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Appendix 9 Odour Assessment



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Willunga Basin Water Co. Pty. Ltd

260 Whitings Road Blewitt Springs – Proposed Treated Water Storage Dam

Odour Assessment

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Executive Summary

Willunga Basin Water Company is proposing to develop two side-by-side treated water storage dams at 260 Whiting's Road, Blewitt Springs, South Australia.

In support of the proposed development, in-field odour surveys were conducted at two existing treated water storage dams, located at Bakewell Drive and Quarry Road. These existing sites are supplied with tertiary treated water from the Christies Beach WWTP, which is also the proposed source for the new dams at 260 Whiting's Road.

The dam at Bakewell Drive is of comparable design, function, and operational conditions to the proposed dams and was therefore considered suitable for an onsite assessment to evaluate potential odour impacts.

The findings from the odour surveys conducted at the two existing Bakewell Dr and Quarry Rd water storage dams may be summarised as follows:

- Bakewell Dr Dam:
 - Odours detected from the dam were generally non-offensive and of low intensity, such that they were only perceptible when actively focusing.
 - Odours originating from the dam water were described as mild, with a slightly muddy water smell and slight saline notes. At some locations additional grassy, earthy and slightly sweet herbaceous tones were observed.
 - The presence of odours was intermittent, where the worst-case scenario was approximately 20% detection rate at measurement points that were approximately 5m downwind of the source. Odour detection rates were less frequent at further distances.
 - Odours were not detected at measurement points upwind of the dam.
- Quarry Rd Dam:
 - Odours associated with the water storage dam were of a non-offensive nature and were rated at low intensity levels.
 - Odours originating from the dam water were described as neutral to mildly pleasant, with characteristics including a slightly muddy pond-like smell and mild earthy, grassy, and herbaceous notes.
 - No odours were detected at upwind locations. Odours were intermittently detected (approximately 25–50% of the time) near the dam edge, with similar but less frequent detections further downwind, where grassy and herbaceous notes were more dominant, likely influenced by surrounding vegetation.

Based on the findings of the odour surveys, Vipac considers that the proposed development does not pose a significant odour-related amenity risk to the nearest sensitive receptors. The existing separation distances are deemed appropriate given the low odour intensity and infrequent winds from the source towards receptors.

Overall, Vipac concludes that the potential for odour impacts should not be considered a hinderance to the proposed development.

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1 Introduction

Willunga Basin Water Company is proposing to develop two side by side treated water storage dams at 260 Whiting's Rd, Blewitt Springs, South Australia.

Concern has been raised regarding the potential for odour impacts upon nearby sensitive receptors, and relevant SA EPA guidance documents recommends that a site specific and onsite assessment is undertaken to determine potential for impacts and assess adequacy of separation distances to any sensitive uses.

As a consequence, an odour assessment of the proposed dams has been undertaken including an infield odour survey of already existing water storage dams of similar construction and operational characteristics in the area. The findings of the odour survey and assessment are presented in this report.

2 Project Context

2.1 Proposed development

The proposed treated water storage dams will be located at 260 Whiting's Road, Blewitt Springs, also described as Lot F153389A3. . The site is situated in a sparsely populated rural area and falls within the City of Onkaparinga Council area..

The closest sensitive receptors are a cluster of three residential properties located approximately 60 metres or more southeast of the proposed dam's activity boundary (i.e., the edge of the dam footprint) to the nearest residential property boundary. Other residential receptors are located approximately 300 metres or more from the proposed site.

The proposed development comprises two treated water storage dams, each with a capacity of 650 ML. The dams are intended to store recycled water for use by vineyard irrigators in the broader McLaren Vale region.

The dams will operate on a seasonal cycle, typically filling from September to March and remaining empty for the rest of the year. To manage odour emissions during periods of low water levels or when the dams are empty, a water cap will be employed as a control measure.

Each dam will be constructed with high-density polyethylene (HDPE) liners to reduce seepage. The recycled water will be sourced from the Christies Beach Wastewater Treatment Plant (WWTP), where it undergoes tertiary treatment prior to storage.

A concept image of the proposed dam and location is illustrated in Figure 2-1 and a draft site plan is provided in Appendix B.



Figure 2-1 – Proposed Water Storage Dams at 260 Whiting’s Road

2.2 Potential for Odour Impacts

Lagoons (or ponds) have been used extensively in the past to collect, naturally treat, store (prior to reuse or discharge) or dispose of wastewater via evaporation. The uses and applications of these lagoons have increased in recent times. However, poorly constructed lagoons can lead to surface and groundwater pollution as well as odour and health impacts.

Storage lagoons holding recycled water are generally large to maximise storage capacity, and deep to minimise evaporation and footprint.

Acidic, alkaline or saline wastewater (from wineries, distilleries and reverse osmosis plants) can react with clay and compromise the long-term integrity of clay liners. Geosynthetic liners are therefore typically recommended and are proposed for the two water storage dams.

Additionally, the proposed recycled water presents less environmental risk as the wastewater has undergone tertiary treatment to reduce chemical pollutants and biological contaminants.

The 2019 SA EPA *Wastewater Lagoon Construction Guidelines* states: “Separation distances for recycled water storage lagoons are not specified. This is because air (odour) and noise issues are not generally associated with these lagoons, providing wastewater has been treated to minimise odour and they contain no mechanical treatment processes which generate noise. For recycled water storage lagoons, a site-specific assessment should be undertaken to determine appropriate separation from sensitive receptors.”

2.3 Odour Assessment

As the proposed recycled water storage dams have not yet been constructed, a field odour survey was undertaken at similar existing water storage dams. The existing dam at Bakewell Dr, Seaford Heights has a capacity of 600 ML and is of comparable design, function, and operational characteristics, providing a suitable opportunity for an onsite assessment to evaluate potential for odour impacts associated with the proposed dams and the suitability of separation distance to existing sensitive use receptors.

Additional odour surveying was conducted at the Quarry Road, McLaren Vale treated water storage dam. Both the Bakewell Dr and Quarry Rd water storage dams are fed with water from wastewater treatment plant at Christies Beach, which has undergone tertiary treatment and is consistent with the proposed approach at the Whiting’s Rd dams.

2.4 Regional Meteorology

Data recorded by the nearest Bureau of Meteorology (BoM) long term weather station at Noarlunga (located approximately 7km east of the proposed site) was reviewed to describe the meteorological and climatic influences in the region. Long term weather data obtained from the BOM weather station at Noarlunga is presented in Table 2-1.

The mean temperature range is between 8.7°C and 28.8°C with the coldest month being July and the hottest, January. The rainfall in the region is variable, with most rainfall in the colder months. On average, most of the annual rainfall is received between May and August. Rainfall is lowest between December and March. The mean annual rainfall is approximately 433.4 mm.

The long-term wind roses recorded daily at the Noarlunga station at 9am and 3pm are provided in Figure 2-2. Winds are shown to be primarily from the north, east and southeast 9am and from the west at 3pm. Stronger winds (>40km/hr or >11.1m/s) occur infrequently mostly from the north at 9am.

Lower wind speeds from the direction of the source toward the receptor are expected to have a higher potential for odour impacts. In contrast, higher wind speeds typically promote greater dilution and dispersion of odorous compounds.

Table 2-1: Mean Long-term Weather Data for Noarlunga

Month	Mean Temperature		Rainfall (mm)	9 am Conditions			3 pm Conditions		
	Max (°C)	Min (°C)		Temp (°C)	Mean RH (%)	Wind Speed (km/h)	Temp (°C)	Mean RH (%)	Wind Speed (km/h)
Jan	28.8	17.2	17.2	21.5	53	19.1	26.7	38	21.7
Feb	27.8	16.9	17.1	20.6	55	19.1	25.9	41	22.3
Mar	25.9	15.7	17.5	18.8	57	16.7	24.2	41	20.1
Apr	22.4	13.7	31.4	17.9	57	16.4	20.9	48	17.9
May	18.4	11.4	54.0	14.5	68	14.4	17.4	58	16.9
Jun	15.6	9.3	66.2	11.8	75	15.8	14.5	65	18.5
Jul	14.9	8.7	60.4	11.2	75	16.6	13.8	65	19.0
Aug	16.0	9.0	54.0	12.1	70	17.7	14.6	60	20.0
Sep	18.7	10.3	42.9	14.4	64	19.4	16.7	57	20.0
Oct	21.5	11.7	31.0	16.2	58	19.7	18.9	49	21.2
Nov	24.6	13.9	24.8	18.9	55	19.1	23.2	43	21.1
Dec	26.5	15.4	21.9	19.9	53	18.5	24.0	42	21.4
Annual	21.8	12.8	433.4	16.5	62	17.7	20.1	51	20

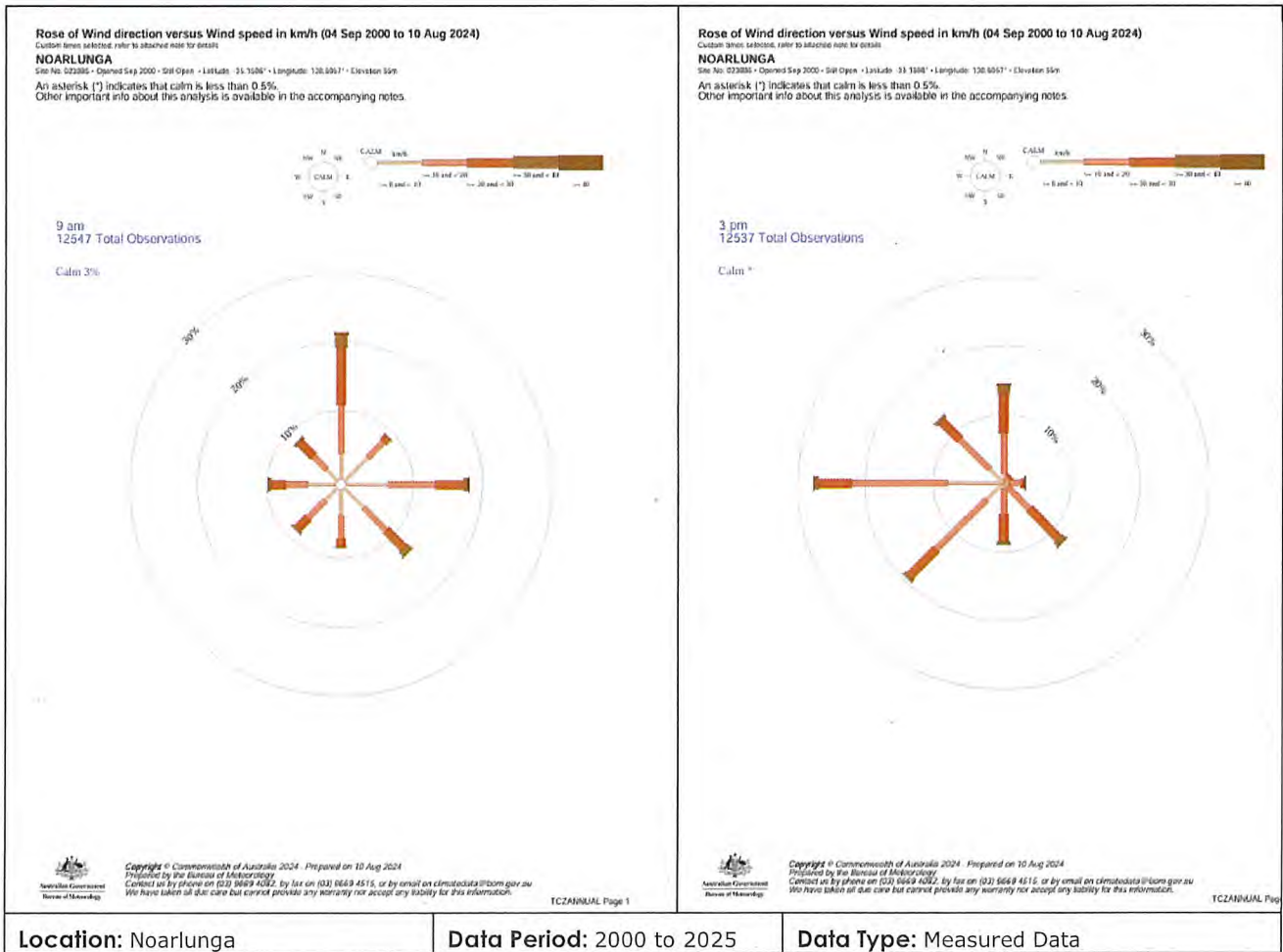


Figure 2-2: Annual Wind Rose for Noarlunga (2000 to 2024)

3 Relevant Legislation and Guidelines

3.1 Planning, Development and Infrastructure Act 2016

The South Australian *Planning, Development and Infrastructure Act 2016*, provides guidance on matters that are relevant to the use, development and management of land and buildings and provides a planning system that regulates construction and use of buildings through a planning and design code. The code sets out comprehensive policies and rules, which is mapped and lays out designated zones and classifications, these have been identified in the South Australian Property and Planning Atlas (SAPPA). The planning and design code assigns zones, subzones and overlays over spatial areas of the state and will set out the rules and policies that apply to the location. The code provides assessment pathways for a proposed development and deems whether the proposal meets the requirements of the zones code as well as desired outcomes and performance outcomes.

3.2 Evaluation Distances for Effective Air Quality and Noise Management 2023

The South Australian EPA *Evaluation Distances for Effective Air Quality and Noise Management* guideline provides recommended minimum distances between pollutant-emitting activities and sensitive land uses. The purpose of the guidelines is to manage and minimise the potential for air quality (including odour) and noise impacts from new or existing developments and support land use planning to effectively manage suitability of conflicting land uses through the implementation of separation distances. The guideline acts as a screening tool for planning and development application and allows for early identification of potential air, odour or noise impacts on sensitive uses and where further investigation or detailed assessment is required to clarify the potential for impacts and the suitability of locations of proposed land uses.

The guideline includes recommended separation distances based on the type and scale of pollutant emitting activities. However, there is no recommended evaluation distance for recycled water storage lagoons, so a site-specific assessment is recommended.

3.3 Wastewater Lagoon Construction Guidelines 2019

The Wastewater Lagoon Construction Guidelines document provides guidance on the siting, construction and lining of wastewater lagoons. It covers the types of lagoons which, treat or store water with a higher concentration of pollutants, are constructed for the purpose of treating a waste stream, or represent a significant risk to the environment, including:

- wastewater treatment, recycled water storage, polishing and evaporation lagoons used in sewage treatment facilities; food, beverage and agricultural processing industries; animal husbandry activities; and aquaculture purposes
- wastewater sedimentation basins, leachate ponds for composting activities, irrigation dams used for holding and mixing treated or untreated wastewater, and ponds on industrial sites used for capturing potentially contaminated stormwater runoff from their premises
- processing and wastewater lagoons for chemical, manufacturing and mining industries
- lagoons used for digestion, dewatering and drying wastewater and water treatment sludge.

As stated in the guideline: "Separation distances for recycled water storage lagoons are not specified. This is because air (odour) and noise issues are not generally associated with these lagoons, providing wastewater has been treated to minimise odour and they contain no mechanical treatment processes which generate noise. For recycled water storage lagoons a site-specific assessment should be undertaken to determine appropriate separation from sensitive receptors."

