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CONSTRUCTION GROUNDWATER QUALITY MONITORING PROGRAM

A2I | Albury to Illabo

CONTRACT NUMBER: 0052

PROJECT DOCUMENT NUMBER:
6-0052-210-EEC-00-PJ-0003

Document Control

DOCUMENT TITLE:	Construction Groundwater Quality Monitoring Program		
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Revision History

REVISION	REVISION DATE	AMENDMENT	DATE TO CLIENT
A	07/07/2025	Internal review	--
B	25/07/2025	Update following review by SME	
0	01/08/2025	Update following external review	1/08/2025

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GLOSSARY

TERM	DEFINITION
A2I	Albury to Illabo
ARTC	Australian Rail Track Corporation
BOM	Bureau of Meteorology
CEMF	Construction Environmental Management Framework
CEMP	Construction Environmental Management Plan
CGMP	Construction Groundwater Monitoring Program
CSSI	Critical State Significant Infrastructure
CSWMP	Construction Soil and Water Management Plan
CSWQMP	Construction Surface Water Quality Monitoring Program
CoA	Conditions of Approval
Construction	Includes work required to construct the CSSI as defined in the Project Description described in the documents listed in CoA A1 including commissioning trials of equipment and temporary use of any part of the CSSI but excluding Low Impact Work which is carried out or completed prior to approval of the CEMP.
CSSI	Critical State Significant Infrastructure
DCCEEW	Department of Climate Change, Energy, the Environment and Water (NSW)
DIPNR	Department of Infrastructure, Planning and Natural Resources (NSW)
DO	Dissolved Oxygen
DPE	NSW Department of Planning and Environment
DPI	Department of Primary Industries (NSW)
DPHI	Department of Planning, Housing and Infrastructure
EAD	Environmental Approval Documentation The Inland Rail – Albury to Illabo project was assessed as part of the following documents: ▪ Inland Rail – Albury to Illabo Environmental Impact Statement (ARTC, August 2022); ▪ Albury to Illabo Response to Submissions (ARTC, November 2023); ▪ Albury to Illabo Preferred Infrastructure Report (ARTC, November 2023); ▪ Albury to Illabo Preferred Infrastructure Report Response to Submissions (ARTC, February 2024); ▪ Inland Rail – Albury to Illabo (SSI-10055) Response to request for additional information – Air Quality Assessment (letter dated 1 May 2024); ▪ Part 1 - Revised Technical Paper 8: Biodiversity Development Assessment Report (WSP, February 2024); ▪ Part 2 - Revised Technical Paper 8: Biodiversity Development Assessment Report (WSP, February 2024).
EC	Electrical Conductivity
EIS	Environmental Impact Statement

TERM	DEFINITION
EPA	Environmental Protection Authority (NSW)
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
EPL	Environment Protection Licence
Environmental Representative (ER)	The Environmental Representative(s) for the CSSI approved by the Planning Secretary
GDE	Groundwater Dependent Ecosystem
GIL	Groundwater Investigation Level
GME	Groundwater Monitoring Event
IRPL	Inland Rail Pty Ltd
km	Kilometre
mBGL	Meters below ground level
mm	Millimetre
MR ESM	Martinus Rail's Environment and Sustainability Manager
N2NS P1	Narrabri to North Star Phase 1
NATA	National Association of Testing Authorities Australia
NEPM	National Environmental Protection Measures
NSW	New South Wales
P2N	Parkes to Narromine
pH	A figure expressing the acidity or alkalinity of a solution on a logarithmic scale on which 7 is neutral, lower values are more acid and higher values more alkaline.
Planning Secretary	Secretary of the NSW Department of Infrastructure, Housing and Infrastructure, or delegate
PIR	Preferred Infrastructure Report
Primary CoA/UMM	CoA and/or UMMs that are specific to the development of this Monitoring Program
POEO Act	<i>NSW Protection of Environment Operations Act 1997</i>
SEARs	Secretary's Environmental Assessment Requirements
SMART	Specific, Measurable, Achievable, Realistic and Timely
SSI	State Significant Infrastructure
SWL	Standing Water Level
TDS	Total Dissolved Solids
UMM	Environmental Management Measure (per the PIR Rts)
WPIA	Water Pollution Impact Assessment

1 INTRODUCTION

1.1 Project overview

Inland Rail is an approximate 1,600 kilometres (km) freight rail network that will connect Melbourne and Brisbane via regional Victoria, New South Wales (NSW) and Queensland. The Inland Rail route would involve using approximately 1,000 km of existing track (with enhancements and upgrades where necessary) and 600 km of new track, passing through 30 local government areas (LGAs). Inland Rail will accommodate double-stacked freight trains up to 1,800 metres (m) long and 6.5 m high.

