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25<sup>th</sup> August 2022

Enquiries: Renata Tracey

Project No: 301350969

Kosciuszko Thredbo Pty Ltd

PO Box 92

Thredbo NSW 2625

Attention: Chloe Chalk

Dear Mrs Chalk,

**RE: Alpine Coaster, Thredbo – Stormwater and Flood Management Letter**

This letter is written in response to Spectrum Property and Projects' request for Stormwater and Flooding Guidance, and outlines the conceptual stormwater drainage design for the proposed Alpine Coaster and associated works at Valley Terminal precinct. The site's address is 2 Friday Drive Thredbo, NSW 2625, and real address is Lot 876/ DP1243112. The site is located in the Kosciuszko National Park Alpine Resorts area and is subject to planning controls under Chapter 4 – Kosciuszko National Park and alpine resorts of the State Environmental Planning Policy (Precincts – Regional) 2021.

We understand that the project involves the construction of Alpine Coaster which is a 1,445m long above-ground structure with a mix of uphill (approx. 405m) and downhill track (approx. 1,040m). A tunnel section is proposed at the start of the uphill track to be constructed using precast culverts. We understand that works on the adjacent site to upgrade Snowgums bottom station will also be part of these works. A locality plan showing the proposed works in relation to the existing infrastructure near the site is shown below.



Figure 1 – Locality Plan

## STORMWATER

The purpose of this section is to evaluate the quantity and quality of stormwater associated with the proposed development plan so as to demonstrate that an appropriate stormwater management strategy will be adopted.

### Existing Topography and Stormwater Infrastructure

The site currently slopes towards Thredbo River, to the South East of site. Through survey analysis and geotechnical report review, it has been determined that the site's regional topography comprises of moderately to steeply sloping terrain upslope of the North-easterly flowing Thredbo River. Ground slopes over the alignment generally range from 8° to 17° and some locally steeper sections up to approximately 25° to 30°.

Refer to Figure 2 below for survey information, where Stantec has marked the overland flow routes with red arrows. The contours are in 0.5 metre intervals, and the site generally has 10m of fall between the North of the Valley Terminal Precinct and the Thredbo River. The indicative location of existing stormwater infrastructure is shown in purple, and the proposed works and important existing stormwater features are notated in red for reference.

