable construction cost produced by Peritas Consulting has been made on the basis of our best judgement as an experienced and qualified engineering consultant, familiar with the construction industry. We have used 2021 to 2022 market rates from different projects to derive the average construction rates. As such our rates are applicable for the next 6 months only, after which we would recommend to make an allowance for the cost adjustment based on the market conditions.

The estimated construction costs have been based on an AACE Estimated Classification – Class 3, as per Estimate Classification Matrix shown on **Figure 7** below.

We have allowed for 20% construction contingency to civil works only, as recommended based on AACE Estimated Classification Class 3 estimates.

ESTIMATE CLASS	Primary Characteristic	Secondary Characteristic			
	LEVEL OF PROJECT DEFINITION Expressed as % of complete definition	END USAGE Typical purpose of estimate	METHODOLOGY Typical estimating method	EXPECTED ACCURACY RANGE Typical variation in low and high ranges [a]	PREPARATION EFFORT Typical degree of effort relative to least cost index of 1 [b]
Class 5	0% to 2%	Concept Screening	Capacity Factored, Parametric Models, Judgment, or Analogy	L: -20% to -50% H: +30% to +100%	1
Class 4	1% to 15%	Study or Feasibility	Equipment Factored or Parametric Models	L: -15% to -30% H: +20% to +50%	2 to 4
Class 3	10% to 40%	Budget, Authorization, or Control	Semi-Detailed Unit Costs with Assembly Level Line Items	L: -10% to -20% H: +10% to +30%	3 to 10
Class 2	30% to 70%	Control or Bid/Tender	Detailed Unit Cost with Forced Detailed Take-Off	L: -5% to -15% H: +5% to +20%	4 to 20
Class 1	50% to 100%	Check Estimate or Bid/Tender	Detailed Unit Cost with Detailed Take-Off	L: -3% to -10% H: +3% to +15%	5 to 100

Notes: [a] The state of process technology and availability of applicable reference cost data affect the range markedly. The +/- value represents typical percentage variation of actual costs from the cost estimate after application of contingency (typically at a 50% level of confidence) for given scope.
 [b] If the range index value of "1" represents 0.005% of project costs, then an index value of 100 represents 0.5%. Estimate preparation effort is highly dependent upon the size of the project and the quality of estimating data and tools.

Figure 7 Estimate Classification Matrix

On the next page is an Opinion of Probable Costs, which includes **extra over** costs for infrastructure and potential road extensions through neighbouring lots, based on information available at the time of the preparation of the report.