The Australian Government has confirmed that Inland Rail is an important project to meet Australia's growing freight task, improve road safety and help decarbonise the economy. Inland Rail will enhance our national freight and supply chain capabilities, connecting existing freight routes through rail, roads and ports, and supporting Australian's growth. Inland Rail is being delivered by Australian Rail Track Corporation (ARTC) and Inland Rail Pty Ltd (IRPL).

Comprising 12 sections, a staged approach is being undertaken to deliver Inland Rail. Each of these projects can be delivered and operated independently with tie-in points to the existing railway. Work south of Parkes has been prioritised, which will enable Inland Rail to initially connect to existing rail networks between Melbourne, Sydney, Perth and Adelaide via Parkes and Narromine. The Parkes to Narromine (P2N) and Narrabri to North Star Phase 1 (N2NS P1) sections are complete.

The project will enable enhancement works to structures and sections of track along 185 km of the existing operational standard-gauge railway in the Albury to Illabo (A2I) section of the Inland Rail program. Enhancement works are required to provide the increased vertical and horizontal clearances required for double-stacked freight trains. Works would include track realignment, lowering and/or modification within the existing rail corridor, modification, removal or replacement of bridge structures (rail, road and/or pedestrian bridges), raising or replacing signal gantries, level-crossing modifications and other associated works.

A detailed project description is provided in Section 4 of the Construction Environmental Management Plan (CEMP).

1.1.1 Planning context

The Inland Rail – Albury to Illabo project (the project) is declared State significant infrastructure (SSI) and critical State significant infrastructure (CSSI) under Division 5.2 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act). The project is permissible without development consent and is subject to assessment and approval by the NSW Minister for Planning and Public Spaces.

An environmental impact statement (EIS) was prepared to support ARTC's application for approval of the proposal in accordance with the requirements of the EP&A Act and the environmental assessment requirements of the Secretary of the (then) NSW Department of Planning, Industry and Environment (the SEARs) (now the Department of Planning, Housing and Infrastructure (DPHI)).

The EIS was placed on public exhibition from 17 August 2022 to 28 September 2022. During the exhibition period, interested stakeholders and members of the community were able to review the EIS online, participate in consultation and engagement activities held by ARTC, and make a written submission to the DPE for consideration in its assessment of the proposal.

In accordance with section 5.17(6)(b) of the EP&A Act, on 13 April 2023 the Planning Secretary directed ARTC to submit a Preferred Infrastructure Report (PIR) that provides further assessment of traffic and transport, noise and vibration, and air quality impacts. The PIR was also prepared to consider changes to the exhibited proposal that have arisen as a consequence of these further assessments and related submissions.

1.1.2 Statutory context and approval

The project was assessed as part of the following documents:

- Inland Rail – Albury to Illabo Environmental Impact Statement (ARTC, August 2022);
- Albury to Illabo Response to Submissions (ARTC, November 2023);
- Albury to Illabo Preferred Infrastructure Report (ARTC, November 2023);
- Albury to Illabo Preferred Infrastructure Report Response to Submissions (ARTC, February 2024);
- Inland Rail – Albury to Illabo (SSI-10055) Response to request for additional information – Air Quality Assessment (letter dated 1 May 2024);
- Part 1 - Revised Technical Paper 8: Biodiversity Development Assessment Report (WSP, February 2024);
- Part 2 - Revised Technical Paper 8: Biodiversity Development Assessment Report (WSP, February 2024);

Together these documents are referred to as the Environmental Approvals Documentation (EAD).

Approval for the Inland Rail – Albury to Illabo project under the EP&A Act was granted by the Minister for Planning on 08 October 2024.

1.2 Scope of this Monitoring Program

The scope of this Construction Groundwater Monitoring Program (CGMP) is to describe how the project will monitor potential groundwater impacts during construction.

SMART (Specific, Measurable, Achievable, Realistic and Timely) principles are to be considered and applied during the preparation and ongoing implementation of this CGMP.

This CGMP is applicable to all activities during construction of the project, including all areas where physical works will occur or areas that may otherwise be impacted by the construction works, and are under the control of Martinus Rail. All Martinus Rail staff and sub-contractors are required to comply with the requirements of this CGMP and related environmental management plans.

1.3 Approval

The Inland Rail – Albury to Illabo project was assessed as part of the following documents:

- Inland Rail – Albury to Illabo Environmental Impact Statement (ARTC, August 2022);
- Albury to Illabo Response to Submissions (ARTC, November 2023);
- Albury to Illabo Preferred Infrastructure Report (ARTC, November 2023);
- Albury to Illabo Preferred Infrastructure Report Response to Submissions (ARTC, February 2024);
- Inland Rail – Albury to Illabo (SSI-10055) Response to request for additional information – Air Quality Assessment (letter dated 1 May 2024);
- Part 1 - Revised Technical Paper 8: Biodiversity Development Assessment Report (WSP, February 2024);
- Part 2 - Revised Technical Paper 8: Biodiversity Development Assessment Report (WSP, February 2024).

