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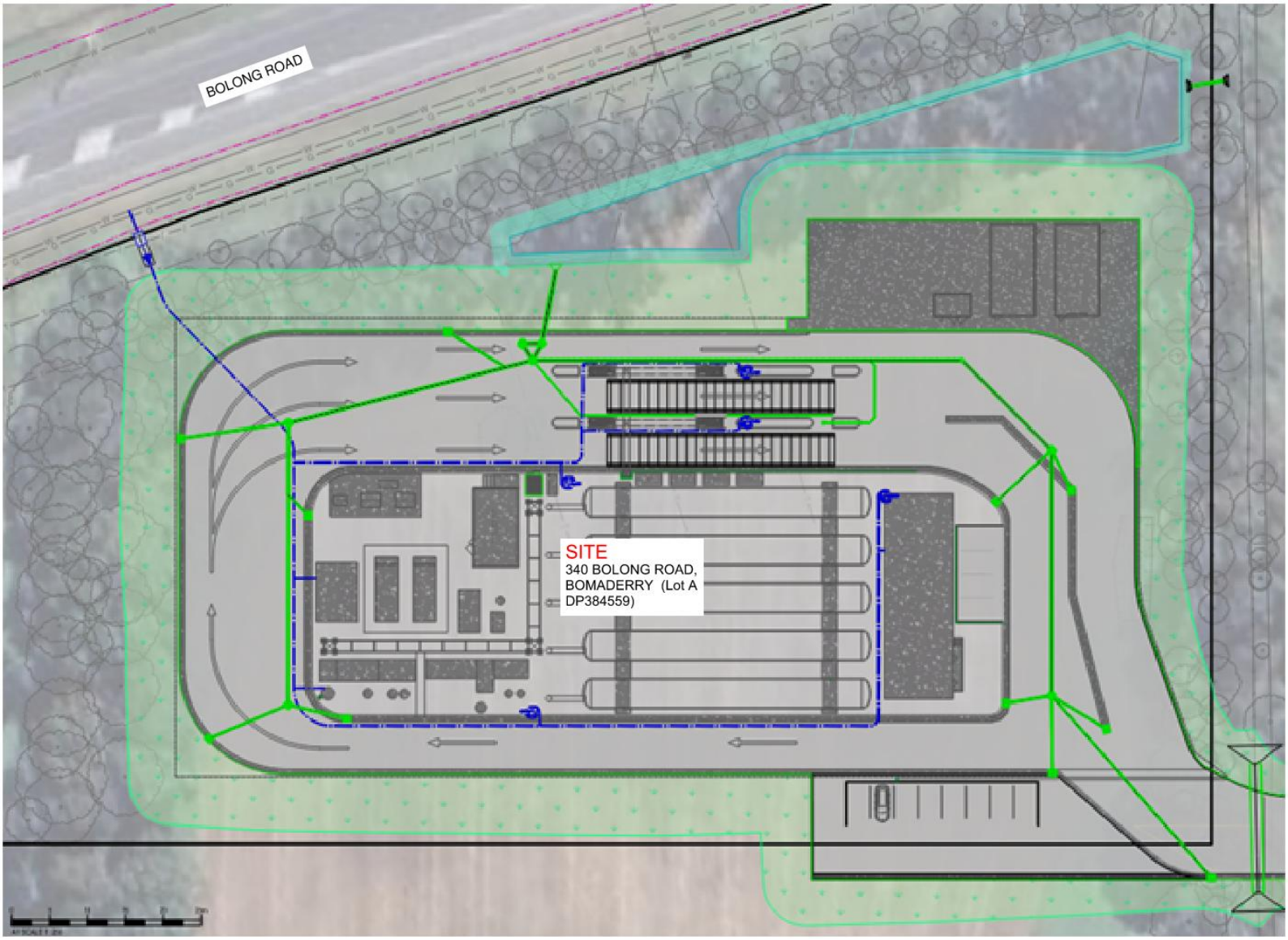
Air Liquide Nowra Development

STORMWATER MANAGEMENT PLAN

for: Air Liquide



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	STORMWATER MANAGEMENT PLAN
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1	24 March 2026	FINAL REV1	JdR	JdR
2	23 April 2026	FINAL REV2	JdR	JdR

EXECUTIVE SUMMARY

This Stormwater Management Plan (SWMP) has been prepared for the proposed Air Liquide CO_2 extraction plant at 340 Bolong Road, Nowra, NSW (Lot A DP384559). The SWMP outlines the design and operational procedures for the site's stormwater (SW) network, ensuring compliance with relevant regulatory frameworks, including the NSW Water Management Act 2000, Protection of the Environment Operations Act 1997, and Shoalhaven DCP Chapter G2.

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1 INTRODUCTION

Babbage has been commissioned by Air Liquide to develop a CO_2 extraction plant located at 340 Bolong Road (Lot A DP384559) just east of the main Manildra factory in Nowra, New South Wales. As part of the civil works for this development, the design of a stormwater (SW) network is required. This Stormwater Management Plan (SWMP) summarises the proposed SW network, including management of SW flows in terms of quantity and quality, along with general maintenance requirements to ensure the SW network continues to operate as required.

The regulatory framework relevant to this SWMP includes:

- NSW Water Management Act 2000
- Protection of the Environment Operations Act 1997
- Shoalhaven DCP Chapter G2

1.1 Site description

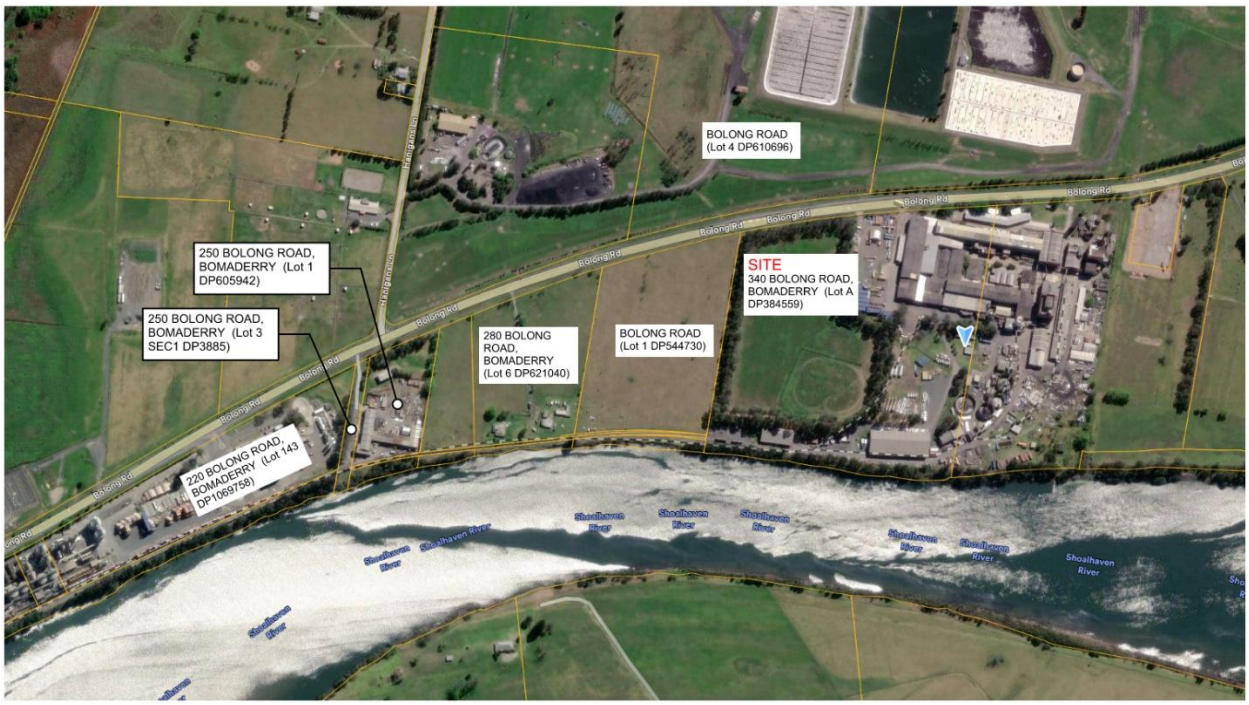
The site has a flat topography with an average RL of 2.5 m AHD. The current land use is farming with cut and carry crops the main activity. The key features surrounding the site include:

- North boundary: Bolong Road and the Manildra waste treatment ponds (north of Bolong Road).
- East boundary: the old paper factory currently used by Manildra as engineering maintenance workshops.
- South boundary: the Shoalhaven River is approximately 250 m from the southern boundary.
- West boundary: greenfield land utilised for farming activities.

The site is surrounded by Manildra land with the closest private landowner being *C&J Fabrication and Engineering* property which is approximately 445 m to the west. Refer to Figure 1 for the key features of the site.

There is an open drain located along the eastern boundary that drains towards a culvert under Bolong Road. This drain collects surface water from the Manildra engineering workshops.

Figure 1. Location for Air Liquide gas plant



1.2 Proposed Development

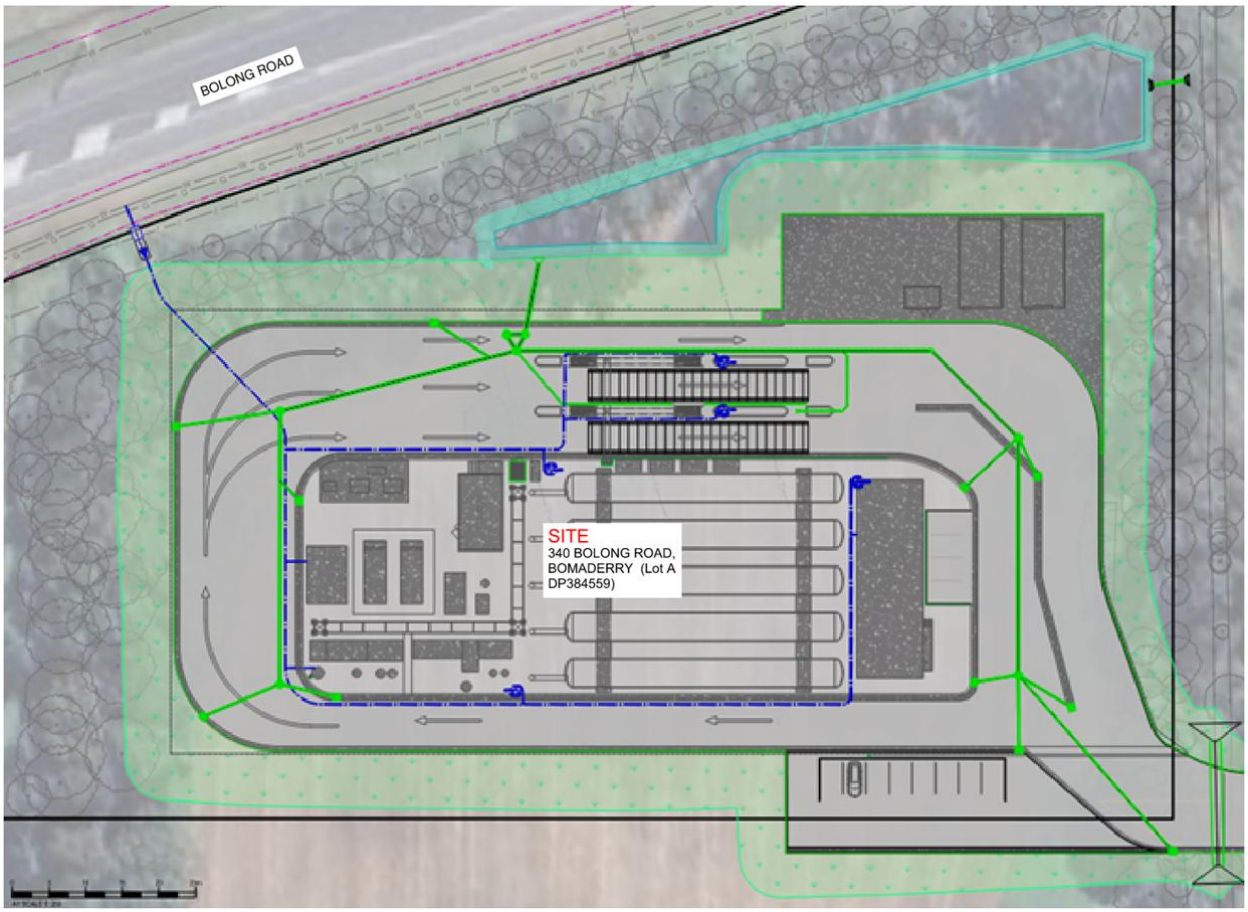
Air Liquide plans to build a CO_2 removal plant for emissions from the Manildra factory. This will include minor buildings with a total area of approximately 253 m^2.