3.4 VDI 3940 Determination of Odorants in Ambient Air by Field Inspection

German Standard VDI 3940 is widely used as a standard for odour assessments by field inspection and sets out a guideline and method.

This document is based on measuring the percentage odour time at defined location points. Each assessor goes to the measurement point and tests the ambient air for odours by regularly inhaling the air during a defined measurement duration (single measurement). Therefore, the method is appropriate to describe an existing status.

Depending on the task definition (assessment of individual sources, survey mapping in a multiple-source area, decisions on planning schemes, calibration of calculation models for odorants dispersion etc.), single measurements will be part of a grid measurement, if an area-related statement of the existing odourant immission is needed, and they will be part of a plume measurement, if a plume-related statement is required.

4 Odour Assessment Methodology

A modified version of the German Standard VDI 3490 (1993) method for odour surveys was adopted for this assessment. In-field odour surveys were conducted over two distinct time of day periods on the 1st and 2nd of July 2025 at the existing water storage facilities at Bakewell Dr, Seaford Heights and at Quarry Rd just north of Bakewell Dr.

At the Bakewell Dr treated water storage dam, odour surveys were conducted between approximately 11:30 am and 1:00 pm on the 1st of July, and between 7:30 am and 12:00 pm on the 2nd of July. At the Quarry Road treated water storage dam, surveys were conducted between approximately 1:00 pm and 2:00 pm on the 1st of July, and between 8:45 am and 9:30 am on the 2nd of July.

Surveys were undertaken within the property boundaries of both sites, as well as at offsite and downwind locations. Odour survey points were initially established in a grid-like pattern around the perimeter of the storage dams and extended to downwind areas and, where practical, nearby residential locations and/or beyond the site boundaries. It is noted that another odour source, the SRWRA recycling centre and rubbish dump is situated approximately 400m south of the Bakewell Drive site. An additional survey point was therefore included near this facility to identify any influence on odour perception at other measurement locations.

For this odour survey, odour presence was recorded by taking air samples via inhalation through the nose every 10 seconds for 5 minutes at each measurement point. Each time an identifiable odour was observed a positive sample was recorded, and is used to calculate the odour percentage time, which is the ratio of the total sampled time and the amount of time where the odour is recognisable (this is recognition threshold which usually lies around 5_{od} (30U/m³) and is higher than the detection threshold).

At each survey point, the odour characteristics were described, an intensity rating was given as well as a hedonic tone rating, the wind direction and approximate wind speed was also noted.

An odour intensity scale of 0 to 6 was used, as follows:

- 6 is extremely strong
- 5 is very strong
- 4 is strong
- 3 is distinct
- 2 is weak
- 1 is very weak
- 0 is not perceptible.

An odour intensity grade of 3-6 was defined as: Odour is easily recognised, can be described and may be attributed to the source. The assessor can smell it without any effort or focus on it. An odour rating of 5 to 6 is typically considered intolerable and requiring action for offensive odour types. An intensity rating of 6 is very rare in an infield situation.

An odour intensity grade of 1-2 was defined as: Odour can be recognised only when focusing.

An odour intensity grade of 0 was defined as No odour, or odour is not strong enough to be recognised.

Hedonic tone refers to the pleasantness of the odour. A Hedonic tone scale was also used to describe the odour observed at each observation point, the scale used was: very pleasant, pleasant, mildly pleasant, neutral, mildly unpleasant, unpleasant, very unpleasant.

Additionally, wind direction and speed were taken into consideration during the onsite assessment to determine suitable downwind measurement points.

Details of the measurement points for each survey is provided in Table 4-1 to Table 4-4 below.

Table 4-1 – Survey Points at Bakewell Drive Dam -1st July

Survey point	Approximate distance from source	Direction from Source	Description
1	5m	North	At the northern edge of the dam
2	5m	Northeast	At the north-eastern edge of the dam, downwind
3	5m	East	Eastern edge of the dam, downwind
4	5m	South	Southern edge of the dam
5	5m	Southwest	Southwestern edge of the dam
6	50m	East	Downwind of the dam, east of the site boundary
7	50m	East	Downwind of the dam, east of the site boundary
8	180m	North	Within the residential community at the end of Rockport Rd.
9	NA – External source	NA – External source	At the SRWRA waste management facility

Table 4-2 – Survey Points at Bakewell Drive Dam – 2nd July

Survey point	Approximate distance from source	Direction from Source	Description
1	5m	South	Southern edge of the dam, downwind
2	5m	South	Southern edge of the dam, downwind
3	5m	South	Southern edge of the dam, downwind
4	5m	East	Eastern edge of the dam
5	5m	North	Northern edge of the dam
6	5m	West	Western edge of the dam
7	180m	North	Within the residential community at the end of Rockport Rd.
8	90m	West	Within the residential community at the end of Nicholls Rd.
9	60m	South	Downwind of the dam, south of the site boundary
10	90m	South	Downwind of the dam, south of the site boundary
11	170m	South	Downwind of the dam, south of the site boundary
12	240m	South	Downwind of the dam, south of the site boundary

Table 4-3 – Survey Points at Quarry Road Dam – 1st July

Survey point	Approximate distance from source	Direction from Source	Description
1	5m	East	Eastern edge of the dam, downwind
2	5m	South	Northeastern edge of the dam, downwind
3	25m	South	East of the dam, downwind and at the site boundary
4	20m	East	East of the dam, downwind and at the site boundary
5	5m	North	Northern edge of the dam
6	5m	West	Northwestern edge of the dam
7	5m	North	Western edge of the dam

Table 4-4 – Survey Points at Quarry Road Dam – 2nd July

Survey point	Approximate distance from source	Direction from Source	Description
1	5m	West	Western edge of the dam
2	5m	West	Western edge of the dam
3	5m	East	Eastern edge of the dam
4	5m	East	Eastern edge of the dam
5	5m	East	Eastern edge of the dam
6	5m	North	Northern edge of the dam

5 In Field Odour Assessment Results

The following sections provide summaries of the findings from the in-field odour surveys conducted at the water storage dams at Bakewell Dr and at Quarry Rd. A summary of the survey measurement points, including the UTM coordinates, measurement durations and odour intensity ratings is provided in Appendix A.

The weather conditions at the times of the in-field surveys were considered a worst-case scenario for potential for odour impacts, with calms to low wind speeds. The hourly weather data recorded from the closest BOM station at Noarlunga for the time periods of the survey are provided in Appendix C. The weather observations recorded at the BOM station were consistent with the observations made on site by the in-field assessor.

5.1 Bakewell Drive Dam

5.1.1 July 1st – Early Afternoon Period

The in-field odour survey conducted on the 1st of July during the early afternoon at the Bakewell Dr treated water storage dam included a total of nine measurement points.

Weather conditions observed in situ at the time of the odour survey was fine and clear weather and turning to overcast later in the survey period, with low-speed westerly winds.

Odours associated with the water storage dam (the source) were generally rated at an intensity level of 1 wherever odours were perceptible. The hedonic tone of these odours was generally rated as neutral (neither pleasant nor offensive). The typical odour characteristics were described as mild, with a slightly muddy water smell and slight saline notes. At some locations, additional mild odour characteristics such as grassy, earthy, and slightly sweet tones were also noted.

Odour detection was intermittent, with the most notable observations recorded at the perimeter on the eastern (downwind) and southern sides of the dam. Odour observations on the southern side (measurement points 4 and 5) were influenced by bird activity, particularly the presence of seagulls and pelicans. Detected odours in these areas included characteristics typically associated with poultry or bird activity, such as bird droppings, and while was noted as mildly offensive was rated at a low intensity rating of 1 to 2. It is also noted that survey point 1 was excluded from analysis due to strong odours caused by a nearby animal carcass that was later identified.

Odours were detected approximately 10–20% of the time at perimeter locations around the dam (points 2 to 5). At the downwind locations beyond the site boundary, odours were detected 6–15% of the time. No odours were detected at the community measurement point; however, it is noted that this location was upwind of the dam at the time of the survey.

In contrast, observations made at the nearby SRWRA waste management facility indicated a higher frequency of odour detection and a more offensive hedonic tone. Odour characteristics at this location were described as sour, musky, with slight ammonia and decaying cardboard.

A summary of the odour survey observations, including measurement locations and a visual representation of the percentage of odour detection by intensity rating, is presented in Figure 5-1.



Figure 5-1: Odour Survey Results Bakewell Drive Dam 1st July

5.1.2 July 2nd – Morning Period

The in-field odour survey conducted on the 2nd of July during the morning at the Bakewell Dr treated water storage dam included a total of twelve measurement points.

Weather conditions observed in situ at the time of the odour survey was fine and clear weather turning to overcast later in the morning with low-speed northerly winds and periods of calms.

Odours associated with the water storage dam (the source) were rated at an intensity level of 1, where odours were perceptible. The hedonic tone of these odours was rated as neutral to mildly pleasant, excluding where observations were influenced by bird activity. The odour characteristics were described as mild, with a slightly muddy water smell and slight saline notes. At some locations, additional mild odour characteristics such as grassy, earthy, and slightly sweet herbaceous tones were also noted. Additionally, mild poultry related odours were also observed at points one and two.

No odours were detected at upwind locations (points four, five, six, seven and eight) and odours detected at downwind locations were infrequent, with detection percentages between 10 and 20 percent. Odour percentages reduced with distance downwind from the source (points nine and ten) and were not detectable at further distances at points eleven and twelve.

A summary of the odour survey observations is presented in Figure 5-2.

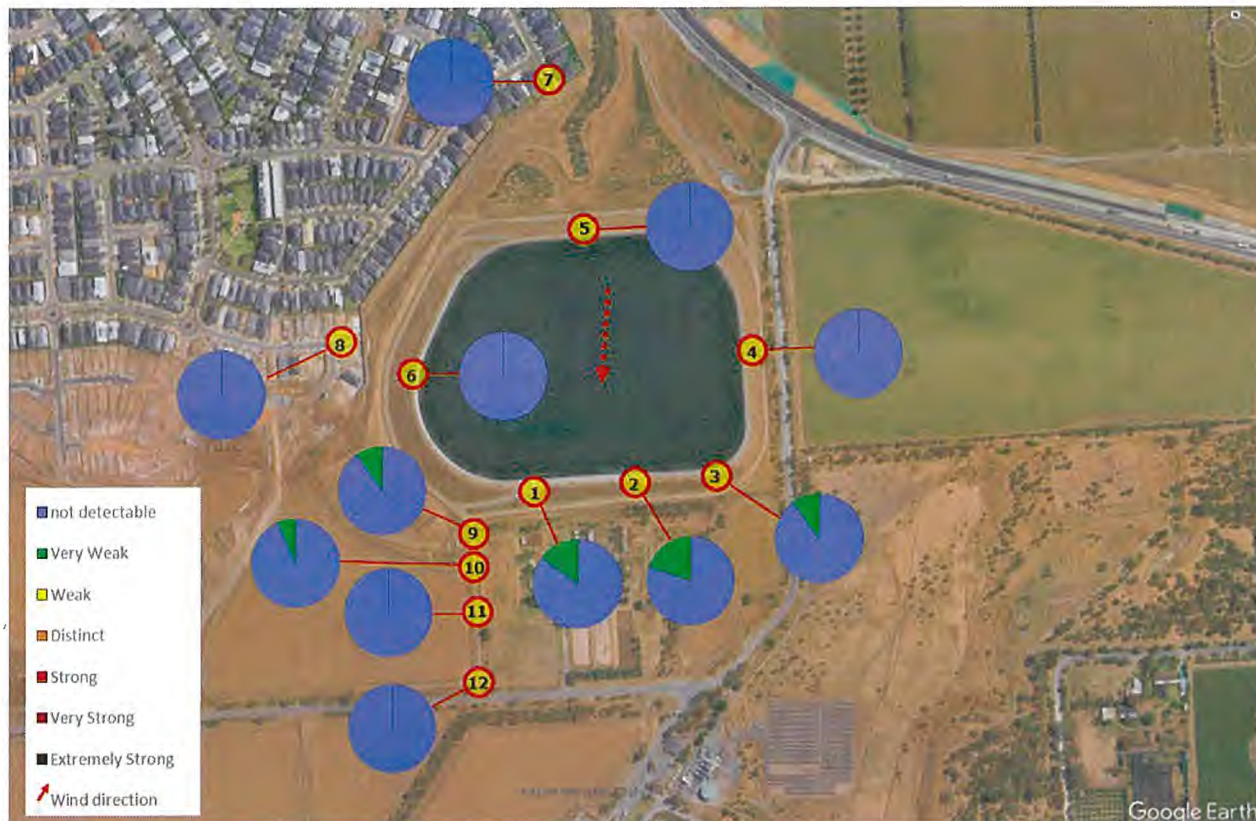


Figure 5-2 - Odour Survey Results Bakewell Drive Dam 2nd July

5.2 Quarry Road Dam

5.2.1 July 1st – Early Afternoon Period

The in-field odour survey conducted on the 1st of July during the early afternoon at the Quarry Rd treated water storage dam included a total of seven measurement points.

Weather conditions observed in situ at the time of the odour survey were overcast with low-speed south-westerly winds.

Odours associated with the water storage dam (the source) were rated at an intensity level of 1 to 2 where odours were perceptible. The hedonic tone of these odours was generally rated as neutral to mildly pleasant. Odour characteristics were described as mild, with a slightly muddy water smell similar to pond water, as well as mildly pleasant earthy, grassy and herbaceous notes.

No odours were detected at upwind locations (points 6 and 7) and odours detected near the edge of the dam were detected approximately 25-50% of the time. Odours further downwind near the site boundary were of similar characteristics, however grassy and herbaceous smells were more dominant, likely influenced by the surrounding flora, and odours detected at these locations were less frequent.

A summary of the odour survey observations is presented in Figure 5-3.