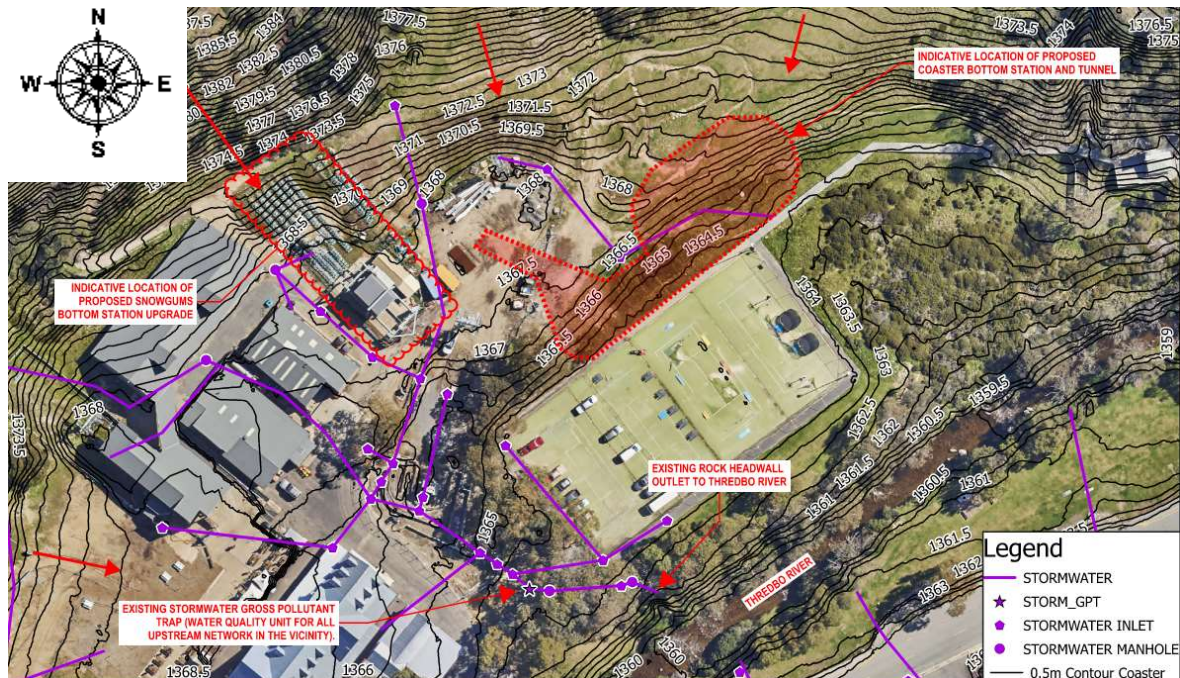


Figure 2 - Site Survey, Fall and Existing Stormwater

There are currently many points of stormwater infrastructure within the site. Survey conducted on the site shows the best estimated location of existing stormwater infrastructure. Refer to the figure above.

A network of subsurface drainage consisting of an in-ground pit and pipe network located within the site and adjoining the works area. Generally, all stormwater within proximity of the works (nearby Gondola) flows into the existing gross pollutant trap (GPT) as noted in the figure above. Downstream of the existing GPT is the existing rock headwall which is the network's outlet to Thredbo River. The image below shows the existing rock headwall outletting to Thredbo River.



Figure 3: Photos showing existing rock headwall, outlet to Thredbo River (GPT piped to outlet)

### **Geotechnical Review**

Stantec has reviewed the geotechnical investigation report prepared for the site entitled Proposed Alpine Coaster Thredbo NSW Geotechnical Investigation dated 11 August 2022 prepared by AssetGeoEnviro. Figure 3 below shows the testing locations with test point labels indicated.

Based on the site investigations conducted, the site has been delineated into three main areas listed below:

- Upper Slope (test points TP01 to 14, 21 to 25)
- Lower Slope (test points TP15 to 18)
- Tunnel Section (test points TP19 & 20)

The geotechnical report provided insights on the groundwater levels observed on site as follows:

- Groundwater was generally not observed at the test locations within the Upper Slope except at TP 05 where slow groundwater inflow at 0.5 m depth was noted
- Groundwater was observed within the lower slope at TP18 where moderate groundwater inflow at 1.0m depth was noted
- Groundwater was not observed in TP19 within the 2m depth of excavation, and rapid groundwater inflow was observed in TP20 at 1.3m depth.

Diversion trenching, groundwater pumping and dewatering works will be required during construction on the following key locations:

- When installing footings or support for the circular downhill turn near TP05 location
- When constructing works around the coaster bottom station and tunnel. Groundwater inflow was already observed at 1m depth from the existing surface at TP18 which is adjacent to the tunnel works area. The tunnel will require approximately 2-3m of excavation as such, dewatering measures may be required including diversion trenching and pumping.
- When installing the coaster and support at the start of uphill section near TP20.

Considering the findings stated above, Stantec recommends the following temporary mitigation measures in working on areas with shallow groundwater level to be considered together with the recommendation of the geotechnical engineer:

- Provide filter dam to temporarily hold pumped groundwater from tunnel excavation for containment and filtering prior to diversion release. Location, configuration, and specifications to be further investigated during the detailed design stage. Indicated location marked up on the figure below.

- Provide rock-lined earth swale and bund north of tunnel and coaster bottom station.
- Provide contour drains at suitable intervals to divert overland flow from the hill away from the tunnel and coaster bottom station. A contour drain is a rocklined earth swale which runs perpendicular to the direction of overland flow. See figure below. Locations, size, and specifications to be further developed during detailed design stage.

#### AUSTRALIAN GEOGUIDE LR5 (WATER & DRAINAGE)

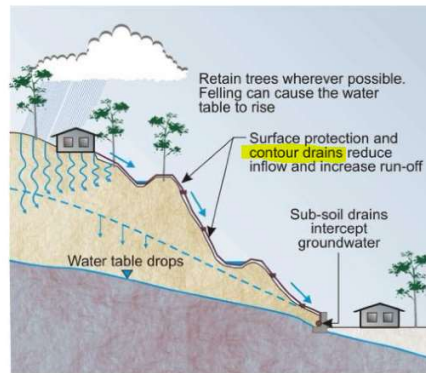


Figure 2 - Techniques used to control groundwater flow

- Provide subsoil drain around the constructed tunnel infrastructure to intercept groundwater and relieve water pressure to the structure.
- Ensure all underground infrastructure in this area has relevant waterproofing
- If required, approval is to be sought from the relevant authority for dewatering activities

In addition to the groundwater level constraints around the area where the tunnel will be constructed, the geotechnical report also noted that there may be variable excavation conditions such as potentially harder rock below the depths of investigation which should be taken into consideration when working on tunnel design and construction methodologies.