A DN450 PE pipeline will convey gas from Manildra to the new site.

The total greenfield area is 17.46 ha with a hardstand area of 8.96 ha, which is 51% of the total site area.

The proposed plant layout is shown in Figure 2.

Figure 2. Proposed site layout.



1.3 Objectives of the Stormwater Management Plan

The purpose of this SWMP is to provide stormwater management procedures to form part of the overall operational procedures for the site. The key objectives of this SWMP include:

- Provide a comprehensive plan for the management of the SW during plant operation,
- Protect water quality by ensuring maintenance requirements are detailed, including frequency of maintenance,
- Comply with the relevant regulatory requirements.

2 STORMWATER NETWORK

This section details the design procedure for the SW network. Engineering plans for the SW network are included in **Appendix A**. The surface discharge is collected through a number of sumps and pipes, with the outlet discharging into the onsite detention (OSD) pond to the north of the plant.

2.1 Hydrology

The design rainfall intensities were taken from the Bureau of Meteorology, with an allowance made for climate change using the Australian Rainfall and Runoff (ARR) 2019 guideline. The rainfall intensities and annual recurrence intervals (ARI) are included in **Appendix B**.

2.1.1 ARR Climate Change Scaling Methodology

The ARR Guidelines recommend adjusting design rainfall intensities using a scaling factor linked to projected global mean surface temperature increase. The general form of the relationship is expressed as:

$$I_{CC} = I_0 \times (1 + \alpha \times \Delta T)$$

Equation 1.

Where:

I_{CC} = climate-adjusted rainfall intensity (mm/hr)

I_0 = baseline design rainfall intensity (from the 2016 IFD data)

ΔT = projected global mean temperature increases relative to 1961–1990 baseline (°C)

α = rate of change in rainfall intensity per degree of global temperature rise (%/°C)

2.1.2 Key Inputs for climate change allowance

We have calculated the allowance for key rainfall intensities using the following parameters:

- Rate of Change (α): Rate of change parameters were taken from Appendix A In ARR 2019.
- Change in Temperature (ΔT): We have assumed a medium-term climate scenario (2041 – 2060) under a moderate emission scenario (SSP2-4.5) which assumes a change in temperature of 1.8ºC (relative to the 1961 – 1990 baseline).
- Uncertainty Range: The “likely” range is 7–28% per °C, as reported in ARR 2019.

The key design parameters are shown in Table 1.

Table 1. Key design parameters for climate change allowance

Duration	Rate of Change (%/°C)	% added to rainfalls for climate change
1 hour	15.0	29
2 hour	12.8	24
6 hour	10.2	19
12 hour	9.0	17
24 hour	8.0	15

2.2 Pre-development & Post-development Flows

The SW flows for pre-development and post-development were estimated using the Rational Formula. The Rational Formula is a simple model but is considered appropriate for this site due to the small catchment area where storage effects are considered insignificant.

$$Q = 2.78CiA$$

Equation 2

The pre-development and post-development catchments and runoff coefficients are given in Table 2, and the pre-development and post-development flows are given in Table 3.

Additional rainfall events are included in **Appendix B**.

Table 2. Parameters entered into the Rational Formula

Site Development run-off coefficient				
	Pre-development		Post-development	
	Area m²	C	Area m²	C
Landscape	8703.0	0.25	2842.0	0.5
Hardstand	0.0	0.85	5608.0	0.85
Roof	0.0	0.9	253.0	0.9
Total	8703.0	0.25	8703.0	0.74

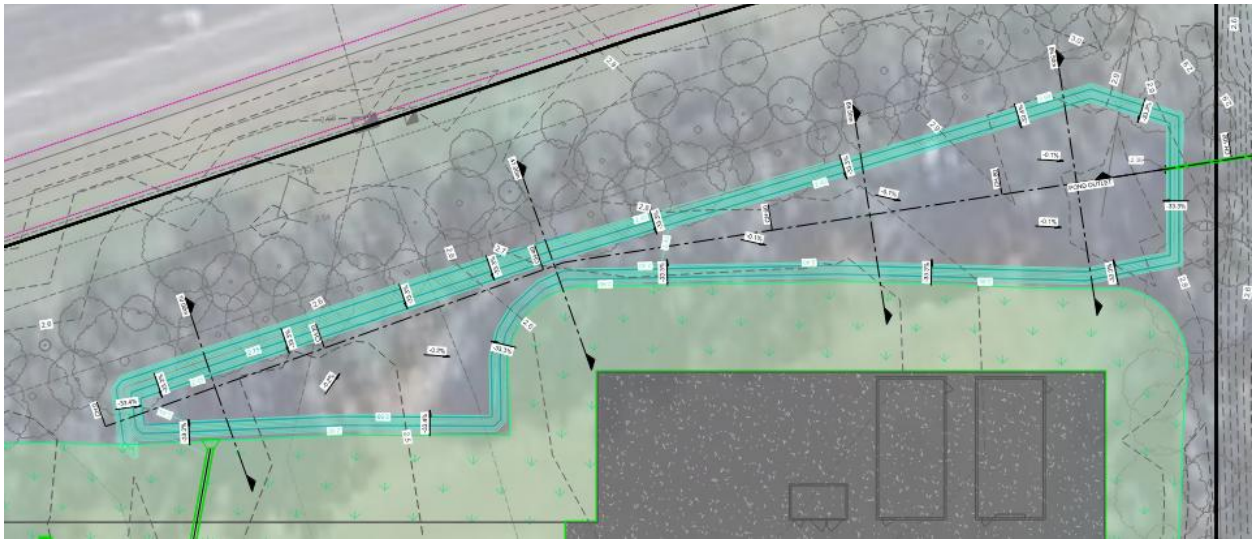
Table 3. Pre-development & post-development flows

Pre development flows					
ARI	**10m**	**1h**	**6h**	**12h**	**24h**
5	78.74	28.69	10.43	7.50	5.18
20	113.05	40.31	14.31	10.39	7.30
100	157.49	55.67	18.92	13.58	9.66
Post development flows					
ARI	**10m**	**1h**	**6h**	**12h**	**24h**
5	232.19	84.60	30.75	22.10	15.27
20	333.34	118.85	42.20	30.65	21.52
100	464.38	164.14	55.77	40.03	28.49

2.3 Detention Pond Design

A detention pond is required to restrict the post-development flow to pre-development flows. The detention pond is shown in Figure 3 and the total volume for this pond is approximately 340 m^3.

Figure 3. Detention pond



Attenuation calculations were completed for the 5- and 20-year storm events to confirm the rainfall events that restricted post-development flows to pre-development flows.

The ideal orifice was determined to be Ø164 mm and the full attenuation calculations are given in **Appendix B**. The average discharge through a Ø164 mm orifice is calculated at an average flow of 28 L/s and a peak discharge of 40 L/s for the 5-year and 20-year events.

Table 4 includes the rainfall durations where restricting the post-development rainfall events was achieved. For the 5-year event, the pond has sufficient volume to attenuate up to the 1-hour duration, with partial attenuation for the 6-hour duration.

For the 20-year event, the pond has sufficient volume to attenuate up to the 6-hour duration, with partial attenuation for the 12-hour duration.

Table 4. Summary of attenuation results for the 5-year and 20-year ARI events

5 year ARI	10min	1h	6h	12h	24h
Post development flow L/s	232	85	31	22	15
Storage Volume m^3	122	203	52	0	0
Post flow < Post development flows	Yes	Yes	Part	No	No

20 year ARI	10min	1h	6h	12h	24h
Post-development flow (L/s)	333	119	42	31	22
Storage Volume m^3	183	325	295	91	0

Post-development flow ≤ pre-development flow	Yes	Yes	Part	Part	No

2.4 Stormwater Quality Management

The sources of contaminants for this site include vehicles, galvanised steelwork and sediment that has accumulated on the site during dry periods. The industrial process of removing the CO_2 from the gas will not generate any contaminants that can enter the stormwater system.

Ocean Protect was asked to recommend a suitable treatment train to remove contaminants from stormwater. The recommended treatment devices include Ocean Guard units in sumps and a Jellyfish treatment device (JF-1200-2-1 WSUD) located just before the outlet to the detention pond. MUSIC modelling was completed to verify that the proposed treatment devices could successfully reduce contaminants to the required levels.

Table 5 presents the reduction in SW contaminants achieved by using the recommended treatment devices. The MUSIC modelling results and treatment devices are included in **Appendix C**.

Table 5. Percentage contaminant removal

Contaminant	Reduction
TSS	80.1%
TP	77.0%
TN	46.8%
GP	99.2%

3 OPERATION & MAINTENANCE

Regular maintenance is essential for the stormwater network and treatment system to function correctly. The Facility Manager will be responsible for ensuring that all maintenance tasks are completed on schedule and properly documented for future reference.

Sumps and manholes should be inspected biannually to check the level of sediment build-up. If the level is approximately 75% of the sump depth, then the sediment should be removed (sucker truck). The key maintenance requirements for the SW treatment devices are listed in Table 6 and Table 7.

Table 6 Jellyfish® Filter Maintenance

Maintenance Frequency	Typical Maintenance Tasks	Major Service / Replacement	Access & Safety	Notes / Triggers for Extra Maintenance
Minor service every 6 months (minimum); more often if high sediment load	• Remove and rinse filter cartridges • Wash down deck level • Remove floatables and debris • Remove accumulated sediment (if required)	Replace filter cartridges (typically every 2–5 years) when rinsing is insufficient or damage evident	Confined-space entry may be required; heavy covers/grates — OH&S procedures required	After hazardous material spills or major storm events, inspect and service as needed

Table 7. Ocean Guard® Maintenance

Maintenance Frequency	Typical Maintenance Tasks	Major Service / Replacement	Access & Safety	Notes / Triggers for Extra Maintenance
2–4 services per year (every 3–6 months, depending on pollutant load)	Inspect and evaluate filtration bag • Remove and dispose of captured pollutants • Inspect frame, diverter, and cage components	Replace filtration bag or repair frame as needed	Usually serviced from surface level; confined-space entry rarely required (site-dependent)	Extra maintenance after major storms or when bag capacity reached; designed to retain pollutants in dry state between services

3.1 Emergency Spill Response

This site has a low risk of an emergency spill occurring, as no fuels or chemicals will be stored in bulk on site. There will likely be fuels, oils and chemicals stored in the workshop, but in containers < 20 L. The most likely emergency spill that may occur is the rupture of a truck fuel tank, which is unlikely. However, the following emergency spill response will be adopted for this site, as the stormwater network discharges to a network of existing drains that eventually discharge into the Shoalhaven River.