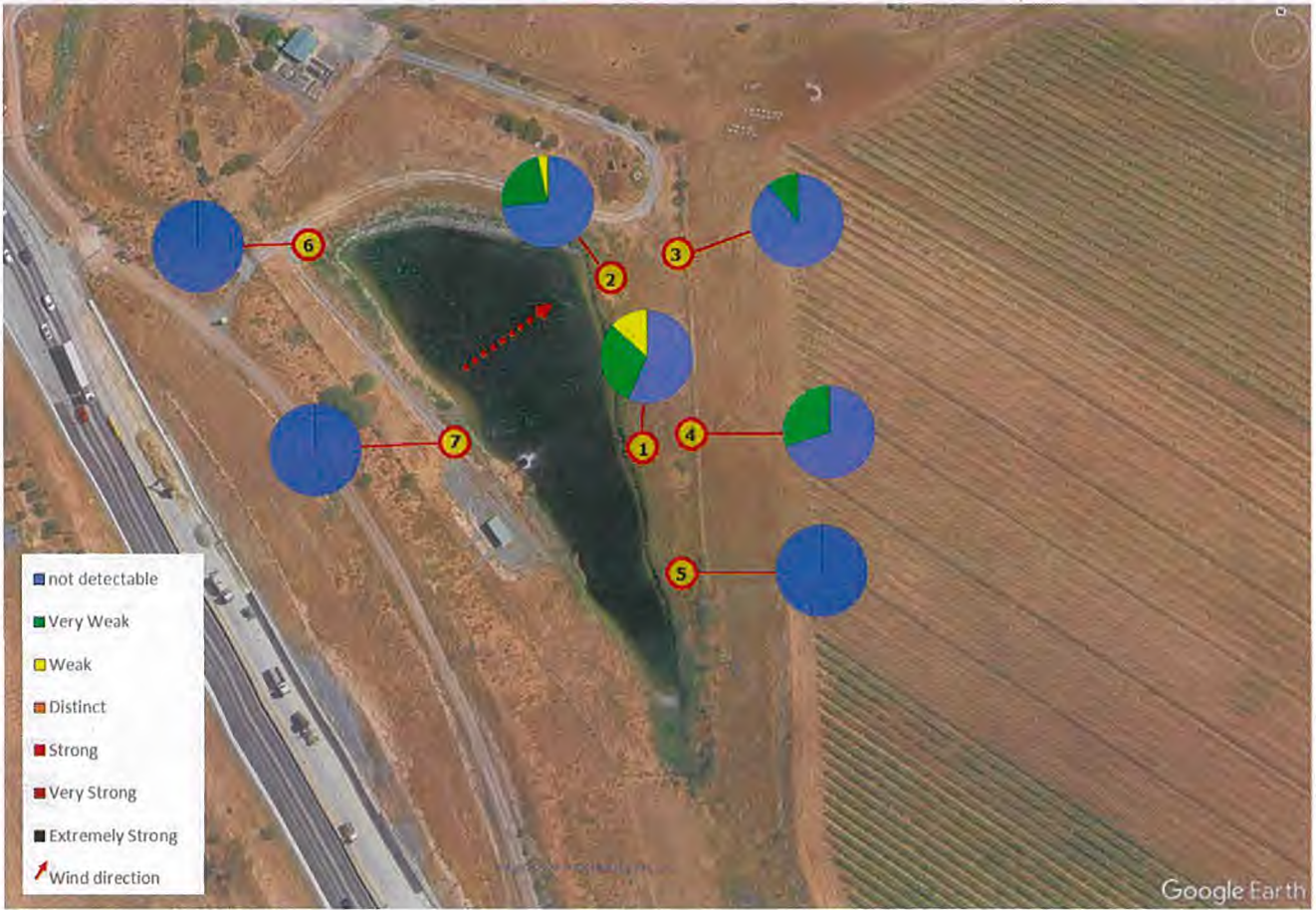


Figure 5-3 - Odour Survey Results Quarry Road Dam 1st July

5.2.2 July 2nd – Morning Period

The in-field odour survey conducted on the 2nd of July during the morning period at the Quarry Rd treated water storage dam included a total of six measurement points.

Weather conditions observed in situ at the time of the odour survey was fine and clear with calms and no observable winds.

The odours detected were of similar characteristics as those observed during the early afternoon on July 1st (see previous section), however were detected at a lower frequency and at locations on the northern side of the dam (points one, five and six) no odours were detected.

A summary of the odour survey observations is presented in Figure 5-4.



Figure 5-4 - Odour Survey Results Quarry Road Dam 2nd July

5.3 Summary of Findings

The findings from the odour surveys conducted at the two existing Bakewell Dr and Quarry Rd water storage dams may be summarised as follows:

- Bakewell Dr Dam:
 - Odours detected from the dam were generally non-offensive and of low intensity, such that they were only perceptible when actively focusing.
 - Odours originating from the dam water were described as mild, with a slightly muddy water smell and slight saline notes. At some locations additional grassy, earthy and slightly sweet herbaceous tones were observed.
 - The presence of odours was intermittent, where the worst-case scenario was approximately 20% detection rate at measurement points that were approximately 5m downwind of the source. Odour detection rates were less frequent at further distances.
 - Odours were not detected at measurement points upwind of the dam.
- Quarry Rd Dam:
 - Odours associated with the water storage dam were of a non-offensive nature and were rated at low intensity levels.
 - Odours originating from the dam water were described as neutral to mildly pleasant, with characteristics including a slightly muddy pond-like smell and mild earthy, grassy, and herbaceous notes.
 - No odours were detected at upwind locations. Odours were intermittently detected (approximately 25–50% of the time) near the dam edge, with similar but less frequent detections further downwind, where grassy and herbaceous notes were more dominant, likely influenced by surrounding vegetation.

6 Conclusion

An odour assessment has been undertaken for two proposed side-by-side treated water storage dams at 260 Whiting's Rod, Blewitt Springs, South Australia.

The assessment included in-field odour surveys conducted at two existing treated water storage dams—located at Bakewell Dr and Quarry Rd which are of comparable design, function, and operational conditions to the proposed Whiting's Rd dams. These existing sites are supplied with tertiary treated water from the Christies Beach WWTP, which is also the proposed source for the new dams at 260 Whiting's Rd.

The findings of the in-field odour surveys indicate that odours generated by the treated water storage dams are of a non-offensive nature, of very mild intensity, and were generally only perceptible infrequently and intermittently, even in close proximity to the source.

Based on the findings of the odour surveys, Vipac considers that the proposed development does not pose a significant odour-related amenity risk to the nearest sensitive receptors. The existing separation distances are deemed appropriate given the low odour intensity and potential for infrequent winds from the source towards receptors.

Overall, Vipac concludes that the potential for odour impacts should not be considered a hinderance to the proposed development, provided that the proposed control measures are implemented, i.e. the use of a water cap during periods of low water levels and the dams and water are appropriately maintained and is supplied with tertiary treated water, as proposed.



Appendix A Odour Survey Results

A.1 Bakewell Drive Dam - 1st July

Survey Point	UTM Coordinates		Hedonic rating	Odour percentage by intensity rating (%)						
	X	Y		Not detectable	Very weak	Weak	Distinct	strong	Very Strong	Extremely Strong
1 ¹	272413.63	6102364.25	Neutral to very unpleasant	83	3	7	7	5	0	0
2	272646.15	6102349.06	Neutral to mildly pleasant	88	12	0	0	0	0	0
3	272678.49	6102242.18	Neutral to mildly pleasant	80	20	0	0	0	0	0
4	272532.31	6102084.53	Unpleasant	80	20	0	0	0	0	0
5	272326.97	6102114.77	Unpleasant	83	13	3	0	0	0	0
6	272719.64	6102123.75	Neutral to mildly pleasant	93	7	0	0	0	0	0
7	272703.83	6102350.11	Neutral to mildly pleasant	87	13	0	0	0	0	0
8	272448.03	6102545.45	NA	100	0	0	0	0	0	0
9	272597.07	6101753.39	Unpleasant	47	43	7	3	0	0	0

¹ Odour observations at survey point one are excluded from the assessment due to extraneous sources.



A.2 Bakewell Drive Dam - 2nd July

Survey Point	UTM Coordinates		Hedonic rating	No. of observations by intensity rating (%)						
	X	Y		Not detectable	Very weak	Weak	Distinct	strong	Very Strong	Extremely Strong
1	272439.19	6102076.61	Neutral to mildly unpleasant	85	15	0	0	0	0	0
2	272536.74	6102090.66	Neutral to mildly unpleasant	80	20	0	0	0	0	0
3	272630.41	6102095.61	Neutral to mildly unpleasant	90	10	0	0	0	0	0
4	272681.26	6102232.67	NA	100	0	0	0	0	0	0
5	272502.87	6102373.87	NA	100	0	0	0	0	0	0
6	272298.86	6102193.98	NA	100	0	0	0	0	0	0
7	272448.27	6102544.58	NA	100	0	0	0	0	0	0
8	272208.18	6102237.09	NA	100	0	0	0	0	0	0
9	272379.02	6102024.35	Neutral	90	10	0	0	0	0	0
10	272381.57	6101991.36	Neutral	93	7	0	0	0	0	0
11	272385.71	6101929.31	NA	100	0	0	0	0	0	0
12	272387.56	6101845.65	NA	100	0	0	0	0	0	0



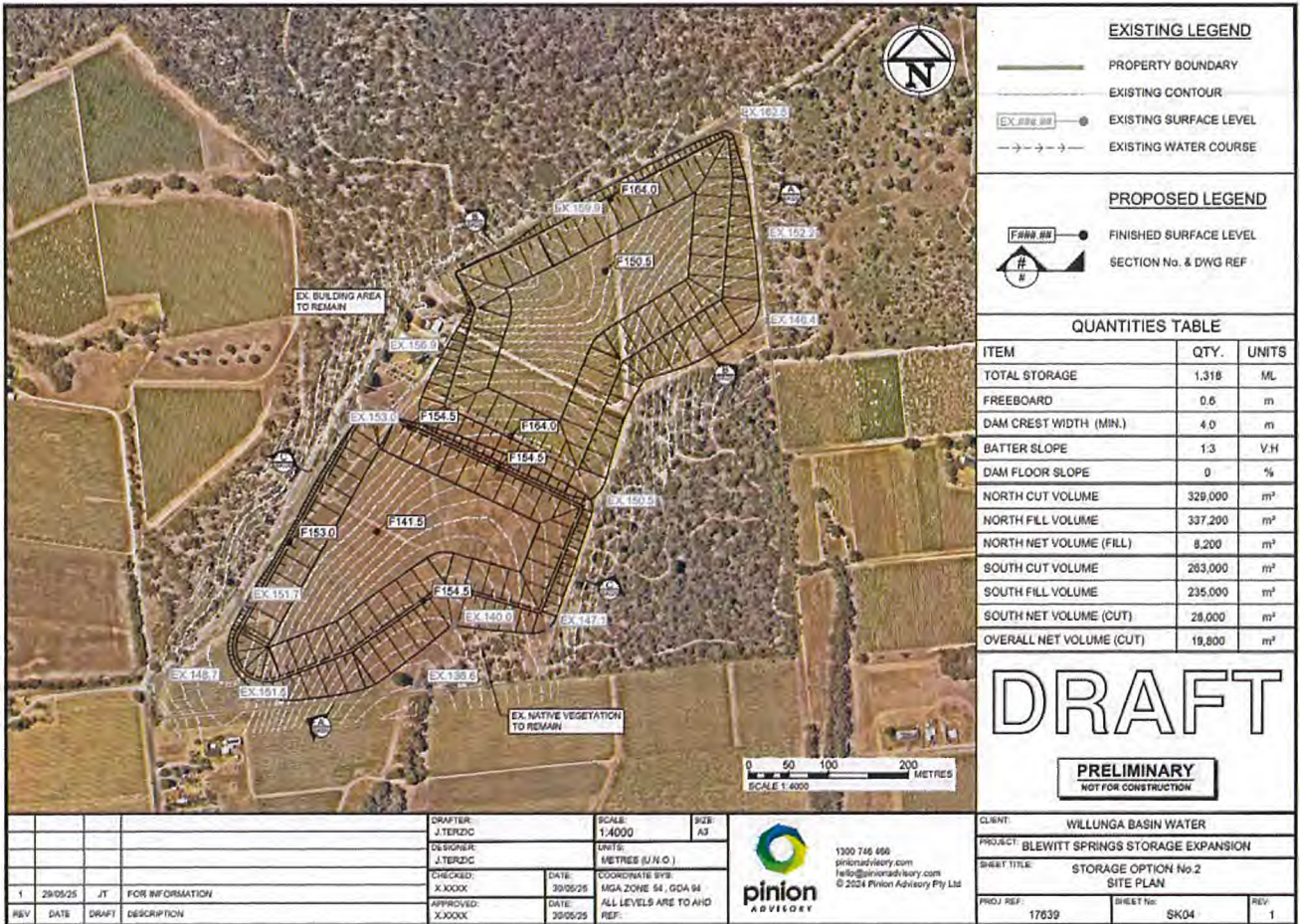
A.3 Quarry Road Dam - 1st July

Survey Point	UTM Coordinates		Hedonic rating	No. of observations by intensity rating (%)						
	X	Y		Not detectable	Very weak	Weak	Distinct	Strong	Very strong	Extremely strong
1	272590.81	6102839.30	Mildly pleasant	57	30	13	0	0	0	0
2	272575.11	6102901.62	Mildly pleasant	73	23	3	0	0	0	0
3	272593.30	6102903.44	Mildly pleasant	89	11	0	0	0	0	0
4	272600.18	6102852.71	Mildly pleasant	70	30	0	0	0	0	0
5	272600.52	6102820.48	NA	100	0	0	0	0	0	0
6	272492.33	6102907.98	NA	100	0	0	0	0	0	0
7	272523.94	6102861.26	NA	100	0	0	0	0	0	0

A.4 Quarry Road Dam - 2nd July

Survey Point	UTM Coordinates		Hedonic rating	No. of observations by intensity rating (%)						
	X	Y		Not detectable	Very weak	Weak	Distinct	Strong	Very strong	Extremely strong
1	272510.13	6102881.54	NA	100	0	0	0	0	0	0
2	272540.20	6102844.54	Mildly pleasant	94	6	0	0	0	0	0
3	272588.33	6102845.05	Mildly pleasant	83	17	0	0	0	0	0
4	272583.62	6102878.65	Mildly pleasant	94	6	0	0	0	0	0
5	272574.38	6102910.62	NA	100	0	0	0	0	0	0
6	272509.97	6102920.00	NA	100	0	0	0	0	0	0

Appendix B Site Plan



Appendix C BOM Weather Observations

Observations for Noarlunga - 1 st July								
Time (ACST)	Temp(°C)	Feels Like(°C)	Humidity(%)	Wind Direction	Wind Speed(km/h) (<i>knots</i>)	Wind Gust(km/h) (<i>knots</i>)	Pressure(hPa)	Rainfall since 9 am (mm)
3:00 PM	12.4	10.8	87	WSW	9	15	-	0
					5	8		
2:30 PM	12.4	10.4	86	W	11	17	-	0
					6	9		
2:00 PM	11.8	10	86	W	9	15	-	0
					5	8		
1:30 PM	12.2	10.4	84	W	9	13	-	0
					5	7		
1:00 PM	12.4	11	83	W	7	11	-	0
					4	6		
12:30 PM	12.4	10.9	80	W	7	9	-	0
					4	5		
12:00 PM	12.5	11.2	81	WSW	6	11	-	0
					3	6		

Observations for Noarlunga - 2 nd July								
Time(ACST)	Temp(°C)	Feels Like(°C)	Humidity (%)	Wind Direction	Wind Speed(km/h) (<i>knots</i>)	Wind Gust(km/h) (<i>knots</i>)	Pressure(hPa)	Rainfall since 9 am (mm)
1:30 PM	12.7	10.6	83	NNW	11	17	-	0.2
					6	9		
1:00 PM	12.4	10.8	87	NNE	9	15	-	0.2
					5	8		
12:30 PM	12	10.4	89	NNE	9	13	-	0.2
					5	7		
12:00 PM	10.7	9.1	96	NNE	9	15	-	0.2
					5	8		
11:30 AM	10.5	9.3	99	NNE	7	11	-	0.2
					4	6		
11:00 AM	9.5	8.1	99	N	7	15	-	0.2
					4	8		

10:30 AM	9.7	7.5	98	NNW	11	19	-	0.2
					6	10		
10:00 AM	10.5	8.7	93	NNW	9	15	-	0.2
					5	8		
9:30 AM	10.5	10.1	95	NE	2	4	-	0.2
					1	2		
9:00 AM	8.9	7.5	99	NNE	6	9	-	0.2
					3	5		
8:30 AM	7.4	5.6	99	NE	6	9	-	0.2
					3	5		
8:00 AM	6.7	5.9	99	CALM	0	0	-	0.2
					0	0		
7:30 AM	6.7	5.9	99	CALM	0	4	-	0.2
					0	2		
7:00 AM	7.1	5.6	99	ENE	4	7	-	0.2
					2	4		

A large, decorative white line graphic is positioned on the left side of the page. It starts with a semi-circle at the top, followed by a horizontal line, then a vertical line, a diagonal line, and another horizontal line, creating a series of connected geometric shapes.