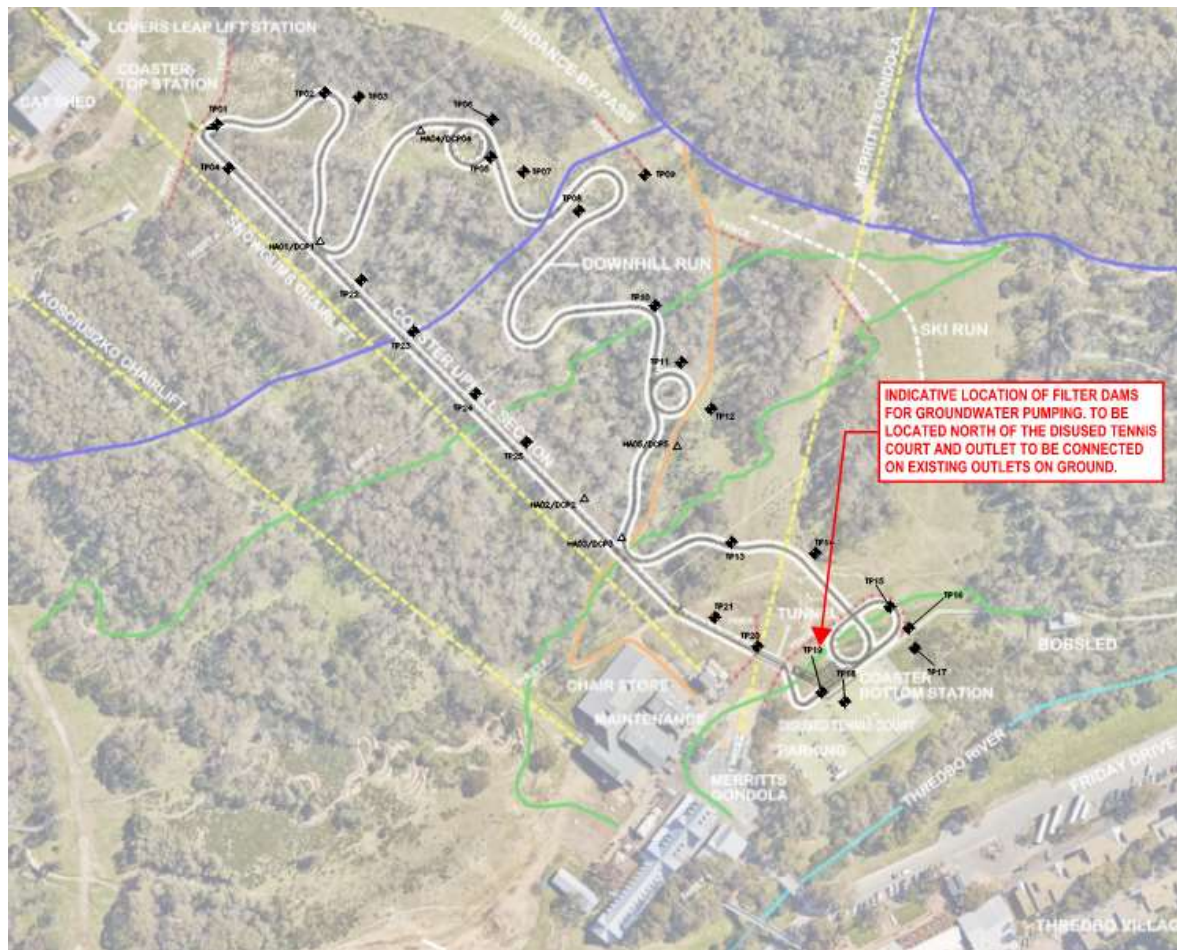


Figure 3: Geotechnical Test Locations with Stantec markup of Filter Dam indicative location