Emergency Spill Response – Stormwater Protection

1. Immediate Actions

- **Stop the source of the spill.**
    - Turn off or isolate any machinery, hoses, or processes causing the spill.
    - Prevent further material release if it can be done safely.
- **Alert nearby personnel.**
    - Notify the site supervisor or environmental officer immediately.
    - Evacuate the area if there is any risk to health or safety.

2. Contain the Spill

- Prevent entry to the stormwater system:
    - Use spill kits (absorbent socks, pads, booms) to create a barrier around nearby drains.
    - Place drain covers or rubber mats directly over stormwater sumps grates.
    - If there is water in the detention pond then place a floating boom around the outlet to contain floating fuels/oil.
- Keep the spill on a hard surface (concrete/asphalt) where it can be easily recovered.

3. Clean Up

- Absorb and collect:
    - Use absorbent materials to soak up the spill.
    - Avoid washing down with water, which could push contaminants into drains.
    - Sweep up and place all used materials in sealed, labelled containers for disposal.
- Dispose appropriately:
    - Treat used absorbents and debris as waste and dispose of them through an approved waste contractor.

- **4. Report and Record**
- Record the incident details:
    - Date, time, location.
    - Type and estimated volume of material spilled.
    - Actions taken and personnel involved.
    - Any environmental impact observed.
- Report to the site manager.
- If the spill entered the detention pond with the potential to enter the downstream drain, then contact the local council/EPA authority for guidance on additional actions.

5. Post-Incident Review

- Inspect and clean stormwater protection equipment including the Ocean Guard and Jellyfish treatment devices.
- Review spill response effectiveness.
- Identify improvements (e.g., more absorbents near drains, staff refresher training).

6. Preventative Measures

- Maintain clean work areas to minimize debris and runoff contamination.
- Regularly inspect and maintain stormwater inlets and filters.
- Keep a spill response kit near high-risk areas (e.g., loading zones, waste storage).
- Conduct staff training on spill response and environmental protection.

4 COMPLIANCE AND REPORTING

At this stage, the compliance and reporting requirements of the relevant consents are unknown. Once all consents are in place, all reporting obligations will be complied with and added to the SWMP.

APPLICABILITY AND LIMITATIONS

Restrictions of Intended Purpose

This report has been prepared solely for the benefit of Air Liquide as our client with respect to the brief. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such party's sole risk.

Legal Interpretation

Opinions and judgements expressed herein are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions. Where opinions or judgements are to be relied on they should be independently verified with appropriate legal advice.

Maps and Images

All maps, plans, and figures included in this report are indicative only and are not to be used or interpreted as engineering drafts. Do not scale any of the maps, plans or figures in this report. Any information shown here on maps, plans and figures should be independently verified on site before taking any action. Sources for map and plan compositions include LINZ Data and Map Services and local council GIS services. For further details regarding any maps, plans or figures in this report, please contact Babbage Consultants Limited.

Reliability of Investigation

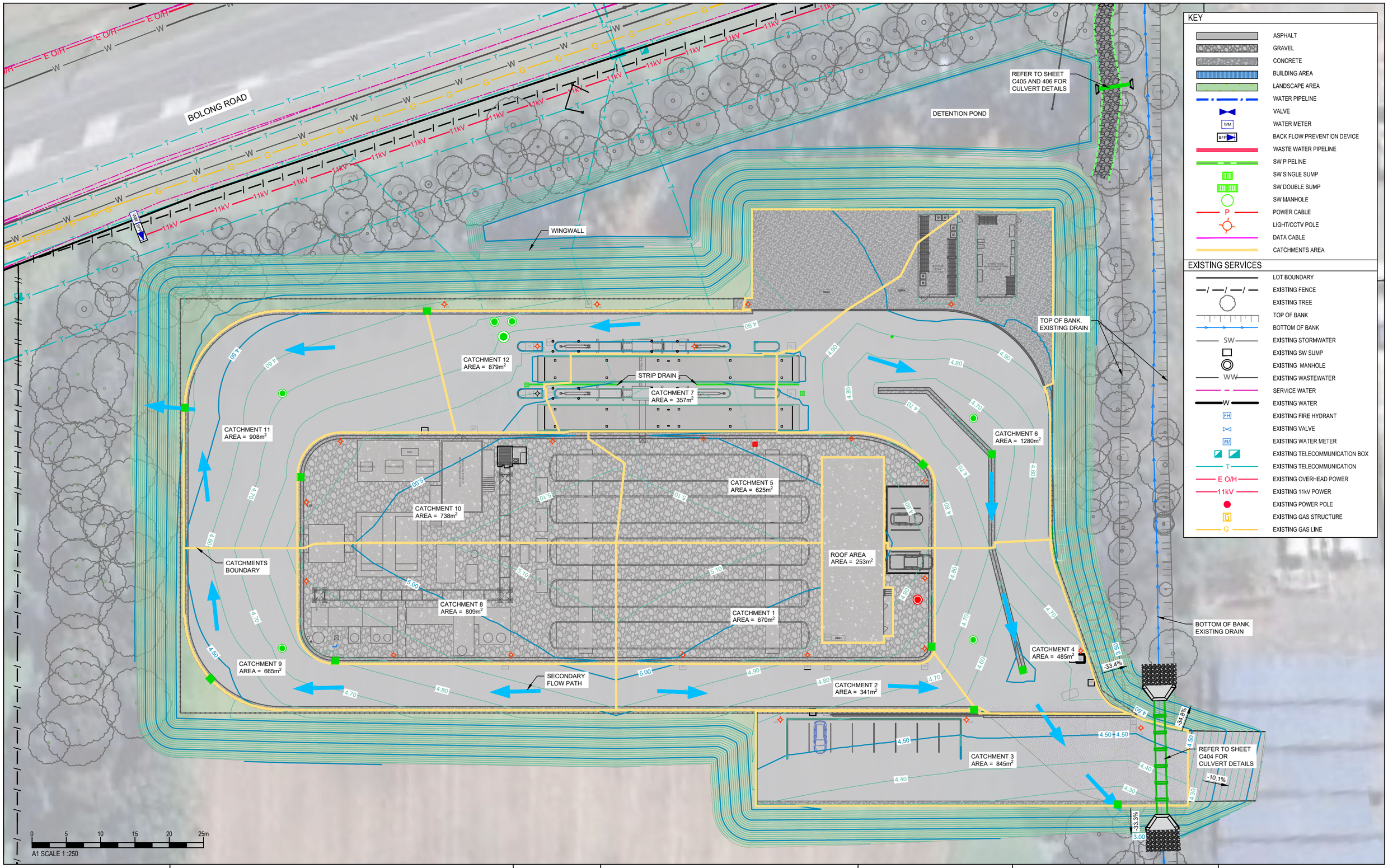
Babbage has performed the services for this project in accordance with the standard agreement for consulting services and current professional standards for environmental site assessment. No guarantees are either expressed or implied.

Recommendations and opinions in this report are based on discrete sampling data. The nature and continuity of matrix sampled away from the sampling points are inferred and it must be appreciated that actual conditions could vary from the assumed model.

There is no investigation that is thorough enough to preclude the presence of materials at the site that presently, or in the future, may be considered hazardous. Because regulatory evaluation criteria are constantly changing, concentrations of contaminants present and considered to be acceptable may in the future become subject to different regulatory standards, which cause them to become unacceptable and require further remediation for this site to be suitable for the existing or proposed land use activities.

Appendix A

Stormwater Plans



KEY

- ASPHALT
- GRAVEL
- CONCRETE
- BUILDING AREA
- LANDSCAPE AREA
- WATER PIPELINE
- VALVE
- WM — WATER METER
- BFP — BACK FLOW PREVENTION DEVICE
- WASTE WATER PIPELINE
- SW PIPELINE
- SW SINGLE SUMP
- SW DOUBLE SUMP
- SW MANHOLE
- P — POWER CABLE
- LIGHT/CCTV POLE
- DATA CABLE
- CATCHMENTS AREA

EXISTING SERVICES

- LOT BOUNDARY
- EXISTING FENCE
- EXISTING TREE
- TOP OF BANK
- BOTTOM OF BANK
- SW — EXISTING STORMWATER
- EXISTING SW SUMP
- EXISTING MANHOLE
- WW — EXISTING WASTEWATER
- SERVICE WATER
- W — EXISTING WATER
- FH — EXISTING FIRE HYDRANT
- EXISTING VALVE
- WM — EXISTING WATER METER
- EXISTING TELECOMMUNICATION BOX
- T — EXISTING TELECOMMUNICATION
- E O/H — EXISTING OVERHEAD POWER
- 11kV — EXISTING 11kV POWER
- EXISTING POWER POLE
- G — EXISTING GAS STRUCTURE
- G — EXISTING GAS LINE

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PROJECT TITLE :

AIR LIQUIDE CO2 PROCESSING PLANT

AIR LIQUIDE NOWRA

340 BOLONG ROAD, BOLONG, NSW, AUSTRALIA

PROJECT NORTH

DRAWING REVISIONS

REV	DESCRIPTION	DATE	DRN BY	DES CHK	APP
1	ISSUED FOR TENDER	13/11/25	YK	JDR	JDR
2	ISSUED FOR ENVIRONMENTAL IMPACT STATEMENT	29/01/26	YK	JDR	JDR
3	ISSUED FOR CONSTRUCTION	16/03/26	YK	JDR	JDR

	DATE	INITIAL
DESIGNED	01/09/25	YK
DRAWN	01/09/25	YK
DESIGN CHECK	16/03/26	JDR
DRAWING CHECK	16/03/26	JDR
APPROVED	16/03/26	JDR

DRAWING TITLE:

STORMWATER CATCHMENT PLAN

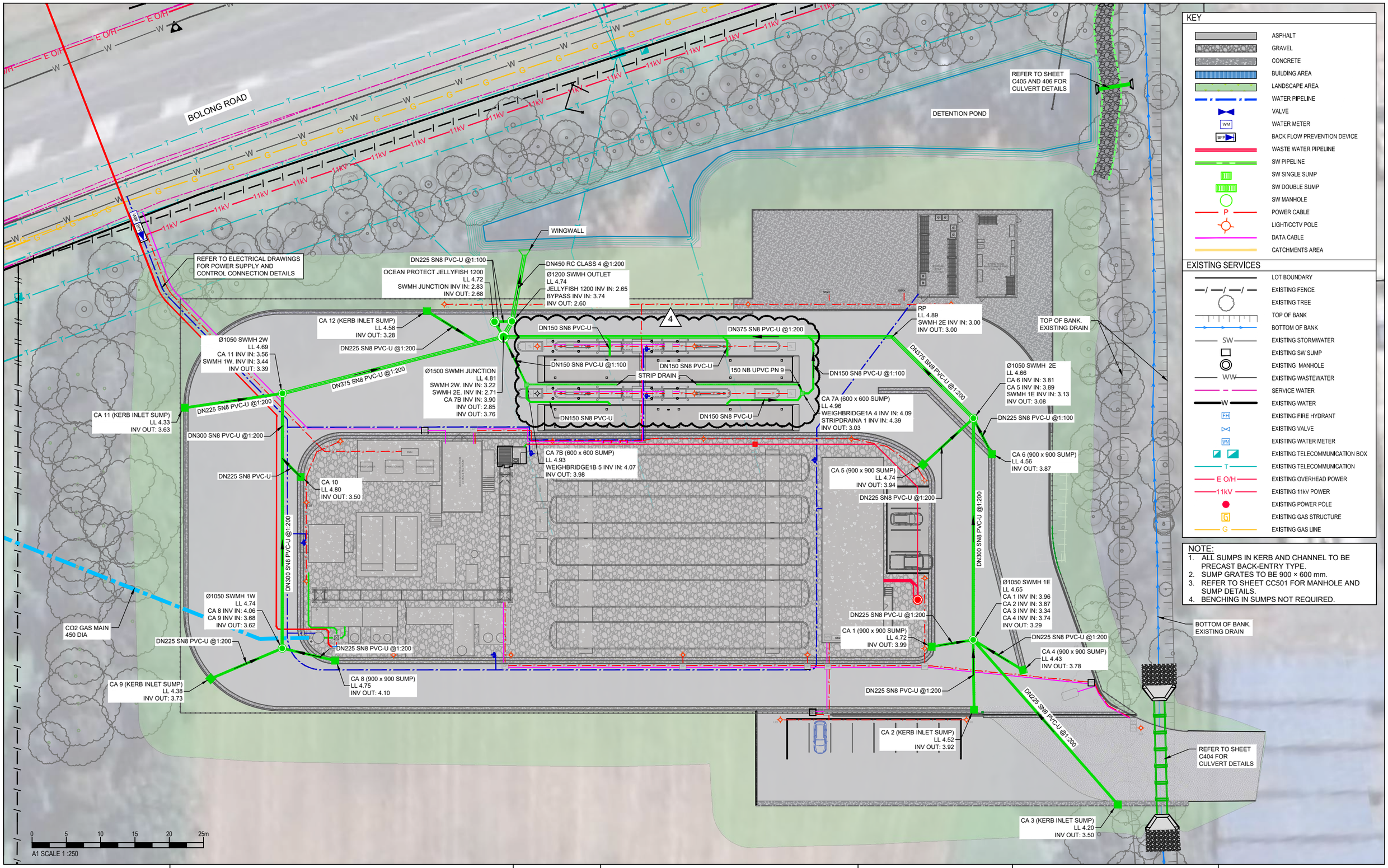
FOR CONSTRUCTION
13/03/2026

SCALE:
1:250 @ A1
1:500 @ A3

JOB NO:
68208

DWG NO. C400

REV: 3



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- EXISTING POWER POLE
- G — EXISTING GAS STRUCTURE
- G — EXISTING GAS LINE

NOTE:
1. ALL SUMPS IN KERB AND CHANNEL TO BE PRECAST BACK-ENTRY TYPE.
2. SUMP GRATES TO BE 900 × 600 mm.
3. REFER TO SHEET CC501 FOR MANHOLE AND SUMP DETAILS.
4. BENCHING IN SUMPS NOT REQUIRED.

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DRAWN	01/09/25	YK
DESIGN CHECK	16/03/26	JDR
DRAWING CHECK	16/03/26	JDR
APPROVED	16/03/26	JDR

DRAWING TITLE:

STORMWATER LAYOUT PLAN

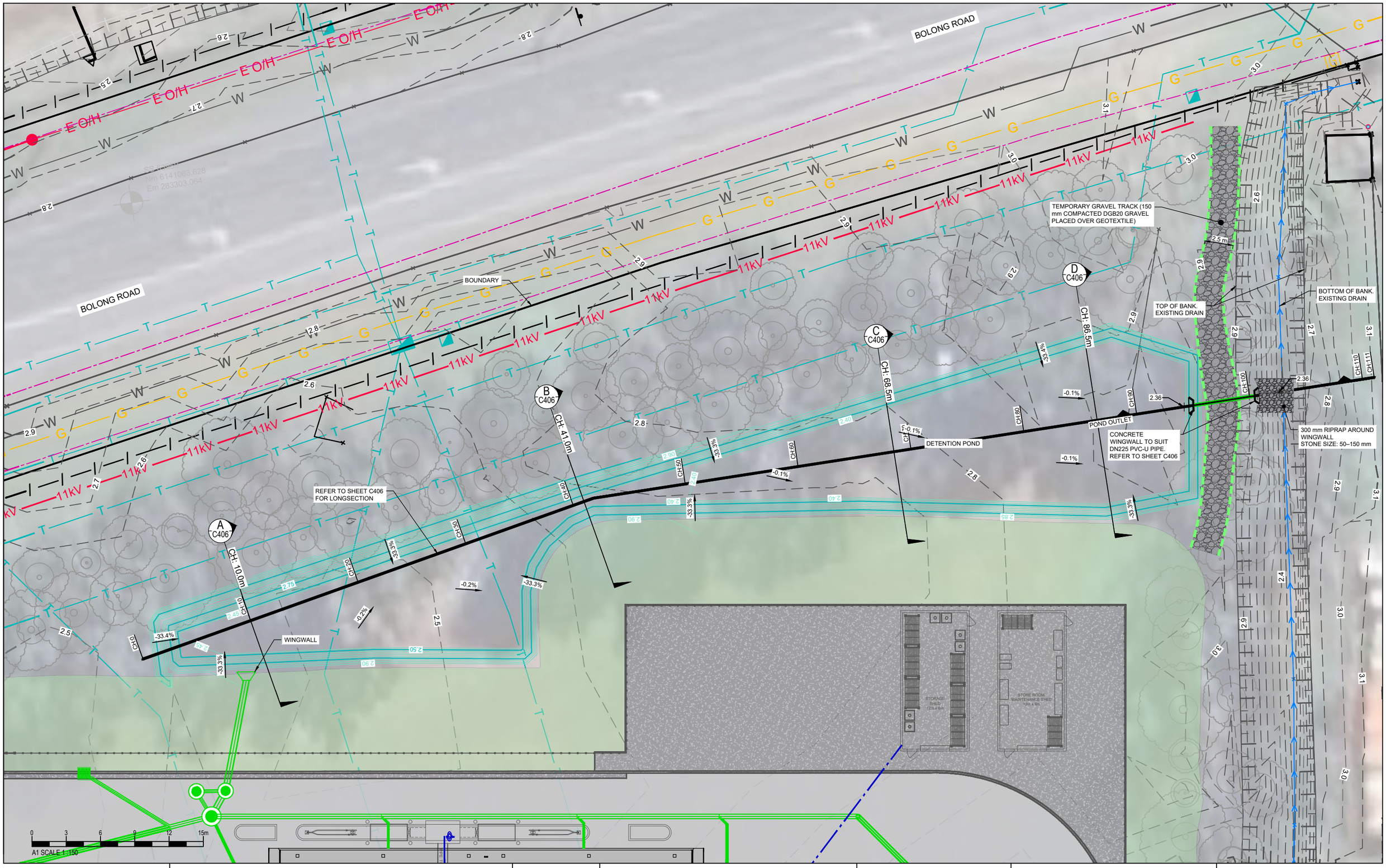
FOR CONSTRUCTION
13/03/2026

SCALE:
1:250 @ A1
1:500 @ A3

JOB NO:
68208

DWG NO. C401

REV: 3



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DESIGN CHECK	16/03/26	JDR
DRAWING CHECK	16/03/26	JDR
APPROVED	16/03/26	JDR

DRAWING TITLE:

DETENTION POND LAYOUT

FOR CONSTRUCTION
13/03/2026

SCALE:
1:150 @ A1
1:300 @ A3

JOB NO:
68208

DWG NO. C405

REV: 3

Appendix B

Stormwater Calculations

Runoff Calculation

Babbage

JOB NAME:	Air Liqude Nowra	**DATE:**	23/10/2025
JOB NO:	68208	**DES BY:**	YK
SUBJECT:	Runoff Calculation	**CHKD BY:**	JDR

Rainfall intensities with climate change (mm/hr)

ARI	10m	20m	30m	1h	2h	6h	12h	24h
5	130	91.72	72.37	47.47	30.63	17.26	12.40	8.57
10	157	111.07	87.33	56.89	36.46	20.47	14.74	10.32
20	187	131.58	102.94	66.69	42.53	23.68	17.20	12.08
50	227	159.96	125.26	80.63	50.96	27.97	20.24	14.26
100	261	183.18	143.19	92.11	57.78	31.30	22.46	15.99

Site Run-off Calculation:

Site Development run-off coefficient

	Pre-development		Post-development		
	Area m²	C	Area m²	C	
Landscape	8703.0	0.25	2842.0	0.5	Gravel
Hardstand	0.0	0.85	5608.0	0.85	
Roof	0.0	0.9	253.0	0.9	
Total	8703.0	0.25	8703.0	0.74	

Flow calculation as per 2.0.1

Q	peak discharge (L/s)
C	run-off coefficent
I	rainfall intensity (mm/hr)
A	area (ha)
Q = 1000*(CIA)/360	

Pre-development Site Run-off Flow (L/s)

ARI	10m	20m	30m	1h	2h	6h	12h	24h
5	78.74	55.43	43.74	28.69	18.51	10.43	7.50	5.18
10	95.12	67.13	52.78	34.38	22.03	12.37	8.91	6.23
20	113.05	79.52	62.22	40.31	25.71	14.31	10.39	7.30
50	137.22	96.68	75.70	48.73	30.80	16.90	12.23	8.62
100	157.49	110.71	86.54	55.67	34.92	18.92	13.58	9.66

Pre-development Site Run-off Volumes (m³)

ARI	10m	20m	30m	1h	2h	6h	12h	24h
5	47.25	66.52	78.73	103.29	133.28	225.26	323.80	447.38
10	57.07	80.55	95.01	123.78	158.64	267.20	384.90	538.65
20	67.83	95.43	111.99	145.11	185.08	309.14	449.05	630.53
50	82.33	116.01	136.27	175.42	221.77	365.07	528.47	744.63
100	94.49	132.85	155.77	200.40	251.45	408.57	586.51	834.70

Post-development Site Run-off Flow (L/s)

ARI	10m	20m	30m	1h	2h	6h	12h	24h
5	232.19	163.45	128.97	84.60	54.58	30.75	22.10	15.27
10	280.46	197.93	155.63	101.38	64.97	36.48	26.27	18.38
20	333.34	234.49	183.45	118.85	75.80	42.20	30.65	21.52
50	404.60	285.06	223.22	143.68	90.82	49.84	36.07	25.41
100	464.38	326.44	255.18	164.14	102.98	55.77	40.03	28.49

Post-development Site Run-off Volumes (m³)

ARI	10m	20m	30m	1h	2h	6h	12h	24h
5	139.31	196.14	232.14	304.56	392.99	664.20	954.78	1319.16
10	168.28	237.52	280.14	364.97	467.77	787.87	1134.93	1588.30
20	200.00	281.38	330.21	427.87	545.73	911.55	1324.08	1859.21
50	242.76	342.07	401.80	517.25	653.92	1076.46	1558.27	2195.64
100	278.63	391.73	459.32	590.91	741.43	1204.72	1729.41	2461.24

Nowra	Attenuated JOAL Development flows 5 year ARI assessment

Post Development run-off coefficient		
	Area m²	C
Landscape	2842	0.5
Hardstand	5608	0.85
Roof	253	0.9
Total	8703	0.74

Flow calculation as per 2.0.1	
Q	peak discharge (m3/s)
C	run-off coefficent
I	rainfall intensity (mm/hr)
A	area (ha)
Q = (CIA)/360	

Rainfall intensities (mm/hr)								
ARI	10m	20m	30m	1h	2h	6h	12h	24h
5	130.29	91.719	72.369	47.472	30.628	17.255	12.402	8.5675

*Data from: Australia 2016 Bureau of Meteorology (ABN 92 637 533 532)

Inflow - Site Run-off Flow (L/s)								
ARI	10m	20m	30m	1h	2h	6h	12h	24h
5	232.19	163.45	128.97	84.60	54.58	30.75	22.10	15.27

Inflow - Site Run-off Volumes (m³)								
ARI	10m	20m	30m	1h	2h	6h	12h	24h
5	139.31	196.14	232.14	304.56	392.99	664.20	954.78	1319.16