Appendix 10 Acoustic Report



CoNEXA Water Storage Dam, Blewitt Springs

Environmental Noise Assessment

23 June 2025

Reference ID: 698-3

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Abbreviations

Assessment	Echo Acoustics <i>Environmental Noise Assessment</i> with Reference ID: 698-3, dated 23 June 2025
BMT	Base Metal Thickness
Code	<i>Planning and Design Code Version 2025.11, 19 June 2025, PlanSA.</i>
dB	Decibel
dB(A)	An A-weighted Decibel
Development	Proposed water storage dam, water storage tanks and pump station at 260 Whittings Road, Blewitt Springs
DO	Desired Outcome of the Code
DTS / DPF	Deemed-to-Satisfy Criteria / Designated Performance Feature of the Code
EP Act	<i>Environment Protection Act 1993</i>
EPA	South Australian Environment Protection Authority
kW	Kilowatts
L_{Aeq}	The A-weighted equivalent time-averaged noise level
PO	Performance Outcome of the Code
Policy	<i>Environment Protection (Commercial and Industrial Noise) Policy 2023</i>
Receivers	Sensitive receivers where noise impacts are considered. In this instance, the receivers are the closest existing dwellings to the development

Glossary

A-weighting	A mathematical adjustment to the measured noise levels to represent the human response to sound. An A-weighted noise level is presented as dB(A)
Ambient environment	The environment in the absence of the development
Assessment criteria	The noise levels established to objectively assess an unreasonable impact on the amenity of sensitive receivers
Characteristic	A characteristic determined in accordance with the Policy to be fundamental to the nature and impact of the noise. For example, a noise source is deemed to exhibit a characteristic if it produces distinctive tonal, impulsive, low frequency, intermittent or modulating features
Day	A period defined by the Policy as between 7.00am and 10.00pm
Decibel	The logarithmic unit of measurement to define the magnitude of a fluctuating air pressure wave. Used as the unit for sound or noise level
Equivalent noise level	The A-weighted noise level which is equivalent to a noise level which varies over time. The descriptor is L _{Aeq} and it is the A-weighted source noise level (continuous) referenced in the Policy

Frequency	Represents the number of fluctuating air pressure waves in one second. High frequency sound (high pitch or squeal) will generate many waves and low frequency sound (bass or rumble) will generate a small number of waves. The unit of frequency is Hertz
Indicative noise level	The noise level assigned by the Policy at a location to represent an impact on the acoustic amenity at that location. No further action is required to be taken under the EP Act for noise levels which are lower than the Indicative Noise Level
Night	A period defined by the Policy as between 10.00pm and 7.00am
Noise	An interchangeable term with sound but which is most often described as unwanted sound
Sensitive receiver	The same meaning as under Part 8 Administrative Terms and Definitions of the Code. Defined as: <ul style="list-style-type: none"> a. any use for residential purposes or land zoned primarily for residential purposes b. child care facility c. educational facility d. hospital e. supported accommodation f. tourist accommodation
Sound	An activity or operation which generates a fluctuating air pressure wave. The ear drum can perceive both the frequency (pitch) and the magnitude (loudness) of the fluctuations to convert those waves to sound
Sound power level	The amount of sound energy an activity produces for a given operation. The sound power level is a constant value for a given activity. The sound power level is analogous to the power rating on a light globe (which remains constant), whereas the lighting level in a space (sound pressure level in this analogy) will be influenced by the distance from the globe, shielding and different locations within the space
Sound pressure level	The magnitude of sound (or noise) at a position. The sound pressure level can vary according to location relative to the noise source, and operational, meteorological and topographical influences. The terms Sound Pressure Level and Noise Level are used interchangeably in this assessment

Summary

A new water storage dam, water storage tanks and pump station are proposed at 260 Whitings Road, Blewitt Springs (the **development**).

The noise from the development will primarily be associated with the operation of the pumps within the pump station.

This environmental noise assessment predicts the noise levels from the development and compares them with assessment criteria established in accordance with the *Planning and Design Code* and the *Environment Protection (Commercial and Industrial Noise) Policy 2023*.

As is common at the planning application stage, the detailed design of the development and selection of the pumps has not yet been finalised. Therefore, this assessment has been based on noise measurements conducted at comparable CoNEXA pump stations at Willunga and Aldinga.

The assessment determines that the assessment criteria can be achieved with the following noise control measures:

- Locating ventilation openings and doors on the northern and eastern sides of the pump station
- Ensuring all doors remain typically closed other than for immediate access
- Locating all pipework external to the pump station underground
- Constructing the pump station from 0.42 BMT sheet steel or acoustic equivalent.

It is also recommended that an acoustic review of the development be conducted during the design stage of the project to ensure the final design of the pump station and selection of the pumps achieves the requirements of the *Environment Protection (Commercial and Industrial Noise) Policy 2023*.

Introduction

A new water storage dam, water storage tanks and pump station are proposed at 260 Whitings Road, Blewitt Springs (the **development**).

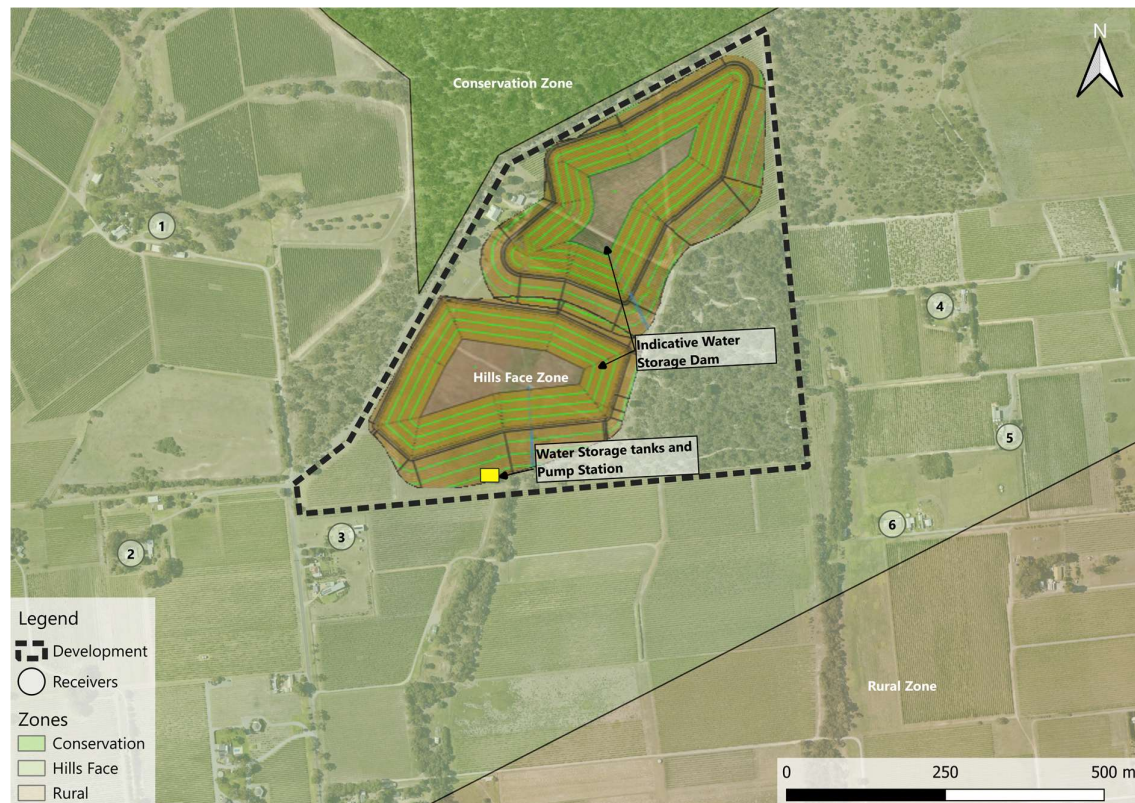
The noise from the development will primarily be associated with the operation of the pumps within the pump station.

This environmental noise assessment (the **assessment**) predicts the noise levels from the development and compares them with assessment criteria established in accordance with the *Planning and Design Code* and the *Environment Protection (Commercial and Industrial Noise) Policy 2023* (the **Policy**).

The closest sensitive receivers are the existing dwellings in the vicinity (the **receivers**). The existing dwelling located on the same land as the development is not considered a sensitive receiver for the purposes of this assessment.

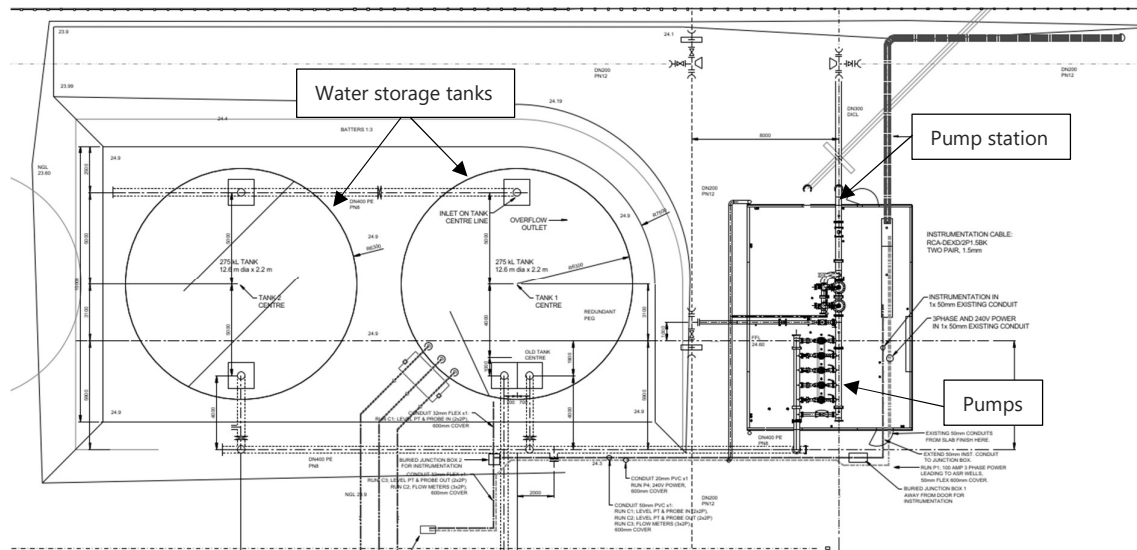
The development, the indicative water storage dam location, indicative water storage tanks and pump station location, the receivers, and the *Planning and Design Code* zones are shown in Figure 1.

Figure 1 Development Locality



The detailed design of the development is not finalised at this stage, but an indicative water storage tank and pump station layout based on a comparable CoNEXA pump station is shown in Figure 2.

Figure 2 Indicative Water Storage Tanks and Pump Station Layout



Source Hydroplan drawing dated 13 November 2009

Assessment Criteria

The Planning and Design Code

The development and the closest receivers are in a Hills Face Zone of the *Planning and Design Code Version 2025.11, 19 June 2025*. The following provisions within the Code are considered relevant to the assessment (*emphasis added*).

Interface between Land Uses (Part 4 – General Development Policies)

Desired Outcome DO 1

Development is located and designed to *mitigate adverse effects* on or from neighbouring and proximate land uses.

Performance Outcome PO 1.2

Development adjacent to a site containing a sensitive receiver (or lawfully approved sensitive receiver) or zone primarily intended to accommodate sensitive receivers is *designed to minimise adverse impacts*.

Performance Outcome PO 2.1

Non-residential development *does not unreasonably impact the amenity of sensitive receivers* (or lawfully approved sensitive receivers) or an adjacent zone primarily for sensitive receivers through its hours of operation having regard to:

- a) the nature of the development
- b) measures to mitigate off-site impacts
- c) the extent to which the development is desired in the zone
- d) measures that might be taken in an adjacent zone primarily for sensitive receivers that mitigate adverse impacts without unreasonably compromising the intended use of that land.

Performance Outcome PO 4.1

Development that emits noise (other than music) *does not unreasonably impact the amenity of sensitive receivers* (or lawfully approved sensitive receivers).

Deemed-to-Satisfy Criteria / Designated Performance Feature DTS / DPF 4.1

Noise that affects sensitive receivers achieves the relevant *Environment Protection (Commercial and Industrial Noise) Policy* criteria.

Performance Outcome PO 4.2

Areas for the on-site manoeuvring of service and delivery vehicles, plant and equipment, outdoor work spaces (and the like) are designed and sited *to not unreasonably impact the amenity of adjacent sensitive receivers (or lawfully approved sensitive receivers) and zones primarily intended to accommodate sensitive receivers* due to noise and vibration by adopting techniques including:

- a) locating openings of buildings and associated services away from the interface with the adjacent sensitive receivers and zones primarily intended to accommodate sensitive receivers
- b) when sited outdoors, locating such areas as far as practicable from adjacent sensitive receivers and zones primarily intended to accommodate sensitive receivers
- c) housing plant and equipment within an enclosed structure or acoustic enclosure
- d) providing a suitable acoustic barrier between the plant and / or equipment and the adjacent sensitive receiver boundary or zone.

Environment Protection (Commercial and Industrial Noise) Policy 2023

Interface between land uses DTS / DPF 4.1 references the relevant Environment Protection (Commercial and Industrial Noise) Policy criteria. The relevant criteria are provided by the *Environment Protection (Commercial and Industrial Noise) Policy 2023* (the **Policy**)

The Policy is an objective instrument under the *Environment Protection Act 1993* (the **EP Act**). The EP Act incorporates a requirement to ensure that noise does not unreasonably interfere with the enjoyment of an area.

The Policy provides an objective approach to satisfy both the EP Act and interface between land uses PO 4.1. With the intent of the other relevant desired outcomes and performance outcomes of the Code being aligned with the EP Act and interface between land uses PO 4.1, they are also considered to be satisfied through compliance with the Policy.

The Policy establishes indicative noise levels that apply at receivers for both the day (7.00am to 10.00pm) and night (10.00pm to 7.00am the following day).

The indicative noise levels vary according to the principal land use promoted in the zones where the development and the receivers are located. For a new development, the Policy's criteria at receivers are the indicative noise levels minus 5 dB(A).

In this circumstance, the Policy assigns the following equivalent noise levels (L_{Aeq}) when assessed at the receivers identified in Figure 1 (the **assessment criteria**):

- L_{Aeq} of 47 dB(A) during the day
- L_{Aeq} of 40 dB(A) during the night.