### **Proposed Stormwater Conveyance**

The stormwater network of pit and pipes will be designed to convey runoff from proposed impervious areas in the minor storm event (5-year average recurrence interval). Proposed gabion and retaining walls throughout site will also be provided with subsoil drainage which connects to the nearest downstream stormwater pit. The proposed in-ground drainage system will make connection to the existing stormwater network which ultimately outlets to the Thredbo River. The major drainage system will consist of overland flow paths designed to safely convey stormwater flows up to and including the 100yr storm event to Thredbo River as per existing condition. The proposed design also includes the stormwater drainage recommendations listed above when working with shallow groundwater levels in the previous section. Refer to Appendix A for site plan showing markup of proposed stormwater mitigation measures.

Revegetation of the existing bank and additional landscaped areas will form part of the ongoing stormwater management and filtration. All rehabilitation shall be undertaken in accordance with the Rehabilitation Guidelines for the Resort Areas of Kosciuszko National Park (DEC 2007).

Given the site largely discharges via overland flow as per the natural condition, this will be attempted to be retained wherever feasible.

### **Proposed Stormwater Treatment**

Based on the survey information it appears that there is an existing Gross Pollutant Trap (GPT) device located downstream of site prior to outlet to Thredbo River. It is assumed that the existing GPT achieves the required pollutant reduction for the existing condition. A maintenance check of all existing pits and the existing GPT device is recommended prior to construction to ensure functionality of the existing system. Pit sacks shall be provided in all proposed stormwater pits to filter pollutants and reduce required maintenance on the existing downstream GPT. It is also recommended to add pit inserts into existing grated inlet pits, if possible.

The proposed high-level layout of stormwater treatment has been included in the attached PDF mark-ups provided as part of this Stormwater Management Letter.

### **Legal Point of Stormwater Discharge**

Stantec have reviewed available survey and aerial photography and have noted that the site discharges stormwater via a headwall which ultimately outlets to the Thredbo River.

### **Erosion and Sediment Control requirements during construction**

Sediment and erosion control will be required during construction works to ensure the Thredbo River is not polluted during the works. The proposed sediment and erosion control will primarily consist of:

- Silt socks or approved equivalent for diverting water and protecting existing stormwater pits/ inlets, where required
- Straw bales/ sediment fencing for diverting water around and away from open excavations and adjacent operating properties, where required

All controls will remain in place until all exposed areas of soil are stabilised and/ or revegetated. If groundwater seepage is encountered during construction, subsoil drainage is recommended to be installed. If significant groundwater is encountered during construction that cannot be controlled using diversion drains, further geotechnical advice will be sought.

### **Overland flow and proposed stormwater drainage mark-up**

Please find stormwater concept plans in Appendix A of this report. Note that this layout is conceptual only. Detailed stormwater plans will be provided at the construction certificate phase of construction.

Please contact the undersigned for any questions, concerns or further information required.