Outflow - Discharge Volume (m³)								
Selected Average Orifice Flow			28.34	l/s	164	mm Orifice		
	10m	20m	30m	1h	2h	6h	12h	24h
	17.01	34.01	51.02	102.04	204.08	612.23	1224.47	2448.94

Inflow-Outflow - Attenuation Volumes (m³)								
ARI	10m	20m	30m	1h	2h	6h	12h	24h
5	122.31	162.13	181.12	202.52	188.91	51.96	0.00	0.00

Orifice Flow Calculation		
Diameter of Orifice (mm)	164	mm
Area of Orifice	0.021124	m^2
Discharge Coefficient	0.61	
Average Head	0.247	m
Average Discharge Flow	28.34	L/s
Peak Head (2*Ave Head)	0.49	m
Peak Discharge Flow	40.08	L/s

=

Maximum Head Calculation		
Tank Model	BASIN	
Available Tank Height (excluding dead storage)	0.5	m
Tank Width	7	m
Tank Length	59	m
Tank Area	413	m^2
Max Attenuation Volume	202.52	m^3
Max Attenuation Height	0.49	m
Is atten height less than tank height?	OK	

SUMMARY

Tank Volume	**203000**	**Litres**
Maximum Discharge	**40.08**	**L/s**
Orifice Diameter	**164**	**mm**
Height of Tank	**0.65**	**m**

Nowra	Attenuated JOAL Development flows 20 year ARI Assessment

Post Development run-off coefficient		
	Area m²	C
Landscape	2842	0.5
Hardstand	5608	0.85
Roof	253	0.9
Total	8703	0.74

Flow calculation as per 2.0.1	
Q	peak discharge (m3/s)
C	run-off coefficent
I	rainfall intensity (mm/hr)
A	area (ha)
Q = (CIA)/360	

Rainfall intensities (mm/hr)								
ARI	10m	20m	30m	1h	2h	6h	12h	24h
20	187.1	131.6	102.9	66.7	42.5	23.7	17.2	12.1

*Data from: Australia 2016 Bureau of Meteorology (ABN 92 637 533 532)

Inflow - Site Run-off Flow (L/s)								
ARI	10m	20m	30m	1h	2h	6h	12h	24h
20	333	234	183	119	76	42	31	22

Inflow - Site Run-off Volumes (m³)								
ARI	10m	20m	30m	1h	2h	6h	12h	24h
20	200	281	330	428	546	912	1324	1859

Outflow - Discharge Volume (m³)								
Selected Average Orifice Flow			28.54	l/s	164	mm Orifice		
	10m	20m	30m	1h	2h	6h	12h	24h
	17	34	51	103	205	616	1233	2466

Inflow-Outflow - Attenuation Volumes (m³)								
ARI	10m	20m	30m	1h	2h	6h	12h	24h
20	183	247	279	325	340	295	91	0

Orifice Flow Calculation		
Diameter of Orifice (mm)	164	mm
Area of Orifice	0.021	m^2
Discharge Coefficient	0.61	
Average Head	0.250	m
Average Discharge Flow	28.54	L/s
Peak Head (2*Ave Head)	0.50	m
Peak Discharge Flow	40.36	L/s

=

Maximum Head Calculation		
Tank Model	BASIN	
Available Tank Height (excluding dead storage)	0.5	m
Tank Width	7	m
Tank Length	100	m
Tank Area	700	m^2
Max Attenuation Volume	340.25	m^3
Max Attenuation Height	0.49	m
Is atten height less than tank height?		OK

SUMMARY

Tank Volume	**340500**	**Litres**
Maximum Discharge	**40.36**	**L/s**
Orifice Diameter	**164**	**mm**
Height of Tank	**0.65**	**m**

Appendix C

Stormwater Treatment

MUSIC-*link* Report

Project Details		Company Details	
Project:	340 Bolong Rd, Bolong (Air Liquide Nowra)	**Company:**	Babbage Consultants
Report Export Date:	23/10/2025	**Contact:**	John de Ruyter
Catchment Name:	Receiving 8	**Address:**	128 Montreal Street, Sydenham, Christchurch 8023 PO Box 2373, Christchurch Central, Christchurch 8140
Catchment Area:	0.87ha	**Phone:**	+64 3 379 2734
Impervious Area*:	100%	**Email:**	john.deruyter@babbage.co.nz
Rainfall Station:			
Modelling Time-step:	Six minutes		
Modelling Period:	01/01/12 - 31/12/2021 11:54:00 PM		
Mean Annual Rainfall:	1082.213mm		
Evapotranspiration:	1172.951mm		
MUSICX Version:	1.50.0.13577 (5.50.0.13577)		
MUSIC-link data Version:	5.1		
Study Area:	Shoalhaven City Council		
Scenario:	Nowra		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

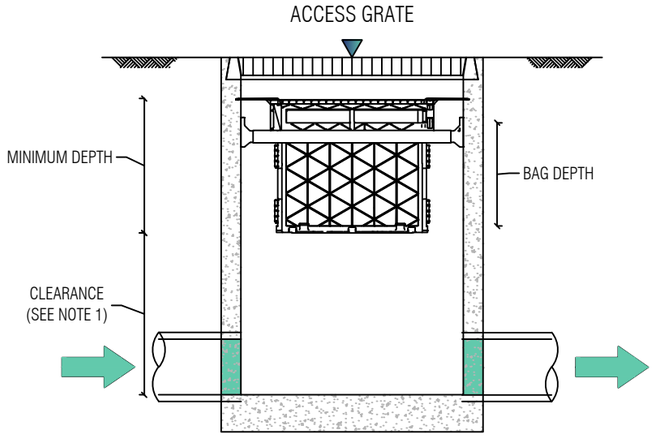
Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node:	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	0%	Generic Treatment Nodes	3	Urban_Roof Nodes	2
TSS	80.115%			Urban_Industrial Nodes	1
TP	77.041%			Urban_SealedRoad Nodes	2
TN	46.809%				
GP	99.157%				

Comments

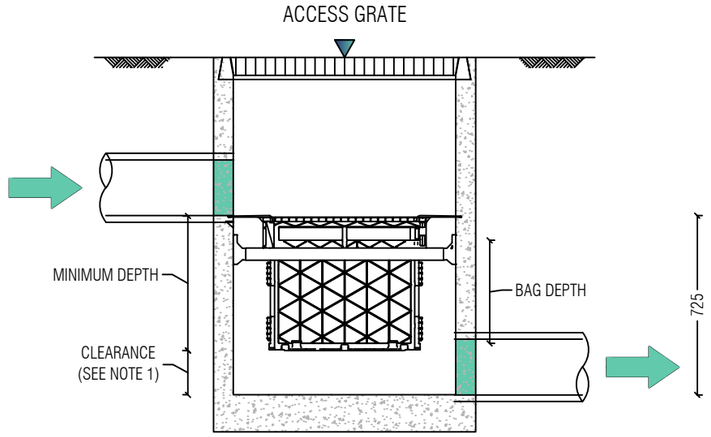
Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Generic	11 x OceanGuard (SQIDEP)	High Flow Bypass	None	99	0.22 m³/s
Generic	2 x OceanGuard (grated Strip Drain Config)	High Flow Bypass	None	99	0.04 m³/s
Generic	Jellyfish JF-1200-2-1 (SQIDEP)	High Flow Bypass	None	99	0.012 m³/s
Receiving	Receiving 8	Flow Reduction	None	None	0 %
Receiving	Receiving 8	GP Reduction	90	None	99.157 %
Receiving	Receiving 8	TN Reduction	45	None	46.809 %
Receiving	Receiving 8	TP Reduction	45	None	77.041 %
Receiving	Receiving 8	TSS Reduction	80	None	80.115 %
Urban_Industrial	Hardstand - Catchments 1, 5, 8 & 10 - 2642m²	Impervious Area	None	None	0.264 ha
Urban_Industrial	Hardstand - Catchments 1, 5, 8 & 10 - 2642m²	Pervious Area	None	None	0 ha
Urban_Industrial	Hardstand - Catchments 1, 5, 8 & 10 - 2642m²	Total Area	None	None	0.264 ha
Urban_Roof	Catchment 8 & 10 Roof - 200m²	Impervious Area	None	None	0.02 ha
Urban_Roof	Catchment 8 & 10 Roof - 200m²	Pervious Area	None	None	0 ha
Urban_Roof	Catchment 8 & 10 Roof - 200m²	Total Area	None	None	0.02 ha
Urban_Roof	Roof Area - 253m²	Impervious Area	None	None	0.025 ha
Urban_Roof	Roof Area - 253m²	Pervious Area	None	None	0 ha
Urban_Roof	Roof Area - 253m²	Total Area	None	None	0.025 ha
Urban_SealedRoad	Catchment 7 - 357m²	Impervious Area	None	None	0.036 ha
Urban_SealedRoad	Catchment 7 - 357m²	Pervious Area	None	None	0 ha
Urban_SealedRoad	Catchment 7 - 357m²	Total Area	None	None	0.036 ha
Urban_SealedRoad	Road to Pits - Catchments 2-4, 6, 9, 11 & 12 - 5251m²	Impervious Area	None	None	0.525 ha
Urban_SealedRoad	Road to Pits - Catchments 2-4, 6, 9, 11 & 12 - 5251m²	Pervious Area	None	None	0 ha
Urban_SealedRoad	Road to Pits - Catchments 2-4, 6, 9, 11 & 12 - 5251m²	Total Area	None	None	0.525 ha

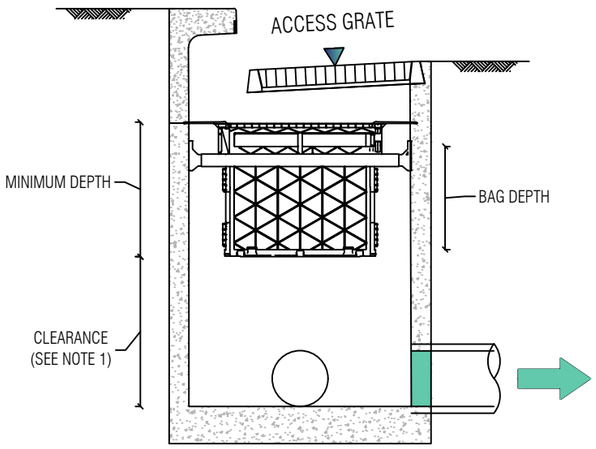
Only certain parameters are reported when they pass validation