When predicting noise levels for comparison to the assessment criteria, the predicted noise levels are to be adjusted (increased) where the activities exhibit "annoying" characteristics (dominant tonal, impulsive, low frequency content, intermittency¹, or modulation characteristics) within the ambient environment.

¹ Intermittency is only applicable during the night period

Assessment

The noise from the development has been predicted based on noise measurements and observations conducted at comparable CoNEXA pump stations at Willunga and Aldinga.

The Willunga pump station houses five 90 kW pumps and is constructed from sheet steel, including a roller door, a personal access door, and ventilation louvres.

The Aldinga pump station houses five 45 kW turbine pumps and is constructed from concrete walls, sheet steel roof, ventilated roller door, and a personal access door.

The main noise generating activity at the development will be the operation of the pumps within the pump station. The noise measurements and subsequent assessment indicate that the location of the pump station along with the positioning of its ventilation and other openings are more important considerations than the construction material of the pump station's walls and roof.

Operational Assumptions

As is common at the planning application stage, the detailed design of the development and selection of the pumps has not yet been finalised. Therefore, the following operational assumptions have been used for the noise assessment over each 15-minute period (default assessment period of the Policy):

Scenario 1: the proposed pump station being equivalent to the Willunga pump station with a roller door, personal access doors, and ventilation louvres

Scenario 2: the proposed pump station being equivalent to the Aldinga pump station with a ventilated roller door and personal access door.

The two scenarios assume five pumps operating simultaneously during the night and the personal access doors being closed.

Noise Control Measures

The following noise control measures are recommended:

- Locate the ventilation openings, roller doors and personal access doors on the northern and eastern sides of the pump station
- Ensure all doors remain typically closed other than for immediate access
- Locate all pipework external to the pump station underground
- Construct the pump station from 0.42 BMT sheet steel or acoustic equivalent.

Future Services Design

The selection and procurement of the pumps has not yet been made, as is common at the planning application stage of a project. As a result, the noise from the development including the effect of ventilation openings and final pump selections should be confirmed during the design and documentation stage of the project when these aspects of the design are finalised.

Based on this assessment, a condition relating to the final pump station design and pump selections achieving the Policy can be reasonably and practicably complied with.

Predicted Noise Level

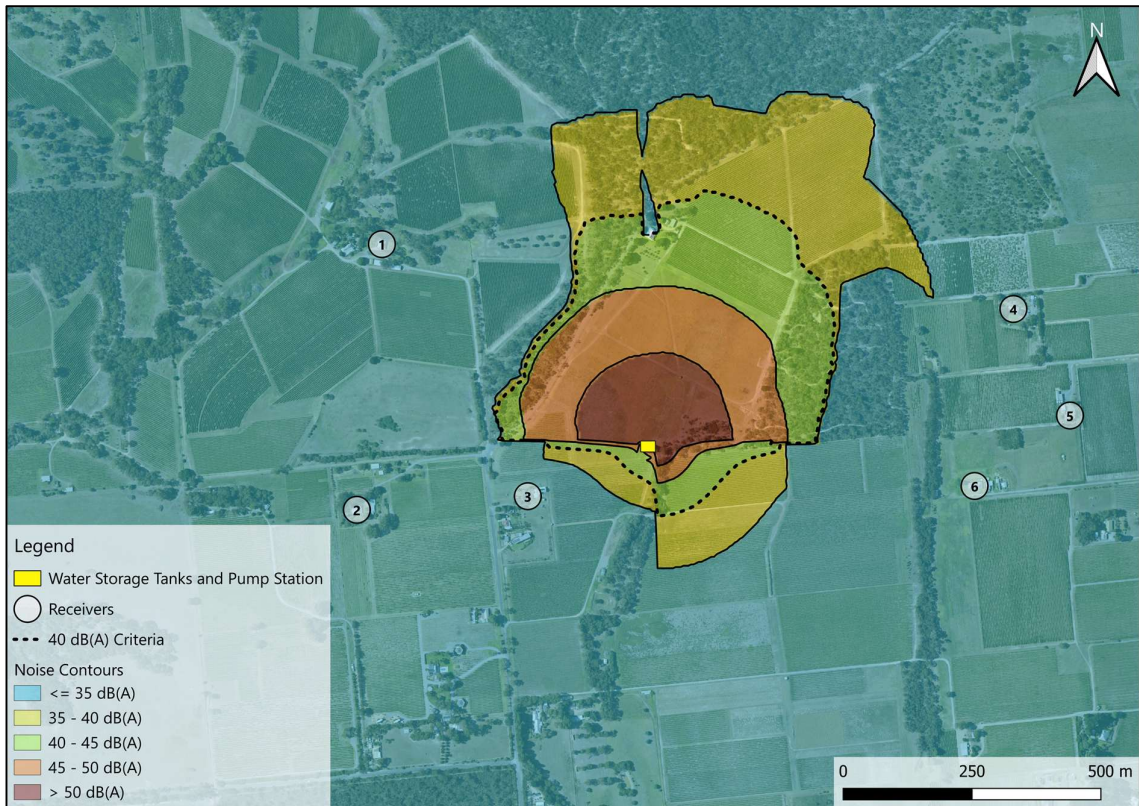
The noise from the development has been predicted using the noise calculation method provided by the *International Standard ISO 9613-2:2024 "Acoustics - Attenuation of sound during propagation outdoors - Part 2: Engineering method for the prediction of sound pressure levels outdoors"* in combination with the operational assumptions and noise control measures detailed above. Local topographical features and the influence of the water storage dams have also been accounted for.

When predicting noise levels for comparison with the Policy, the noise levels are to be adjusted where the activities exhibit "annoying" characteristics in comparison to the ambient environment. An adjustment (increase) of 5 dB(A) has been applied to the predicted noise levels at all receivers to account for tonal characteristics which can occur with some pump selections. The results of the noise predictions, which include the 5 dB(A) adjustment, are shown as a noise contour map in the figures below.

Figure 3 Scenario 1 Noise Contour Map



Figure 4 Scenario 2 Noise Contour Map



The noise contour maps demonstrate that the assessment criteria for both operating scenarios are predicted to be achieved at all receivers.

That is, whilst the final design of the pump station and pumps for the development has not been completed (as is common at this stage of a project), comparable facilities have been measured and modelled to comply with the assessment criteria subject to the inclusion of reasonable and practicable noise reduction measures.

Conclusion

Noise from the proposed water storage dam, water storage tanks and pump station at 260 Whittings Road, Blewitt Springs, has been considered against assessment criteria developed in accordance with the requirements of the *Planning and Design Code*, and the *Environment Protection (Commercial and Industrial Noise) Policy 2023* (the **Policy**).

The assessment utilises noise level measurements and modelling based on comparable pump stations to determine that the assessment criteria can be achieved with the following reasonable and practicable noise control measures:

- Locating ventilation openings and doors on the northern and eastern sides of the pump station
- Ensuring all doors remain typically closed other than for immediate access
- Locating all pipework external to the pump station underground
- Constructing the pump station from 0.42 BMT sheet steel or acoustic equivalent.

It is recommended that an acoustic review of the development be conducted during the detailed design and documentation stage of the project to ensure the final design of the pump station and selection of the pumps can achieve the requirements of the Policy. Based on this assessment, a condition relating to the final pump station design and pump selections achieving the Policy can be reasonably and practicably complied with.

Based on the above, the development can be located and designed to manage environmental impacts and not unreasonably impact the amenity of existing dwellings. In doing so, the development satisfies all the relevant *Planning and Design Code* provisions relating to environmental noise.

References

Environment Protection Act 1993

Environment Protection (Commercial and Industrial Noise) Policy 2023

Guidelines for the Use of The Environment Protection (Commercial and Industrial Noise) Policy 2023

Hydroplan drawing, Drawing No 212- 27, 13 November 2009

International Standard ISO 9613-2:2024 "Acoustics - Attenuation of sound during propagation outdoors - Part 2: Engineering method for the prediction of sound pressure levels outdoors"

Planning and Design Code Version 2025.11, 19 June 2025, PlanSA

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Appendix 11
Stormwater Management Plan & Report

Blewitt Springs Water Storage Dams

Stormwater Management Plan

coNEXA

27 June 2025
Ref: 250770R001



Building exceptional
outcomes together



Document History and Status

Rev	Description	Author	Reviewed	Approved	Date
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Client: coNEXA
Ref: 250770R001

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Appendix A – Draft site plan



1 Introduction

1.1 Background

coNEXA is in the early concept design stages of two new water storage dams at 260 Whittings Road, Blewitt Springs, and is seeking a stormwater management plan (SMP) to support the development application for the project. A concept plan for the proposed works has been developed by Pinion Advisory (2025) (refer Appendix A). The plan shows a total storage volume of 1,138 ML.

1.2 Site description

The 34.6 ha site is bounded by Whittings Road to the north and west, and horticultural land uses to the east and south (refer Figure 1.1). Much of the site grades towards the southern boundary at an average grade of approximately 4%. Flow would be expected in the form of shallow sheet flow, ultimately discharging to the Onkaparinga River which is located approximately 2 km to the south. Smaller portions of the site at the northern end grade towards the south-east and north. Flows from these areas also ultimately discharge to the Onkaparinga River.

The northern dam is situated at the top of a high point at a higher elevation than the southern dam which is located on the downward slope. Both dams will be constructed above the natural surface elevations, resulting in a 'turkey nest' configuration.

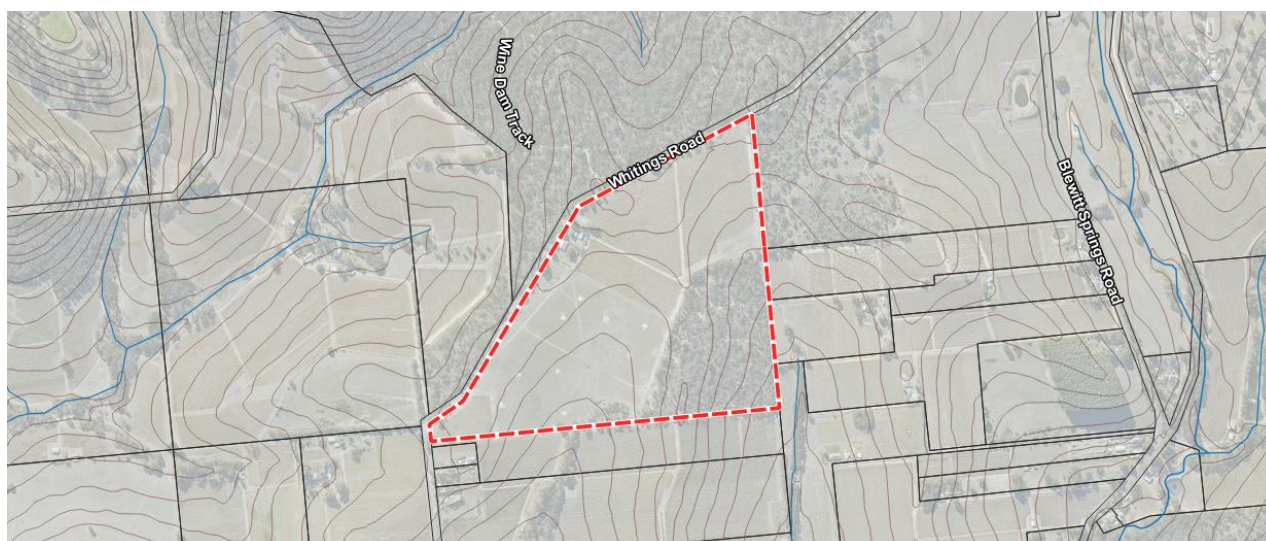


Figure 1.1 Locality plan

1.3 This report

This report provides a recommendation for the management of stormwater discharged from the developed site. Consideration is given to the requirements of a number of relevant policies. Details of the hydrological and hydraulic analyses that have been undertaken are included.



2 Relevant policies

The site of the proposed storages is located within an area over which several policies apply. The policies, and their potential impact on the operations of the storages, are discussed in the following sections.

2.1 Planning and Design Code

Review of the Planning and Design Code was undertaken to identify relevant requirements relating to stormwater management for the site. One requirement of relevance within the Water Resources Overlay was identified, as follows:

- Performance outcome (PO) 1.9: Dams, water tanks and diversion drains are located and constructed to maintain the quality and quantity of flows required to meet environmental and downstream needs.

2.2 Western Mount Lofty Ranges Water Allocation Plan

The site is located within the Western Mount Lofty Ranges (WMLR) Prescribed Water Resources Area. Specifically, the site is within Surface Water Management Zone (SWMZ) W_PedI01 within the Willunga Basin catchment. The development is therefore subject to the requirements of the WMLR water allocation plan (WAP).

The WAP sets out the maximum amount of surface water and watercourse water that can be taken within an SWMZ, how that water may be allocated to users, and the types of activities that are permitted with that water. The limit aims to ensure sufficient flows for environmental water provisions as well as for downstream users. Each SWMZ also has a diversion limit which is the total volume of surface water and watercourse water that can be collected or diverted by all dams and/or intercepted by commercial forests.

The extraction and diversion limits for SWMZ W_PedI01 as set out in the WAP are as follows:

- Surface water extraction: 94 ML/a
- Main watercourse extraction: N/A
- Diversion limit: 189 ML/a

The site plan (Appendix A) shows that the storages will be built above existing surface levels and therefore will not capture surface runoff, other than water directly falling onto the storages themselves. It is therefore unlikely that a licence under the WMLR WAP will be required for the site.

2.3 McLaren Vale Water Allocation Plan

The site is situated within the McLaren Vale Prescribed Wells Area, and hence is subject to the conditions of the McLaren Vale WAP. This WAP pertains to the taking and use of groundwater.

A licence would only be required if extraction from groundwater was proposed as part of the operations of the storage.



3 Hydrological modelling

Hydrological modelling was undertaken to provide estimates of pre- and post-development peak flows leaving the site. The hydrological assessment is based upon the recommendations and guidance provided within the 2016 edition (and 2024 update) of Australian Rainfall and Runoff (ARR2016) and the specifications of Council's Stormwater Management Design Guide (SMDG).

The modelling was undertaken using DRAINS. As recommended in ARR2016, for each duration the model was run for an ensemble of ten rainfall patterns using the latest (2016) intensity-frequency-duration (IFD) data.

Consistent with Council's requirements the model was run for a minor (10% annual exceedance probability (AEP)) and major (1% AEP) rainfall event.

3.1 Hydrological modelling parameters

The sub-catchments within the study area have been modelled in DRAINS using an initial loss-continuing loss type hydrological model. The model parameters provided in Table 3.1 have been obtained from the Australian Rainfall and Runoff data hub. The post-development modelling has been undertaken for a future climate scenario to account for potential increases in rainfall intensity. The adopted climate change scenario is summarised below and is based on the development being 'low risk' (i.e. inundation will not result in significant damage):

- Shared Socio-economic Pathway (SSP): SSP1-2.6 (low emissions)
- Target horizon: 2090

Table 3.1 DRAINS model parameters

Parameter	Value
Impervious area initial loss	1 mm
Pervious area initial loss (current climate)	24 mm
Pervious area continuing loss (current climate)	4.6 mm/hr
Pervious area initial loss (future climate)	25.7 mm
Pervious area continuing loss (future climate)	4.97 mm/hr
Antecedent moisture content	2.5

Given that the batters are relatively steep and will be compacted, the initial and continuing losses for the future scenario have been scaled down by 50% across the site to account for the potential additional runoff from the batters.