Yours sincerely,

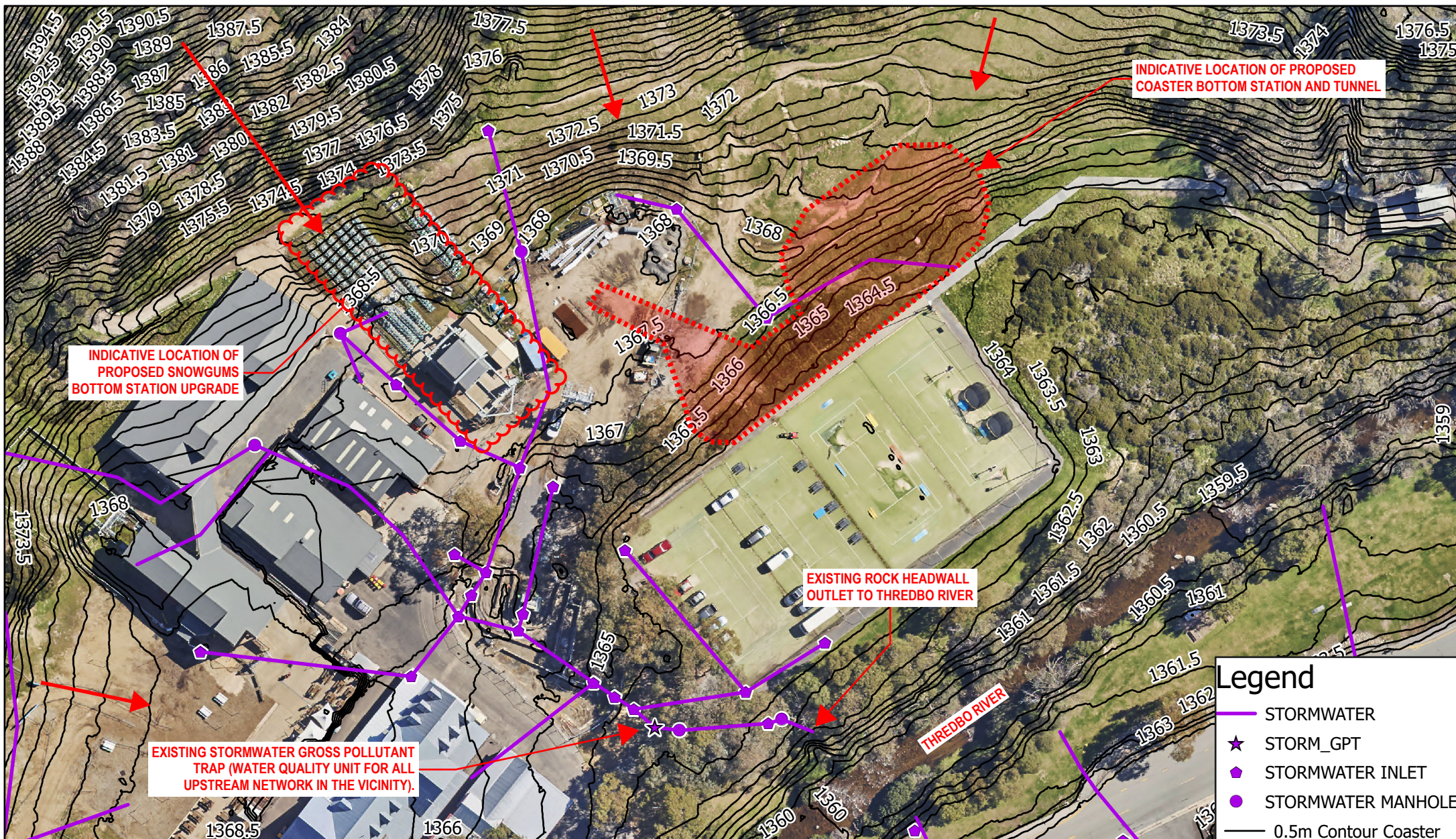


**Renata Tracey CPEng NER**

**Civil Section Manager, Principal**

**Stantec Australia Pty Ltd**

# Appendix A Conceptual Stormwater Layout



Scale: 1:882



Map Projection: Universal Transverse Mercator  
Horizontal Datum: GDA 2020  
Grid: GDA 2020 MGA Zone 55