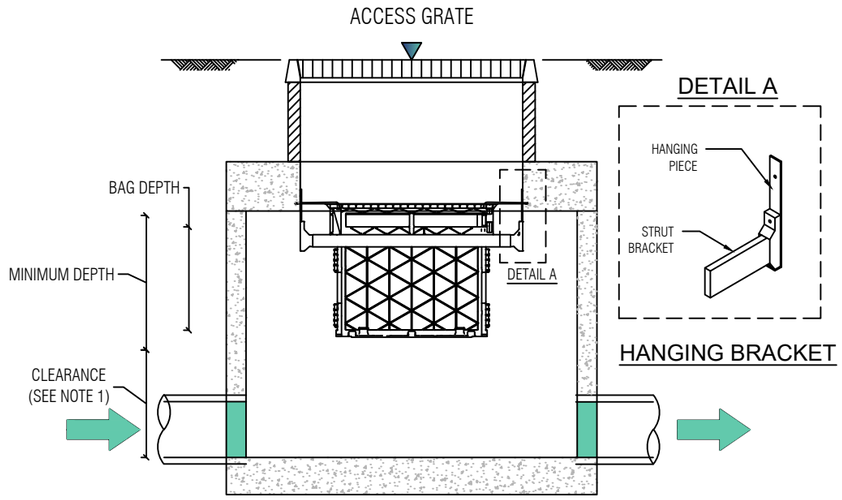
SURFACE FLOW
CONFIGURATION



PIPE FLOW
CONFIGURATION

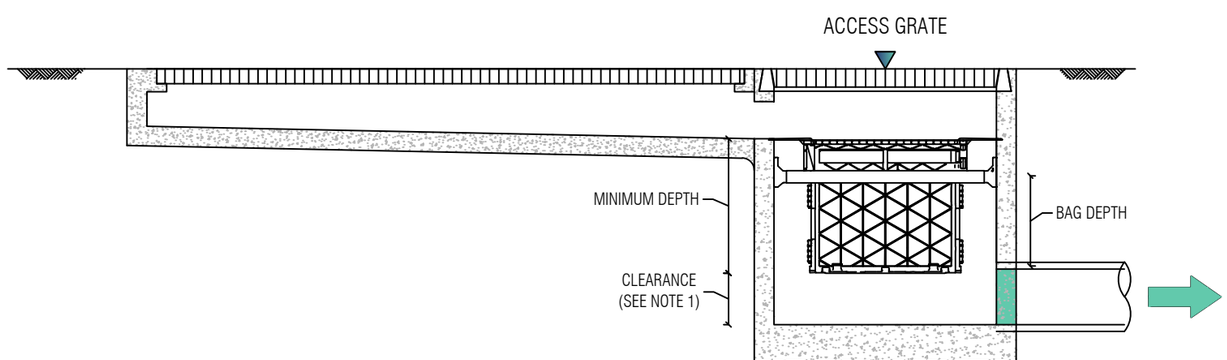


SURFACE FLOW
CONFIGURATION



HANGING BRACKET

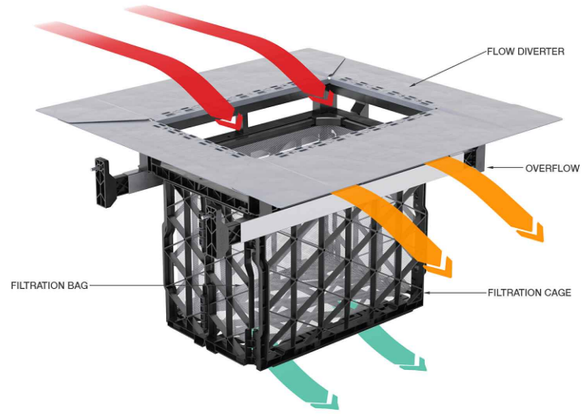
SURFACE FLOW
CONFIGURATION



GRATED STRIP DRAIN
CONFIGURATION

OCEANGUARD - STANDARD

PRODUCT ID	PIT DIMENSIONS (MAXIMUM) (mm)	MINIMUM DEPTH (mm)	BAG DEPTH (mm)
OG4/6S	450 × 450	350	250
	600 × 600		
OG6D	600 × 600	475	375
OG9S	600 × 900	400	300
	900 × 900		
OG9D	600 × 900	600	500
	900 × 900		
OG12S	900 × 1200	400	300
	1200 × 1200		
OG12D	900 × 1200	600	500
	1200 × 1200		



GENERAL NOTES

1. CLEARANCE FOR ANY PIT WITHOUT AN INLET PIPE (ONLY USED FOR SURFACE FLOW) CAN BE AS LOW AS 50mm. FOR OTHER PITS, THE RECOMMENDED CLEARANCE SHOULD BE GREATER OR EQUAL TO THE PIPE OBVERT SO AS NOT TO INHIBIT HYDRAULIC CAPACITY.
2. OCEAN PROTECT PROVIDES TWO FILTRATION BAG TYPES:
   - 2.A. 200 MICRON BAGS FOR HIGHER WATER QUALITY FILTERING
   - 2.B. COARSE BAG FOR TARGETING GROSS POLLUTANTS.
3. DRAWINGS NOT TO SCALE.
4. FOR SPECIAL DESIGNS PLEASE CONTACT OCEAN PROTECT

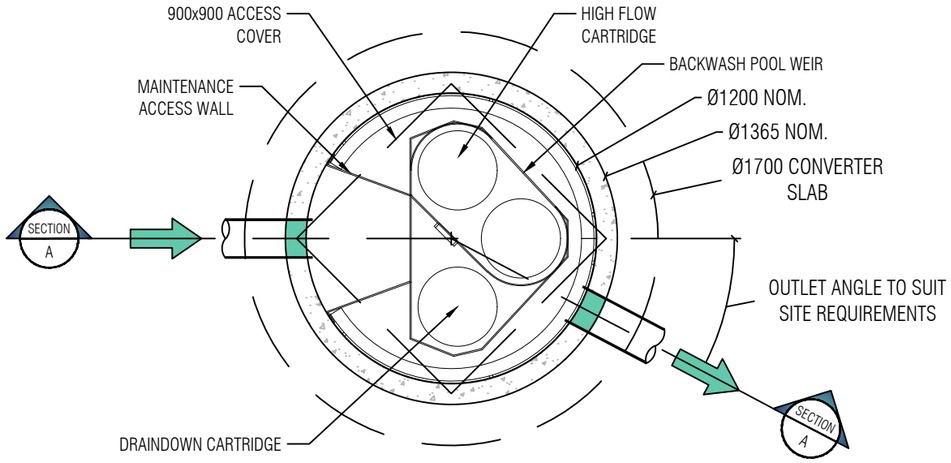
OCEAN PROTECT

PHONE: 1300 354 722 www.oceanprotect.com.au

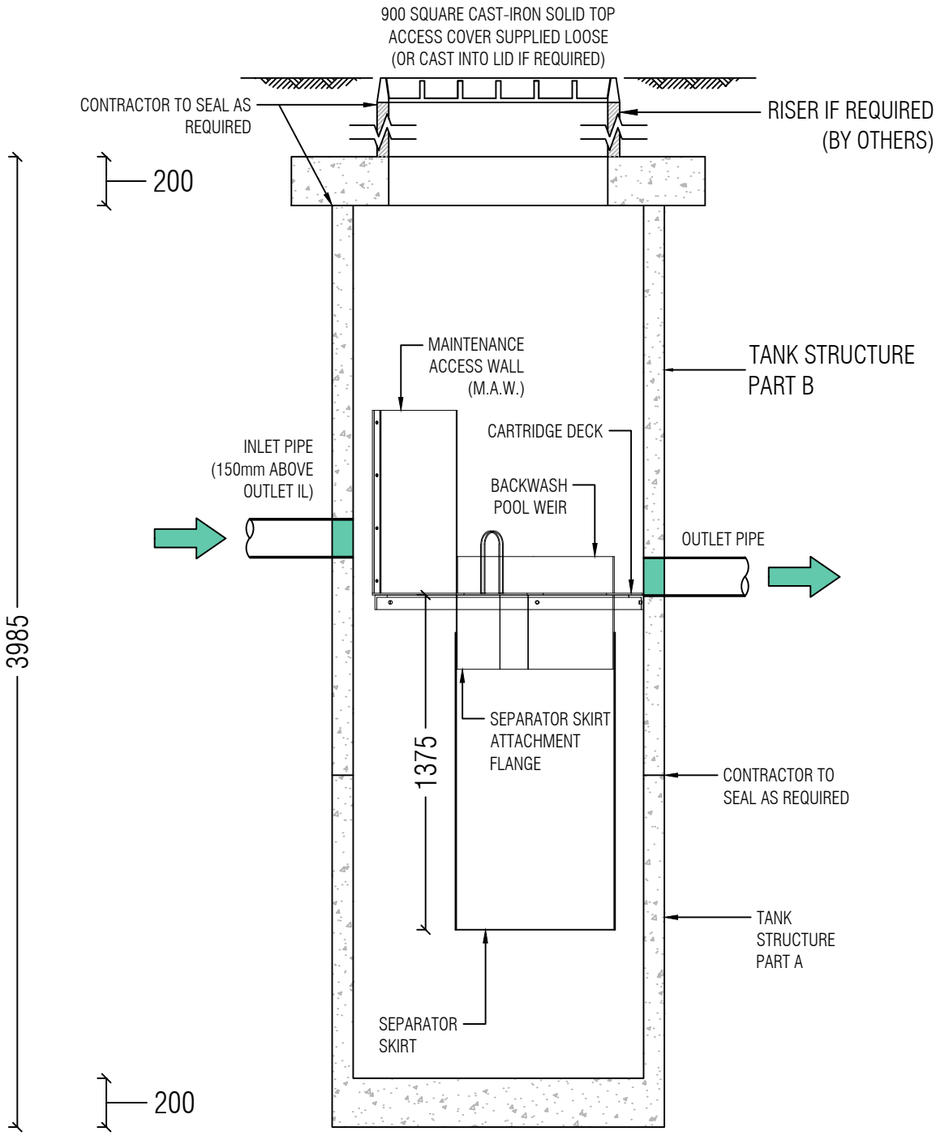
OCEAN PROTECT

OCEANGUARD
TYPCIAL ARRANGEMENTS
SPECIFICATION DRAWING

NOT FOR CONSTRUCTION



PLAN LAYOUT



SECTION A

JELLYFISH DESIGN TABLE

JELLYFISH TREATMENT FLOW IS A FUNCTION OF THE NUMBER OF CARTRIDGES AND THE DEVICE TOTAL HEAD DIFFERENTIAL. IF THE PIPE FLOW EXCEEDS THE TREATMENT FLOW THEN AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

REQUIRED DEVICE TOTAL HEAD DIFFERENTIAL [mm]	460	230
CARTRIDGE FLOW RATE FOR HIGH-FLOW / DRAINDOWN [L/s]	5 / 2.5	2.5 / 1.25
CARTRIDGE LENGTH [mm]	1375	1375
OUTLET INVERT TO STRUCTURE INVERT [mm])	1985	1985

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	[ ]
WATER QUALITY FLOW RATE (L/S)	[ ]
# OF CARTRIDGES REQUIRED (HF - DD)	[-]
CARTRIDGE SIZE	1375

PIPE DATA:	I.L.	MATERIAL	DIAMETER
INLET PIPE	[ ]	[ ]	[ ]
OUTLET PIPE	[ ]	[ ]	[ ]

LID WEIGHT	APPROX. 1,500kg
PART A & B WEIGHT (SEPARATE)	APPROX. 2,500kg

NOTE: TANK SUPPLIED IN TWO PARTS; PARTS A & B TO BE JOINED ON SITE

GENERAL NOTES

1. JELLYFISH WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF THE PROJECT.
2. PRECAST STRUCTURE SUPPLIED WITH CORE HOLES TO SUIT OUTER DIAMETER OF NOMINATED PIPE SIZE / MATERIAL.
5. STRUCTURE AND ACCESS COVERS TO BE DESIGNED TO MEET AUSTROADS T44 LOAD RATING WITH 0.0m TO 2.0m FILL MAXIMUM (CLASS D) UNLESS OTHERWISE NOTED. THE OUTLET PIPE INVERT ELEVATION. CERTIFYING ENGINEER TO CONFIRM ACTUAL GROUNDWATER ELEVATION.PRECAST STRUCTURE SHALL BE IN ACCORDANCE WITH AS3600.
6. IF THE PEAK FLOW RATE, AS DETERMINED BY THE CERTIFYING ENGINEER, EXCEEDS THE TREATMENT FLOW RATE OF THE SYSTEM, AN UPSTREAM BYPASS STRUCTURE IS REQUIRE.
7. ALL WATER QUALITY TREATMENT DEVICES REQUIRE PERIODIC MAINTENANCE. REFER TO OPERATION AND MAINTENANCE MANUAL FOR GUIDELINES AND ACCESS REQUIREMENTS.
8. SITE SPECIFIC PRODUCTION DRAWING WILL BE PROVIDED ON PLACEMENT OF ORDER.
9. DRAWING NOT TO SCALE.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE SPECIFIC DESIGN CONSIDERATION AND SHALL BE SPECIFIED BY THE CERTIFYING ENGINEER.