No supplementary areas were used in the modelling, in accordance with the SMDG.

3.2 Catchment characteristics

3.2.1 Sub-catchment definition

Sub-catchment boundaries for the existing scenario were delineated using topographical data available from ELVIS (0.5 m cell size), overlaid onto the site plan. Review of the topography of the site identified three low points around the circumference of the proposed storages towards which runoff would



currently flow. The sub-catchments have been drawn to these low points, as shown in Figure 3.1 (noting that Catchment 1a and 1b would discharge slightly downstream of the nominated outlet).

A summary of the contributing areas is provided in Table 3.2.

Table 3.2 Catchment contributing areas

Parameter	Area (ha)
Dam footprint	21.0
Contributions from external catchments	4.0
Total catchment area	25.3

Sub-catchment boundaries for the post-development scenario have been delineated to the same three discharge locations (refer Figure 3.2). The catchments include contributions from the external catchments as well as runoff from the external basin batters. Areas draining into the storages have been excluded as they will not contribute to runoff leaving the site. This assumes that coNEXA will manage the water level within the storages to ensure they are not overtopped. There is a thin catchment along the western edge of the southern storage that would not arrive at the original discharge location, but would instead fall westerly towards Whittings Road.

A summary of the pre- and post-development sub-catchment areas is provided in Table 3.3.

Table 3.3 Sub-catchment areas

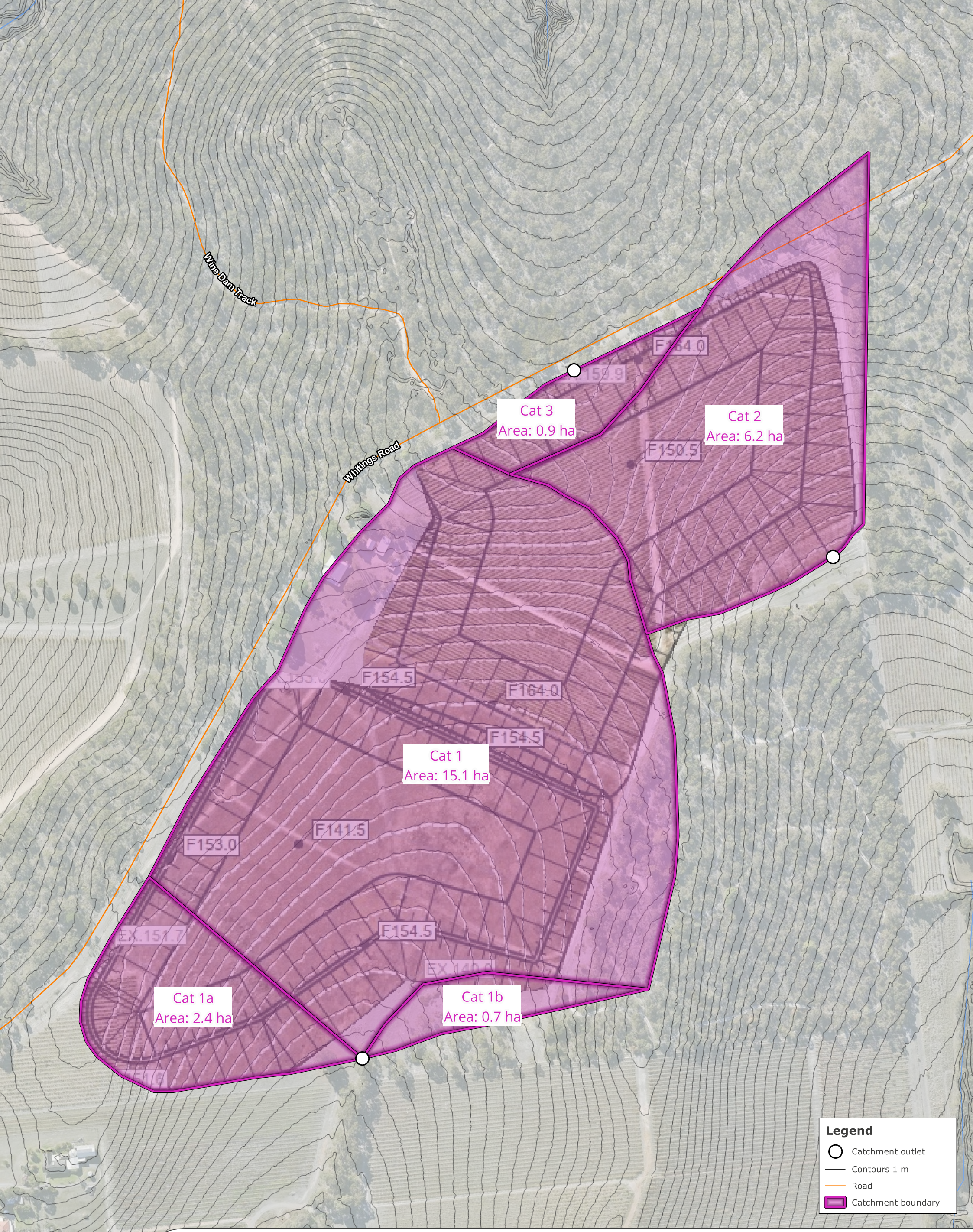
Catchment	Pre-development area (ha)	Post-development area (ha)
Catchment 1, 1a, 1b	18.2	6.8
Catchment 2	6.2	2.7
Catchment 3	0.9	0.8
Catchment 4	N/A	0.4
Total	25.3	10.7

3.2.2 Estimates of impervious area

The DRAINS model requires estimates of impervious areas for each catchment. Review of aerial imagery suggests that in its current state, the site is entirely pervious. The modelling therefore has assumed a 0% impervious fraction for all catchments pre-development.

In the post-development scenario, the drawings show an access track around the upper circumference of the southern basin. The track appears to have a width of 4.5 m and is assumed to be a compacted rubble material. It is understood a similar track will also be constructed around the northern basin (not currently shown on the drawings). A shed style pump station (10 m x 30 m) is also proposed at the southern end of the site. These elements will result in a total impervious area of approximately 1.1 ha (i.e. approximately 10% of the total post-development catchment area).

It has been conservatively assumed that the tracks will be graded such that runoff falls down the external batters. If the tracks are graded towards the interior of the storages, then they would not need to be modelled in DRAINS. A track would normally be modelled in DRAINS as a supplementary area, however as the SMDG specifies that supplementary areas are not to be used, the compacted rubble portion of each catchment was modelled as an effective impervious area.



Job Number: 250770
 Filename: 250770GQ001
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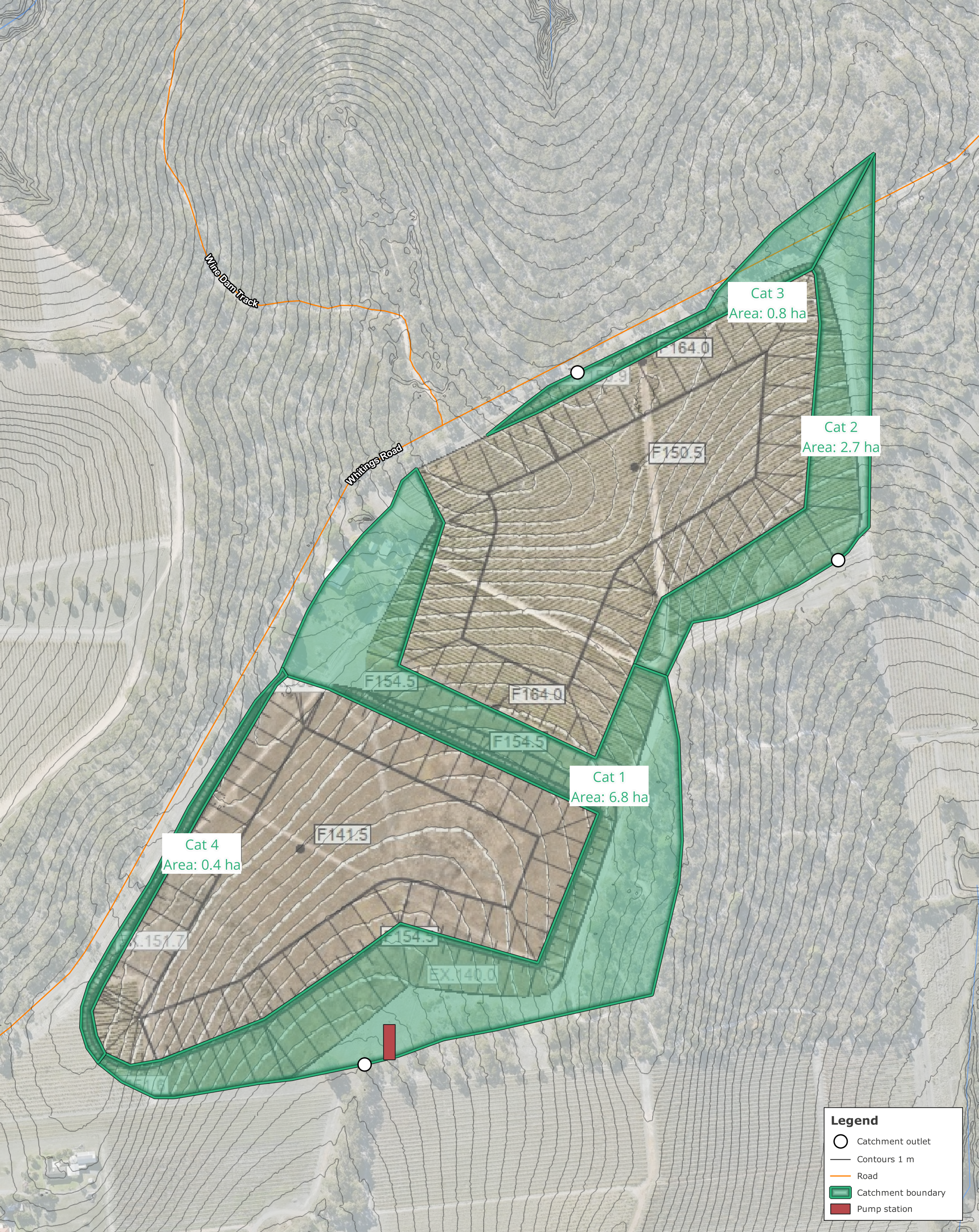
Data Acknowledgement:
 Aerial imagery from MetroMap, 2025
 Contours from ELVIS, 2025
 Site plan from coNEXA, 2025



**BLEWITT SPRINGS WATER STORAGE DAMS
 CATCHMENT PLAN (PRE-DEVELOPMENT)**

CONEXA

Figure 3.1



Cat 4
Area: 0.4 ha

Cat 1
Area: 6.8 ha

Cat 2
Area: 2.7 ha

Cat 3
Area: 0.8 ha

Legend

- Catchment outlet
- Contours 1 m
- Road
- Catchment boundary
- Pump station



Job Number: 250770
 Filename: 250770GQ001
 Revision: A
 Date: 2025-06-26
 Drawn: MM



Data Acknowledgement:
 Aerial imagery from MetroMap, 2025
 Contours from ELVIS, 2025
 Site plan from coNEXA, 2025



**BLEWITT SPRINGS WATER STORAGE DAMS
 CATCHMENT PLAN (POST-DEVELOPMENT)**

Figure 3.2



3.2.3 Time of concentration

The times of concentration for each sub-catchment were estimated based on flow paths lengths and slopes, and are summarised in Table 3.4. As is to be expected the steeper batter slopes result in lower times of concentration for the smaller sub-catchments in the post-development scenario.

Table 3.4 Times of concentration (minutes)

Sub-catchment	Pre-development	Post-development
Catchment 1, 1a, 1b	46	33
Catchment 2	36	21
Catchment 3	30	10
Catchment 4	N/A	6

3.3 Peak flows

The estimates of 10% AEP and 1% AEP peak flows for each sub-catchment are summarised in Table 3.5.

Table 3.5 Modelled flow rates (L/s) for each sub-catchment

Sub-catchment	Pre-development 10% AEP	Post-development 10% AEP	Pre-development 1% AEP	Post-development 1% AEP
Catchment 1, 1a, 1b	502	194	1,810	1,030
Catchment 2	196	92	714	538
Catchment 3	29	22	117	123
Catchment 4	N/A	16	N/A	130

The results show that the post-development flow rates for Catchments 1 and 2 do not exceed the flow rates for the pre-development scenario, and Catchment 3 is roughly equivalent. The slight increase in impervious area is offset by the reduction in catchment size.

Runoff from Catchment 4 is higher in the post-development scenario due to the formation of the western batter of the southern basin redirecting flows to the west towards Whittings Road (this runoff would previously have travelled south). In the post-development scenario, Catchment 3 receives additional runoff from a 0.5 ha area that previously contributed to Catchment 2 but will now be obstructed by the new batter and also diverted back towards Whittings Road (refer Figure 3.3). Measures to reduce the peak flows from each catchment are not considered to be necessary given the overall reduction in flow rates discharged from the site.

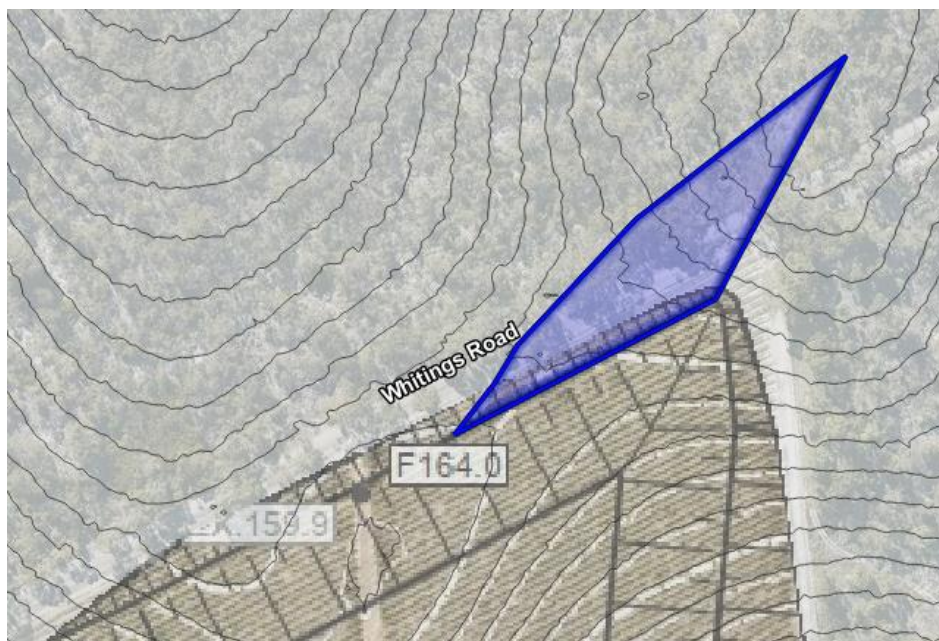


Figure 3.3 Catchment area intercepted by new batter



4 Stormwater management plan

Based on the outcomes of the above investigations, stormwater management recommendations have been developed, as summarised in the following sections and shown in Figure 4.4.