## STORMWATER AND 0.5m CONTOUR

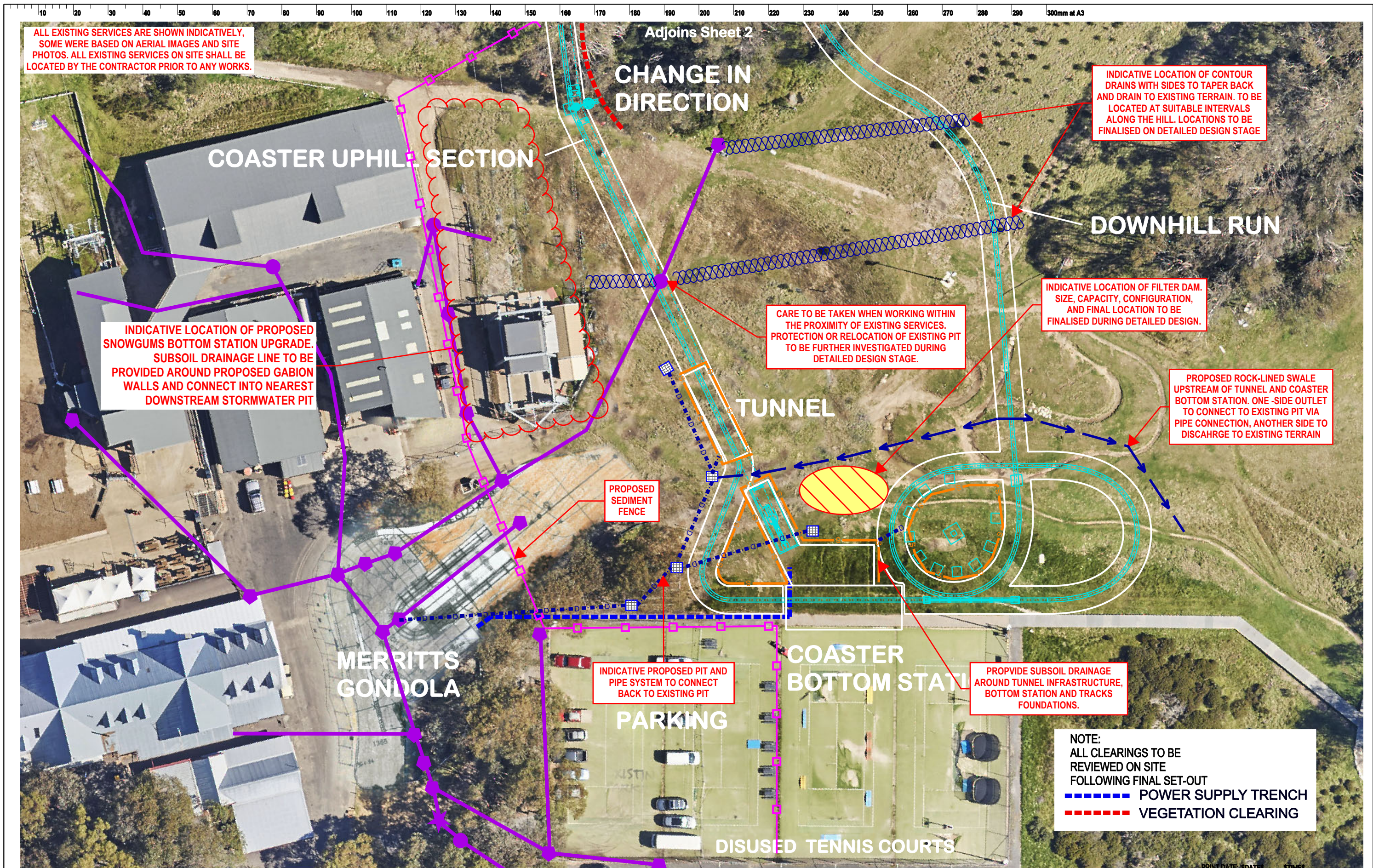
Project: Alpine Coaster Installation



Note: Due to the age of services in the village, locations shown represent our best estimation.