B. CONTRACTOR TO PROVIDE ALL EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING DETAIL PROVIDED SEPARATELY).

C. CONTRACTOR TO INSTALL AND LEVEL THE STRUCTURE, APPLY SEALANT TO ALL JOINTS AND TO PROVIDE, INSTALL AND GROUT INLET AND OUTLET PIPES.

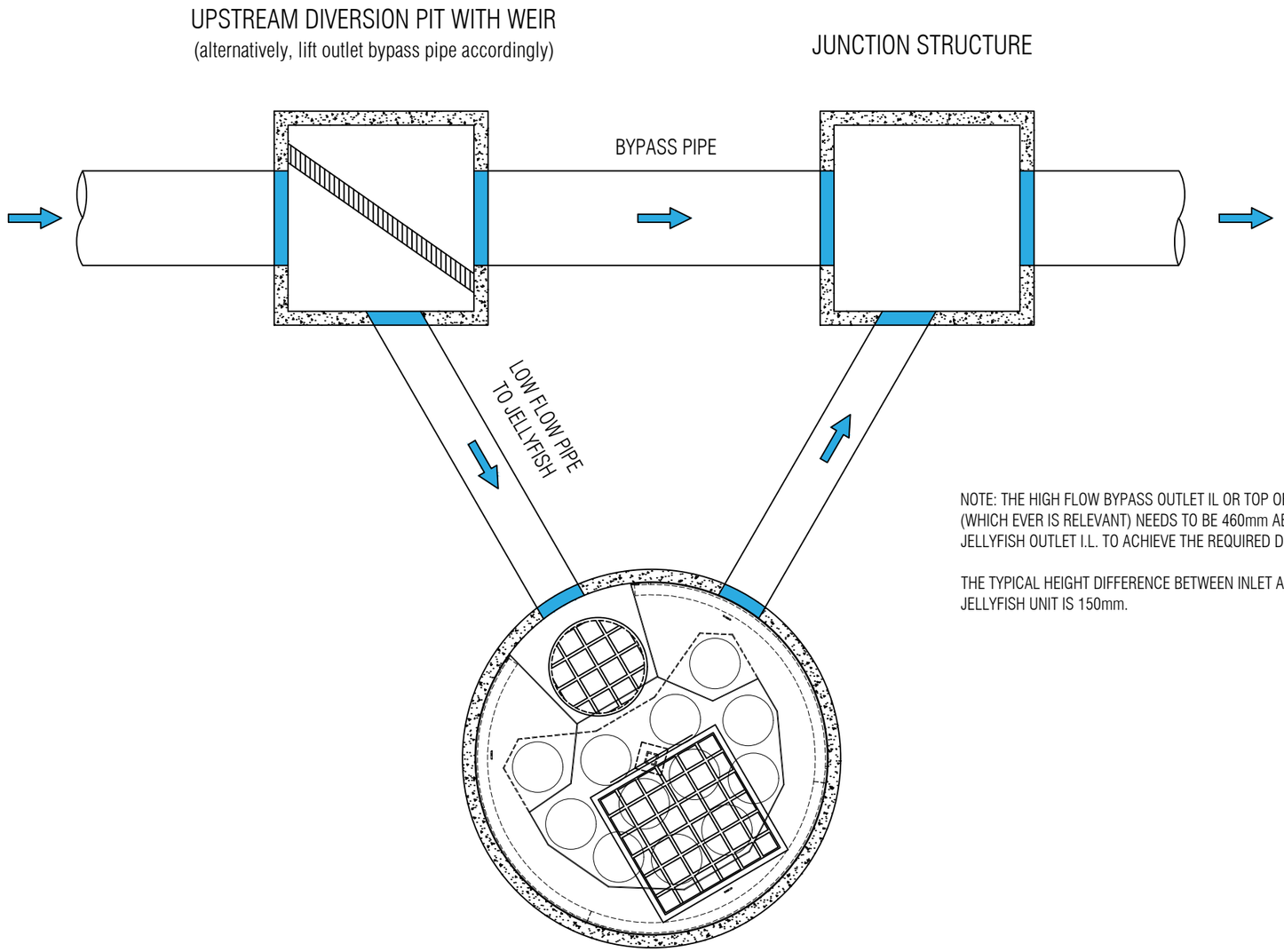
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.

E. CARTRIDGE INSTALLATION, BY OCEANPROTECT, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE JELLYFISH UNIT IS CLEAN AND FREE OF DEBRIS. CONTACT OCEAN PROTECT TO COORDINATE CARTRIDGE INSTALLATION WITH SITE COMPLETION.

OCEAN PROTECT
PHONE: 1300 354 722
www.oceanprotect.com.au

OCEAN PROTECT
JELLYFISH 1200
STANDARD PRODUCT DRAWING

LAST MODIFIED: 25-02-19



NOTE: THE HIGH FLOW BYPASS OUTLET IL OR TOP OF WEIR WALL (WHICH EVER IS RELEVANT) NEEDS TO BE 460mm ABOVE THE JELLYFISH OUTLET I.L. TO ACHIEVE THE REQUIRED DRIVING HEAD.

THE TYPICAL HEIGHT DIFFERENCE BETWEEN INLET AND OUTLET OF THE JELLYFISH UNIT IS 150mm.

PLAN OF TYPICAL OFFLINE LAYOUT

REFER TO PRODUCT DRAWING .....
FOR SYSTEM DETAILS

OCEAN PROTECT
PHONE: 1300 354 722
www.oceanprotect.com.au

OCEAN PROTECT

TYPICAL OFFLINE LAYOUT
HIGH FLOW BYPASS
WITH PRECAST JELLYFISH

DRAWING	DATE: 07.05.19	NOT TO SCALE	DRN: J.S	CHK: W.J
1				
A				

Auckland

Address | Level 4, 68 Beach Road, Auckland 1010

Post | PO Box 2027, Shortland Street, Auckland 1140, New Zealand

Ph | 64 9 379 9980

Fax | +64 9 377 1170

Email | contact-us@babbage.co.nz

Hamilton

Address | Unit 1, 85 Church Road, Pukete, Hamilton 3200

Post | PO Box 20068, Te Rapa, Hamilton 3241, New Zealand

Ph | +64 7 850 7010

Fax | +64 9 377 1170

Email | contact-us@babbage.co.nz

Christchurch

Address | 128 Montreal Street, Sydenham, Christchurch 8023

Post | PO Box 2373, Christchurch 8140, New Zealand

Ph | +64 3 379 2734

Fax | +64 3 379 1642

Email | solutions@babbage.co.nz

Babbage Consultants Australia Pty Ltd – Australia

Address | Suite 4, Level 2, 1 Yarra Street, Geelong,

Victoria 3220, Australia

Ph | +61 3 8539 4805

Email | contact-us@babbage.co.nz

www.babbageconsultants.com.au

www.babbage.co.nz

MEMORANDUM

To:	Joanna Bakopanos	Date:	27 January 2026
Cc:	Tim Barrett / Louise Egan	Job No:	68208
From:	John de Ruyter		

Environmental Impact Statement; Water Management

Introduction

Babbage have been commissioned by Air Liquide to develop a CO_2 extraction plant located at 340 Bolong Road just east of the main Manildra factory in Nowra, New South Wales. The civil design includes;

- potable water supply,
- stormwater collection / treatment / disposal, and
- wastewater collection.

This memo is the EIS response for Water Management items raised in the SEARS assessment

1. Water Balance

A detailed site water balance including a description of the water demands and breakdown of water supplies, measure to minimize water use and any water licensing requirements

A detailed site water balance has been prepared to characterise water demands, sources of supply, water use efficiency measures, and any applicable water licensing requirements for the development. The water balance considers both construction and operational phases.

1.1 Water demands

Water demands associated with the development will comprise construction-phase water use and ongoing operational demands. Construction water use will be temporary and limited to activities such as dust suppression, concrete works, and equipment washdown. Operational water demands will be associated with site amenities, minor washdown activities, and any process-related uses, as applicable.

The operational water demand was estimated using AS/NZS3500.1 Water Services and the summary table is included in **Appendix A**. The total water demand is estimated at 2.0 L/s which will be supplied by connecting to existing reticulated potable water infrastructure along Bolong Road. This infrastructure is owned by Shoalhaven City Council (SCC) and an application to connect to their watermains along Bolong Road has been submitted.

Babbage Consultants Limited
128 Montreal Street, Sydenham,
Christchurch 8023
PO Box 2373, Christchurch 8104, New Zealand
T 03 379 2734 E contact-us@babbage.co.nz
www.babbage.co.nz

1.2 Water supplies

No surface water or groundwater extraction is proposed for either construction or operation. Stormwater generated onsite will be managed through the stormwater system described in the Stormwater Management Plan. Stormwater will not be relied upon as a primary water supply and no groundwater will be taken or used as part of the development.

1.3 Water use minimisation measures

Measures to minimise water use will be incorporated into the design and operation of the development, including:

- Installation of water-efficient fixtures and fittings within amenities;
- Implementation of dry clean-up procedures in preference to hose-down where practicable;
- Use of trigger-controlled or high-efficiency hoses for washdown activities;
- Isolation of non-essential water use during maintenance activities; and
- Management procedures to promptly identify and repair leaks.

These measures are consistent with contemporary water efficiency practices and NSW expectations for industrial developments.

1.4 Water licensing and approvals

The development does not propose the extraction or use of surface water or groundwater and the development does not constitute an aquifer interference activity. Therefore, no water access licence is required under the **Water Management Act 2000**

Temporary construction dewatering, if required, will involve the return of water to land and will not result in a net take of groundwater.

No additional water-related licences or approvals are anticipated in relation to water supply or use.

Summary

The site water balance demonstrates that water demands will be met through reticulated supply, with no reliance on surface water or groundwater extraction. Water efficiency measures will be implemented to minimise demand, and no water licensing requirements are triggered by the development.

2. Description of Groundwater & Surface Water

A description of groundwater and surface water conditions and all works/activities that may intercept, extract, use divert of receive surface water and or groundwater (both temp and permanent)

2.1 Surface water conditions

The site is located on generally flat, low-lying land and is currently drained by a combination of overland flow paths and existing open drains located along site boundaries. These drainage features convey runoff from the site and adjoining industrial land toward downstream drainage infrastructure beneath Bolong Road, before ultimately discharging to the Shoalhaven River approximately 250 metres south of the site.

Surface water flows are intermittent and rainfall-driven, with no permanent watercourses located within the development footprint. The downstream receiving environment is the Shoalhaven River catchment.

2.2 Groundwater conditions

Geotech investigations identified groundwater at a depth of between 3 – 4m below ground level. The site is not located within a mapped groundwater source relied upon for potable supply, irrigation, or other sensitive beneficial uses, and no groundwater-dependent ecosystems have been identified within or adjacent to the site.

2.3 Works and Activities Interacting with Water Resources

Temporary works and activities (construction phase)

- **Surface water:** Temporary construction-phase controls will manage surface runoff during earthworks and construction, including diversion and treatment of stormwater in accordance with standard erosion and sediment control practices and the SWMP.
- **Groundwater:** Temporary and localised dewatering may be required during construction of the gas pipeline where shallow excavations intersect groundwater. Any dewatering will be short-term and limited to the immediate excavation area. Dewatering will be discharged back to land within the site or immediately adjacent areas, allowing infiltration and natural recharge to occur. Dewatering will not be exported offsite or discharged to surface waters, and there will be no net loss of groundwater from the groundwater system.