4.1 Erosion management

4.1.1 Erosion protection for the batters

It is important that the batters of each storage are constructed with appropriate erosion protection to ensure that material is not removed from the surface of the batters and transported downstream. A well vegetated cover is recognised as the best long-term mechanism for limiting sediment detachment and therefore preventing erosion (IECA, 2008). As such, it is recommended that all exposed batters be topsoiled and hydromulched using a seed/fertiliser mix to establish vegetation (grass) growth.

4.1.2 Flow diversion banks

Additionally, IECA (2008) provides guidance on the spacing of flow diversion banks along well grassed, low to moderately erodible soil slopes. For batter slopes of 1V:4H, the following maximum spacings are recommended:

- Horizontal spacing: 40 m.
- Vertical spacing: 10 m.

Review of the proposed site plan shows that there are sections of embankment that have horizontal distances exceeding 40 m. In these locations it is recommended that a flow diversion bank be constructed to intercept runoff before rill erosion can occur. The longitudinal grade of the diversion bank should be limited to a maximum of 1%. A typical profile of a flow diversion bank is shown in Figure 4.1.

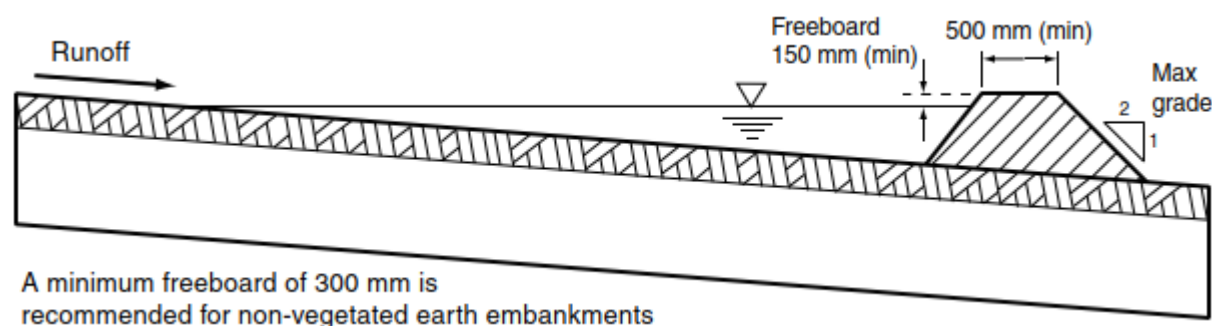


Figure 4.1 Typical profile of flow diversion bank formed from earth (IECA, 2009)

Flow diversion banks would not be required on the western side of the storages which discharge to Whittings Road as the batters do not exceed 40 m.

4.1.3 Rock chutes

The diversion banks should terminate at a rock chute. Based on the proposed configuration of diversion banks there will need to be two rock chutes. The rock chutes will be used to transfer the concentrated flows passing along the diversion banks to the bottom of the batters. Based on the similar contributing catchment area from the batters, the dimensions shown in Table 4.1 are proposed for both rock chutes.



Table 4.1 Rock chute dimensions

Parameter	Value
Design flow (1% AEP)	210 L/s
Longitudinal grade	25% (matches batter grade)
Base width	0.5 m
Side slopes	1V:3H
Channel depth	300 mm (includes 150 mm freeboard)
d ₅₀ rock size	125 mm

4.2 Flow discharge (level spreader)

Runoff discharging down the western batters will not be concentrated, and it is therefore proposed to allow this runoff to continue sheeting towards Whittings Road along existing flow paths towards the north and north-west. Runoff discharging down the eastern batters via the rock chutes and perimeter swales will be concentrated. These flows should be spread out to limit the risk of concentrated discharge downstream of the site posing an erosion risk. It is proposed that level spreaders downstream of the batter are utilised to disperse the concentrated runoff over the existing vegetated surface. This will allow the embankment runoff to be discharged from the site as shallow sheet flow, utilising the natural fall of the land and allowing the post-development flow regime to be kept as close as possible to the existing flow regime.

The length of the outlet sill (weir) of the level spreader is governed by the design discharge and the allowable flow velocity of the downstream area. Based on a land slope of 3.5%, the allowable discharge velocity would be 2 m/s (Catchments and Creeks, 2010). For this velocity and land slope, Catchments and Creeks recommends a minimum sill length of 4 m.

4.3 Perimeter swale

All runoff from the batter that is not intercepted by a flow diversion bank will be discharged to the bottom of the batter. To capture this runoff, it is proposed that a shallow trapezoidal swale is constructed along the toe of the eastern embankments, conveying flow to one of the level spreaders prior to discharge from the site. Based on the contributing catchment areas, different swale dimensions are proposed for the northern and southern storages, as summarised in Table 4.2. The swales are to be grass-lined for their full length to slow velocities and minimise the risk of erosion. In calculating the swale dimensions, a Manning's roughness (n) value of 0.04 has been assumed, typically representative of a vegetated, moderately rough channel.

Table 4.2 Perimeter swale dimensions

Parameter	Northern storage	Southern storage
Design flow (1% AEP)	230 L/s	820 L/s
Minimum grade	2.5%	5.0%
Base width	0.5 m	0.5 m
Side slopes	1V:3H	1V:3H



Parameter	Northern storage	Southern storage
Channel depth (excludes freeboard)	170 mm	350 mm

If an access track is to be constructed across a section of swale, it is recommended that the swale batters be flattened to a maximum of 1V:5H to ensure they are traversable. Alternatively, appropriately sized culverts could be placed to match the invert of the swale with the access track passing over the culverts.

4.4 Interface between storages

4.4.1 Trapped area

The concept drawings show that the interface between the two storages will be built up above the existing surface levels. This will result in runoff from the 1 ha catchment to the west of the storages becoming trapped against the western batter (refer Figure 4.2). To avoid water ponding against the embankment, it is recommended that a cross pipe is constructed to convey flow to the east of the storages. A 375 mm diameter concrete pipe would be sufficient for conveying the runoff from that catchment (in the order of 150 L/s in the 1% AEP event). The pipe would discharge to the perimeter swale on the eastern side of the storages. Scour protection at the outlet of the pipe in the form of rock riprap would be required.

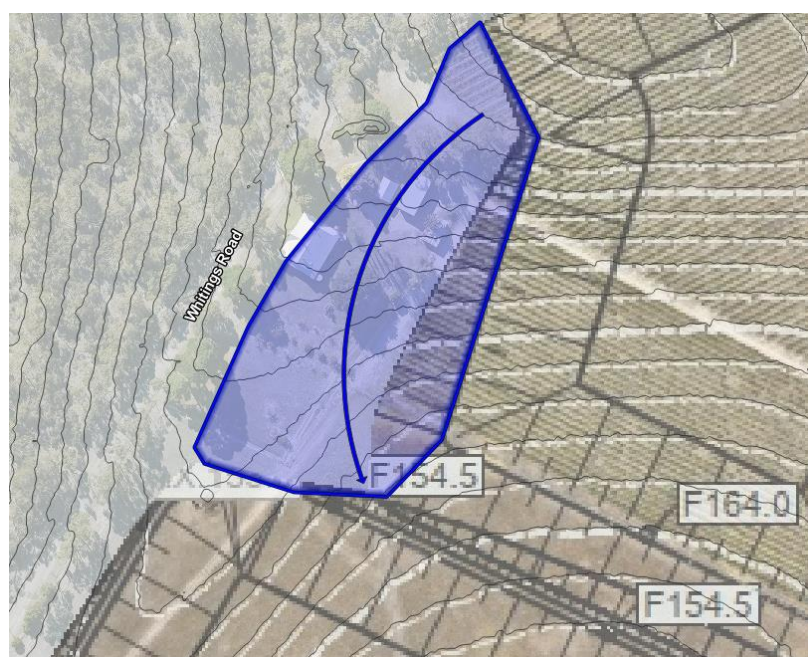


Figure 4.2 Location of trapped low point against western embankment

4.4.2 Open channel

The interface of the storages currently forms a V-shaped channel (refer Figure 4.3). The height of the channel is approximately 1.5 m, so there would be ample capacity for the channel to convey runoff that runs down the batters. It should be noted that a V-shaped channel presents a higher risk of erosion due to water concentrating along the invert of the V. It is recommended that the base of the channel be flattened off to form a trapezoidal channel, nominally 0.5 m wide. This would require the invert to be lifted slightly. Runoff within the channel would then be discharged to the eastern perimeter swale.

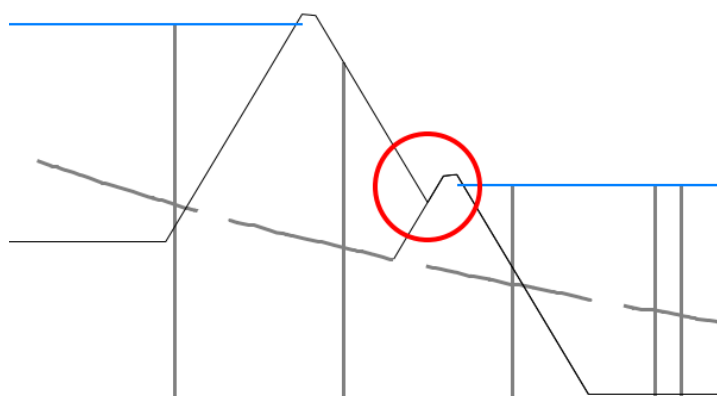
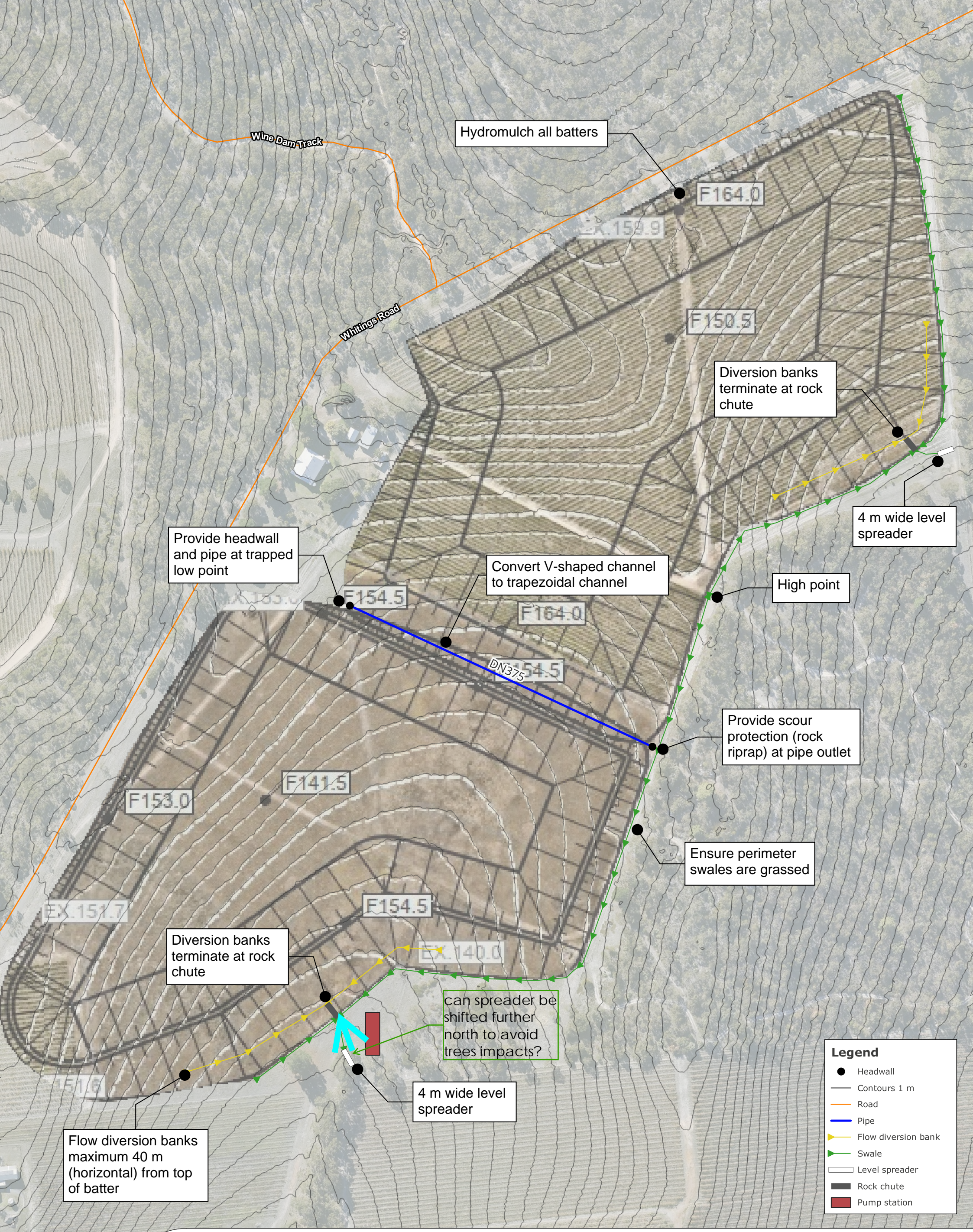


Figure 4.3 V-shaped channel at the interface of the two storages

4.5 Water quality

It is considered that the operation of the storages will not impact the water quality of runoff from the site. The main impact will be during construction, which will need appropriate measures in place to manage erosion through the adoption of an effective soil erosion and drainage management plan (refer Section 5). Additionally, as the site will retain more water than was previously discharged, specific water quality treatment measures are not considered necessary. However, the batters of the storage will be grassed, as will the swales conveying flows to the nominated discharge points. These will provide vegetative filtering which will reduce the volume of pollutant loads leaving the site, and should satisfy the water quality requirements of the Planning and Desing Code (PO1.9).

Grading the perimeter access tracks to direct runoff into the storages (rather than down the external batters) would ensure that any potential pollutants from vehicle use are retained on site.



Wine Dam Track

Hydromulch all batters

F164.0

Whitings Road

F150.5

Diversion banks terminate at rock chute

4 m wide level spreader

Provide headwall and pipe at trapped low point

Convert V-shaped channel to trapezoidal channel

High point

F154.5

F164.0

Provide scour protection (rock riprap) at pipe outlet

F153.0

F141.5

Ensure perimeter swales are grassed

EX 151.7

F154.5

Diversion banks terminate at rock chute

can spreader be shifted further north to avoid trees impacts?

4 m wide level spreader

Flow diversion banks maximum 40 m (horizontal) from top of batter

Legend

- Headwall
- Contours 1 m
- Road
- Pipe
- Flow diversion bank
- Swale
- Level spreader
- Rock chute
- Pump station



**BLEWITT SPRINGS WATER STORAGE DAMS
STORMWATER MANAGEMENT PLAN**

Job Number: 250770
 Filename: 250770GQ001
 Revision: A
 Date: 2025-06-26
 Drawn: MM

Data Acknowledgement:
 Aerial imagery from MetroMap, 2025
 Contours from ELVIS, 2025
 Site plan from coNEXA, 2025

Figure 4.4



5 Erosion and sediment control during construction

During construction of the proposed storage, site runoff should be managed to ensure that sediment is not transported into any downstream receiving waters, particularly given the large areas of exposed earth during construction that will be susceptible to erosion. A soil erosion and drainage management plan (SEDMP) should be prepared by the contractor prior to the commencement of construction.