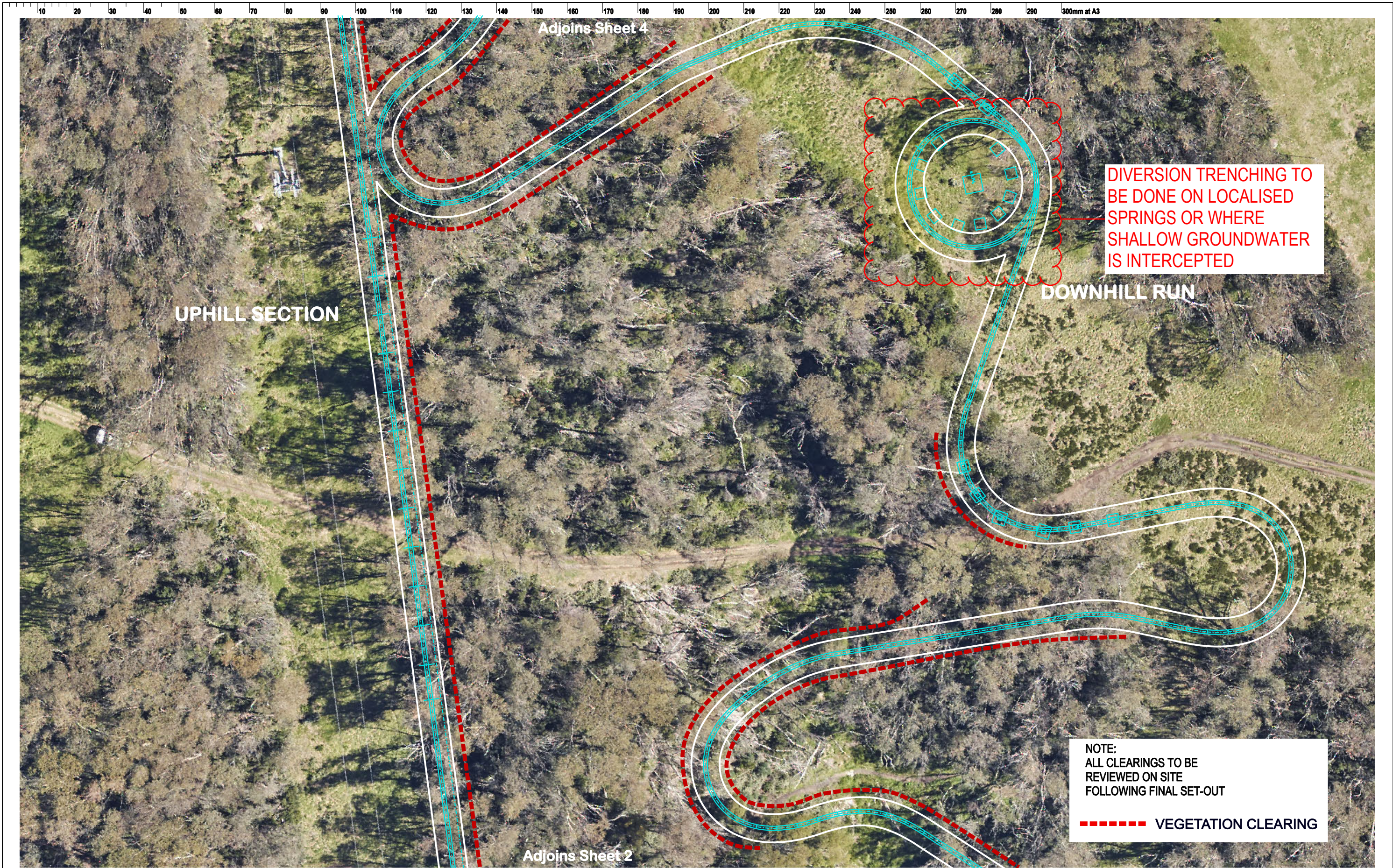
Revision: C

Date: 13/07/2022

Produced By: KO



ISSUE				DATE		SUBJECT		AUTHORISED		PROJECT MANAGER		PROJECT		CLIENT		ARCHITECT		DRAWN		SCALE AT A3		ISSUE DATE			
A				25-03-22		ISSUED FOR REVIEW		PL		<div>SERVICES</div> <div>STRUCTURE &amp; CIVIL</div> <div></div>		ALPINE COASTER & ASSOCIATED WORKS		Kosciuszko Thredbo Pty Ltd				T +612 9319 2955 ABN: 48 942 921 969 Nominated Architects: Andrew Hipwell 6562 Daniel Beskowilder 6182  63 Myrtle Street Chippendale NSW 2008 Sydney Australia djird.com.au		Author		1:500 AT A3		DESCRIPTION SITE WITH COASTER OVERLAY VEGETATION CLEARING SHEET 1 OF 4	
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ISSUE	DATE	SUBJECT	AUTHORISED
A	25-03-22	ISSUED FOR REVIEW	PL
B	14-04-22	ISSUED FOR DA	RD

PROJECT MANAGER	
SERVICES	STRUCTURE & CIVIL

This drawing should be read in conjunction with all relevant contracts, specifications and drawings. Dimensions are in millimetres. Levels are metres. Do not scale off drawings. Use figured dimensions only. Check dimensions on Site. Report discrepancies immediately.

PROJECT  
**ALPINE COASTER & ASSOCIATED WORKS**

VALLEY TERMINAL PRECINCT  
THREDBO

CLIENT  
**Kosciuszko Thredbo Pty Ltd**

AUTHORISED FOR ISSUE

DIRECTOR                      DATE

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Nominated Architects:  
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Daniel Beskowilder 6182

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DRAWN	SCALE AT A3	ISSUE DATE
Author	1:500 AT A3	
DESCRIPTION <b>SITE WITH COASTER OVERLAY VEGETATION CLEARING SHEET 3 OF 4</b>		
PROJECT No	DRAWING No	REVISION
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PRINT DATE: \$DATE\$      \$TIME\$