Permanent works and activities

- **Surface water:** The operational development will receive stormwater runoff generated within the site. Stormwater will be collected via pits and pipework, treated through proprietary stormwater treatment devices, detained within an onsite detention basin, and discharged in a controlled manner to the existing downstream drainage network, in accordance with the Stormwater Management Plan (SWMP).
- **Groundwater:** The operational phase of the development will not intercept, extract, divert, inject, or use groundwater. No permanent groundwater interaction or take is proposed.

Summary

The development will permanently **receive and manage surface water runoff only**, with no permanent interception or use of groundwater. Temporary groundwater interaction may occur during construction, but this will be short-term, localised, and managed to avoid any measurable or lasting impacts on groundwater levels, flows, quality, or beneficial uses.

3. Assessment of impacts on surface and groundwater

An assessment of potential surface and groundwater impacts (both quality and quantity) associated with the development, including potential impacts on water courses riparian areas, groundwater and groundwater dependent communities nearby in accordance with relevant water quality guidelines and the DCCEEW -Water groundwater toolkit

3.1 Assessment of Potential Surface Water and Groundwater Impacts

An assessment of potential surface water and groundwater impacts associated with the development has been undertaken n accordance with relevant **Australian water quality guidelines** and the **DCCEEW–Water Groundwater Toolkit**.

- **Surface water – quantity impacts**

  Stormwater quantity impacts arising from the increase in impervious area have been assessed in the Stormwater Management Plan (SWMP) using Australian Rainfall and Runoff (ARR 2019) methodologies, including climate change allowances. The assessment demonstrates that post-development peak flows will be managed through an onsite detention basin designed to attenuate runoff and limit discharge rates toward pre-development conditions.

  With the implementation of the proposed stormwater detention and controlled discharge regime, the development is not expected to result in increased downstream flood risk, erosion, or channel instability within downstream drainage lines or watercourses.

- **Surface water – quality impacts**

  Potential surface water quality impacts are limited to typical urban and industrial stormwater contaminants such as sediments, hydrocarbons from vehicle movements, and trace metals from building materials. The CO_2 removal process will not generate contaminants that enter the stormwater system.

  Stormwater quality mitigation has been designed in accordance with **NSW EPA stormwater management guidance** and the **Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018)**, adopting a risk-based approach to ecosystem protection. The treatment train described in the SWMP includes proprietary stormwater treatment devices and an onsite detention basin. MUSIC modelling demonstrates substantial reductions in key pollutants, including total suspended solids, nutrients, and gross pollutants.

  With these controls in place, treated stormwater discharges are not expected to adversely affect downstream drainage lines, riparian areas, or the Shoalhaven River.

- **Groundwater – quantity impacts**

  The development does not involve permanent groundwater extraction, interception, diversion, injection, or disposal. Accordingly, no operational impacts on groundwater levels or flows are anticipated.

  Temporary and localised groundwater drawdown may occur during construction of the gas pipeline where shallow excavations intersect groundwater. In accordance with the **DCCEEW–Water Groundwater Toolkit**, this interaction is assessed as low risk due to:

  1. the short-term and localised nature of dewatering;
  2. the absence of regional drawdown; and
  3. the return of dewatered water to land to allow infiltration and recharge.

  No measurable or permanent changes to groundwater levels or flow regimes are anticipated.

- **Groundwater – quality impacts**

No impacts on groundwater quality are anticipated during operation, as the development does not involve groundwater use or discharge. Construction-phase dewatering, if required, will be managed to ensure discharged water is free of visible contamination prior to discharge to land.

The proposal will not introduce new contaminant sources with the potential to migrate to groundwater.

- **Watercourses, riparian areas, and groundwater-dependent communities**

There are no permanent watercourses or riparian vegetation within the development footprint. Downstream drainage features and the Shoalhaven River will be protected through the implementation of stormwater quality and quantity controls described in the SWMP.

No groundwater-dependent ecosystems or communities have been identified within or adjacent to the site. Based on the absence of permanent groundwater interaction and the temporary, low-risk nature of construction dewatering, the development is not expected to impact groundwater-dependent communities.

- **Residual impacts**

With the implementation of the proposed stormwater management system and construction controls, the development is expected to result in **negligible residual impacts on surface water and groundwater quality and quantity**. No adverse impacts on watercourses, riparian areas, groundwater resources, or groundwater-dependent communities are anticipated.

4. Surface Water Discharge Assessment (EPA Guidelines)

A surface water discharge assessment in accordance with EPA guidelines including an assessment of potential impacts on watercourses and riparian areas and characterization of water quality at the point of discharge against the relevant water quality criteria using a MUSIC water quality model.

4.1 Surface Water Discharge Assessment

Surface water discharges from the development will be limited to treated stormwater runoff generated during rainfall events. The development will not discharge process water, wastewater, or contaminated flows to the surface water environment.

The stormwater management system and discharge regime are detailed in the Stormwater Management Plan (SWMP). Potential stormwater contaminants are limited to typical urban and industrial sources, including sediments, hydrocarbons from vehicle movements, and trace metals from building materials. The CO_2 removal process will not generate contaminants that enter the stormwater system.

The surface water discharge assessment has been undertaken in accordance with NSW EPA guidance and adopts a risk-based approach consistent with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018) for the protection of aquatic ecosystems.

Stormwater quality at the point of discharge has been characterised using a MUSIC (Model for Urban Stormwater Improvement Conceptualisation) water quality model, as documented in the SWMP. The modelling assesses developed site runoff both with and without treatment and demonstrates that the proposed stormwater treatment train achieves substantial reductions in key pollutants, including total suspended solids, nutrients, and gross pollutants. These outcomes are consistent with best-practice stormwater management objectives and relevant water quality criteria under the ANZG Guidelines.

Stormwater quantity impacts have also been managed through the incorporation of onsite detention and controlled discharge, which reduces the potential for increased downstream erosion, scour, or instability within drainage lines, watercourses, or associated riparian areas.

Summary

Treated stormwater discharges are not expected to result in adverse impacts on downstream watercourses or riparian areas, and predicted water quality at the point of discharge is expected to be consistent with the relevant aquatic ecosystem protection objectives.

Surface water discharges from the site will not require an Environment Protection Licence under the Protection of the Environment Operations Act 1997.

5. Surface / Groundwater Mitigation, management and monitoring

Details of any surface or groundwater mitigation, management and monitoring activities and methodologies.

Mitigation, management and monitoring measures have been incorporated into the design, construction and operation of the development to minimise potential impacts on surface water and groundwater resources. These measures are consistent with **NSW EPA guidance**, **DCCEEW–Water expectations**, and best-practice stormwater management.

5.1 Surface water mitigation and management

Surface water impacts will be mitigated through the implementation of a best-practice stormwater management system, as detailed in the Stormwater Management Plan (SWMP). Key mitigation and management measures include:

- Collection of site runoff via a piped drainage network to prevent uncontrolled overland flows;
- Treatment of stormwater through proprietary stormwater treatment devices to remove sediments, nutrients and gross pollutants;
- Attenuation of post-development flows via an onsite detention basin to manage peak discharge rates and minimise downstream erosion risk;
- Controlled discharge to the existing downstream drainage network; and
- Implementation of an operation and maintenance regime to ensure ongoing performance of stormwater infrastructure, including routine inspection, sediment removal and servicing of treatment devices in accordance with the SWMP.

During construction, the erosion and sediment plan (ESCP) will be implemented to minimise sediment-laden runoff, including staged earthworks, stabilisation of disturbed areas, and inspection and maintenance of controls following rainfall events. The proposed ESCP are shown in Plans C201 and C202.

5.2 Groundwater mitigation and management

The development does not involve permanent groundwater extraction or interaction. Accordingly, no operational groundwater mitigation measures are required.

Temporary groundwater interaction may occur during construction of the gas pipeline if shallow excavations intersect groundwater. In this instance, mitigation and management measures will include:

- Limiting dewatering to the minimum extent and duration required to safely complete excavation works;
- Discharging dewatered water back to land within the site or immediately adjacent areas to allow infiltration and natural recharge;
- Insuring dewatered water is free of visible contamination prior to discharge to land; and
- Ceasing dewatering immediately upon completion of excavation works.

These measures are consistent with the **DCCEEW–Water Groundwater Toolkit** and the **NSW Aquifer Interference Policy** and are expected to prevent any measurable or lasting impacts on groundwater levels or quality.

5.3 Monitoring activities and methodologies

- **Surface water and stormwater monitoring**

Ongoing performance of the stormwater management system will be monitored through routine inspection and maintenance activities outlined in the SWMP. This includes:

- Visual inspection of pits, pipes, treatment devices and the detention basin;
- Removal of accumulated sediments and gross pollutants when trigger levels are reached; and,
- Inspection following significant rainfall events to confirm system integrity and function.

Formal water quality monitoring is not proposed given the low-risk nature of the discharge and the implementation of best-practice stormwater controls. However, additional monitoring may be undertaken if required by regulatory authorities.

- **Groundwater monitoring**

Dedicated groundwater monitoring is not proposed, as the development will have no operational interaction with groundwater and only temporary, low-risk dewatering may occur during construction. Construction activities will be visually monitored to confirm that any groundwater interaction remains localised and short-term.

5.4 Residual risk

With the implementation of the above mitigation, management and monitoring measures, the development is expected to result in **negligible residual impacts on surface water and groundwater resources** during both construction and operation.

APPENDIX A Water Demand Calculation

JOB NAME:		**DATE:**	26/01/2026
Air Liquide Nowra			
JOB NO:		**DES BY:**	YK
68208			
SUBJECT:		**CHKD BY:**	JdR
co2 gas plant			

External Water Design as per AS/NZS 3500.1 2021

Inputs (Refer to ASNZS3500.1 Appendix C.2)

Parameter	Value	Source referance	Notes
Tapping Pressure (m),Hm	20.0	minimum available tapping main/submain pressure	Find from council provided pressure map or relevant information
Max Fixture Height from FFL	3.50	Architectural plan	Height of highest fixture from FFL
FFL	2.75	Civil plan	Refer to civil levels plan
Water Line RL	2.00	Topo Survey	Assume 600mm cover from survey
Static head loss (m),Hs	4.25	ASNZS 3500.1	Max Fiture Height + FFL - Water Line RL
Hx (m)	5	ASNZS 3500.1	Min head required by any fixture outlet. Special fixtures may require additonal head. *Refer AS3500.1 Clause 3.3.2*
Pressure drop (m)	11	ASNZS 3500.1	Equation C.2, **Pressure drop = Hm - Hs - Hx**
Fixture outlet length (m)	160	Civil plan	Length of pipe from tapping pressure point to furthest fixture outlet (external and internal length)

Table 3.2.1 Flow Rates and Loading Units

Type E,F,G,O&RG House (1,4,9,10,11,18,19,20)				
Fixture	**Flow rate L/s**	**Loading units**	**No.**	**Total**
Water closet cistern	0.10	2	5	10
Bath	0.30	8	0	0
Basin (standard outlet)	0.10	1	5	5
Spray tap	0.03	0.5	0	0
Shower	0.10	1	1	1
Sink (standard outlet)	0.12	3	3	9
Laundry through	0.12	3	0	0
Washing machine/dishwasher	0.20	3	1	3
Main pressure water heater	0.20	8	0	0
Hose tap (20 nom. Size)	0.30	8	3	24
Hose tap (15 nom. Size)	0.20	4		0
Total				52

From Table 3.2.4 Probable Simultaneous Flow Rates (PSFRs)

Loading units	PSFR L/s	Co2 Plant L/s	Total L/s
52	0.63	1.35	**1.98**