5.1 Preliminary erosion hazard assessment

A preliminary assessment of erosion hazard has been undertaken using Appendix F of the IECA (2008) guidelines. A summary of the key parameters of the assessment is provided in Table 5.1. A score of 17 or greater is considered high risk.

Table 5.1 Erosion hazard assessment

Condition	Assessment	Score
Average slope of disturbance area	3-5%	1
Soil classification group (AS1726)	Untested, but assume clayey sand (SC)	2
Emerson (dispersion) class number	Untested	4 (default)
Duration of soil disturbance	4-6 months	4
Area of disturbance	More than 4 ha	6
Waterway disturbance	No disturbance to a watercourse	0
Total score		17

Based on the preliminary assessment, the site is likely to be considered high risk for erosion during construction and will require a detailed SEDMP.

5.2 Likely requirements for erosion and sediment control

Development of a detailed SEDMP is beyond the scope of this SMP. The measures specified in the SEDMP will be required to address:

- Effective control of surface runoff entering and leaving the site.
- Erosion control works and measures to minimise the amount of site erosion.
- Sediment collection devices to prevent sediment leaving the site.
- Provision for stockpiles to be stored within the sediment barrier.
- Rehabilitation of all disturbed areas as soon as is practical. Temporary vegetation may be required.
- Maintenance of all erosion control and sediment collection devices.

Potential measures may include:

- Sedimentation basins.
- Sediment fences.
- Staging of construction.



- Sediment control at site entry and exit points.
- Covering of stockpiles.
- Temporary erosion protection during vegetation establishment.

The SEDMP will also need to specify maintenance requirements for the control measures. All sediment and erosion control measures should be inspected at least weekly and after any significant rainfall event. Any necessary repairs should be addressed immediately. The timing of construction may also be a consideration such that construction is undertaken during the drier months of the year.



6 References

Catchments and Creeks (2010), *Level Spreaders*, Version 2 – May 2010.

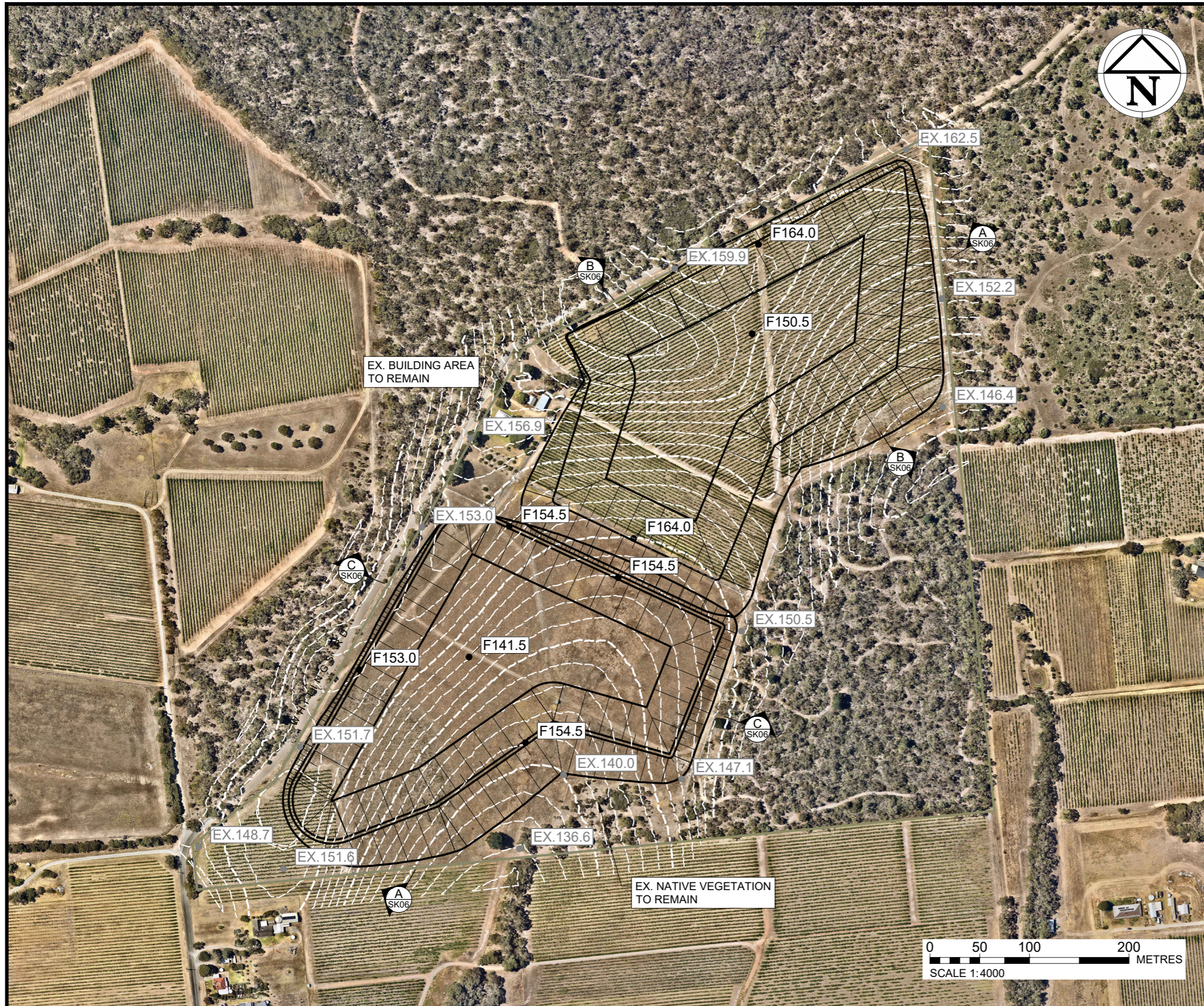
IECA (2008), *Best Practice Erosion & Sediment Control*, International Erosion Control Association (Australasia), Picton NSW.

IECA (2009), *Flow Diversion Banks*, drawing DB-01.

Pinion Advisory (2025), *Blewitt Springs Storage Expansion – Storage Option No. 2 Site Plan*, sheet no. SK04 and SK06 dated 30/05/25.



Appendix A – Draft site plan



EXISTING LEGEND	
	PROPERTY BOUNDARY
	EXISTING CONTOUR
	EXISTING SURFACE LEVEL
	EXISTING WATER COURSE
PROPOSED LEGEND	
	FINISHED SURFACE LEVEL
	SECTION No. & DWG REF

QUANTITIES TABLE		
ITEM	QTY.	UNITS
TOTAL STORAGE	1,318	ML
FREEBOARD	0.6	m
DAM CREST WIDTH (MIN.)	4.0	m
BATTER SLOPE	1:3	V:H
DAM FLOOR SLOPE	0	%
NORTH CUT VOLUME	329,000	m ³
NORTH FILL VOLUME	337,200	m ³
NORTH NET VOLUME (FILL)	8,200	m ³
SOUTH CUT VOLUME	263,000	m ³
SOUTH FILL VOLUME	235,000	m ³
SOUTH NET VOLUME (CUT)	28,000	m ³
OVERALL NET VOLUME (CUT)	19,800	m ³

DRAFT

PRELIMINARY

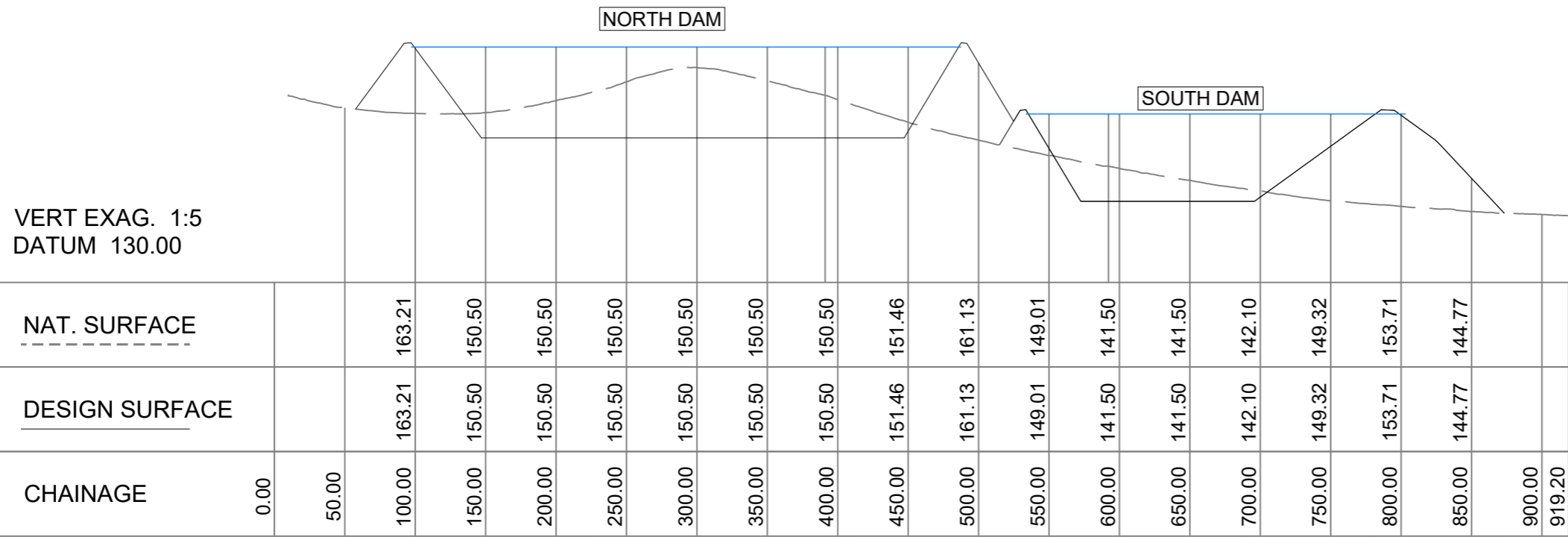
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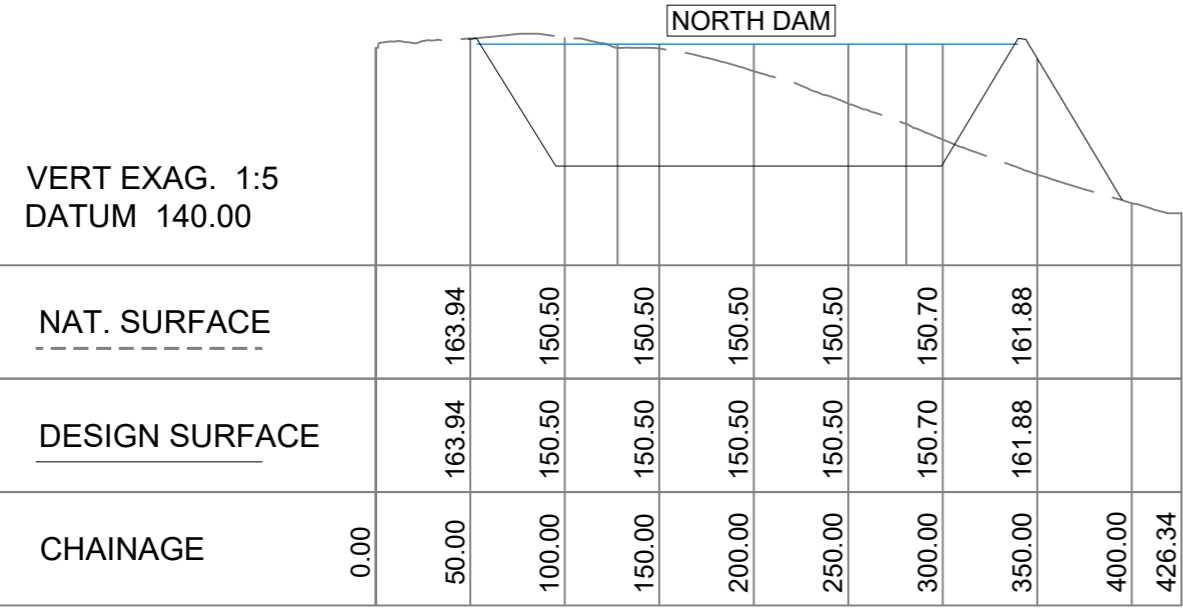
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APPROVED: X.XXXX	DATE: 30/05/25	ALL LEVELS ARE TO AHD
	REF:	

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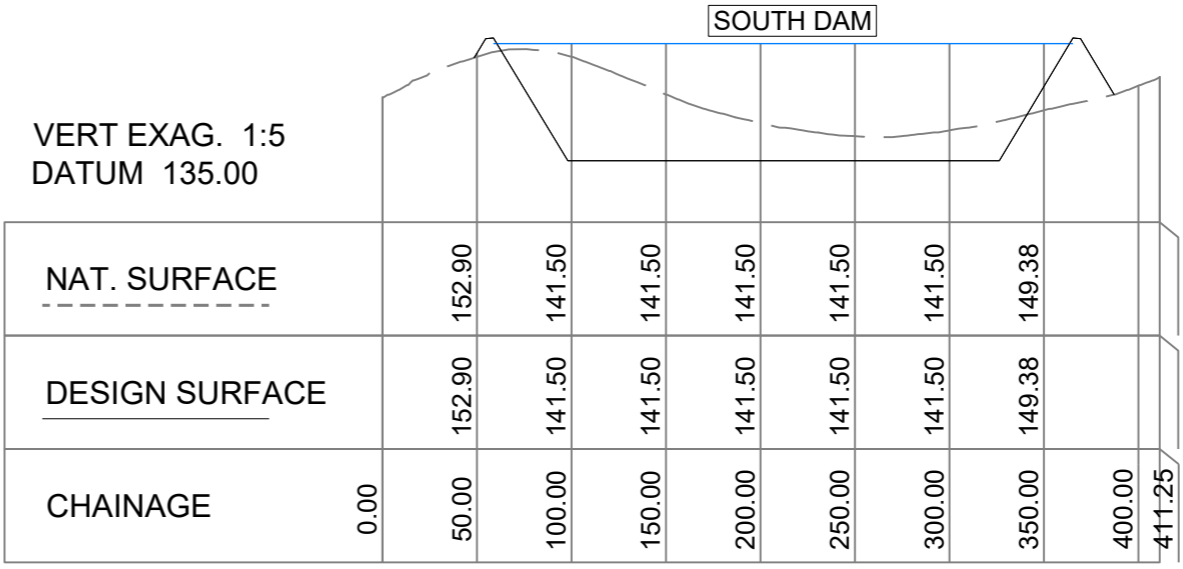
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PROJ. REF:	17639	SHEET No: SK04
REV:		1



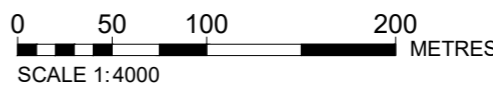
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SECTION **C**
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SK04



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PRELIMINARY
NOT FOR CONSTRUCTION

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REV	DATE	DRAFT	DESCRIPTION							PROJ. REF: 17639		SHEET No: SK06		REV: 1



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