Together these documents are referred to as the Environmental Assessment Documentation (EAD).

Approval for the project under the EP&A Act was granted by the Minister for Planning on 08 October 2024.

This CGMP will be implemented throughout construction.

1.4 Responsibilities

Martinus Rail's Construction Manager/Area Manager and the Environment, Approvals and Sustainability Manager (MR ESM) are responsible for ensuring that all legal and other requirements described in this CGMP are met.

1.5 Environmental requirements

1.5.1 Guidelines and standards

The main guidelines, specifications, and policy documents relevant to this CGMP include:

- National Water Quality Management Strategy (Australian and New Zealand Environment and Conservation Council (ANZECC), 2018);
- Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ, 2000a) (the ANZECC guidelines);
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Governments, 2018) (the Water Quality Guidelines);
- NSW Water Quality and River Flow Objectives (Department of Environment, Climate Change and Water (DECCW), 2006) (the NSW Water Quality Objectives).
- Groundwater Sampling and Analysis. A Field Guide 2nd Edition. Geoscience Australia Record 2024/33

1.5.2 Minister's Conditions of Approval

No CoA presented in the EAD were considered relevant to the development of this CGMP.

1.5.3 Updated Management Measures

UMM GW2 has informed the development of this monitoring program, no other primary or secondary UMMs presented in the EAD are considered relevant to the development of this CGMP. The UMM relevant to this monitoring program is presented in Table 1.

TABLE 1: UMM RELEVANT TO THIS MONITORING PROGRAM

No.	Requirement	Where addressed
GW2	A groundwater monitoring program (level and quality), prepared by a suitably qualified person, will be implemented in accordance with the requirements outlined in this assessment prior to construction. This will identify ongoing monitoring requirements, following the completion of construction, according to the risks to groundwater levels and quality. Ongoing groundwater monitoring (level and quality) will be carried out at the sites for the duration specified in the groundwater monitoring program.	This program (CGMP)

1.5.4 EPL No.21984

The A2I project is subject to Environment Protection License (EPL) 21984 as a Scheduled Activity for ‘railway activities – railway infrastructure construction’. The EPL includes clauses requiring the licensee to minimise soil and water impacts from the project. No conditions set out in the EPL are relevant to groundwater monitoring.

1.5.5 Water Access Licence

Consultation with NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) Water Group regarding the requirement for a water access licence or applicable exemption was undertaken in June 2025. Following that consultation and a review of the Water Management (General) Regulation 2018 it was determined that a water access licence was not required for the project.

2 BASELINE DATA

2.1 Desktop review

A desktop review of available data was undertaken to develop an understanding of the hydrogeological environment within the groundwater study area and to identify sensitive receptors including waterways, Groundwater Dependent Ecosystems (GDEs) and registered groundwater bores.

The desktop assessment involved:

- reviewing existing survey information from previous geotechnical investigation at the proposal sites
- reviewing geological data from the Seamless Geology Project (Colquhoun, Hughes & Deyssing et al., 2019) and information from geotechnical investigations and regional maps
- reviewing relevant proprietary databases detailing the existing groundwater, geological, climate and hydrogeological environments including:
 - GDE information from the BOM GDE Atlas (2021) and the SEED database.
 - climate data including rainfall and evapotranspiration from the Bureau of Meteorology (BOM) (refer to Chapter 25: Climate change adaptation and greenhouse gas and section 4.2 of Technical Paper 12: Groundwater)
 - registered groundwater bore data including groundwater levels, quality and yield, from the BOM National Groundwater Information System (NGIS) and WaterNSW
- reviewing publicly available reports and databases further detailing the existing groundwater, soil (refer to Chapter 20: Soils and contamination), geological (refer to section 19.3.1 of this EIS and section 4.3 of Technical Paper 12: Groundwater), topographical (refer to section 20.2.1 of this EIS), and hydrogeological environments (see to section 19.3.1), including surface water and groundwater interaction, and climate (refer to section 25.1.2). Sources include background aquifer descriptions documented in water resource plans (WRP) and water sharing plans, local council management plans and reports. The following water sharing plans are covered by the alignment:
 - Murray Alluvial Groundwater Sources 2020
 - Murrumbidgee Alluvial Groundwater sources 2020
 - NSW Murray–Darling Basin Fractured Rock Groundwater sources 2020
- reviewing information provided by Wagga Wagga City Council regarding local monitoring bores within their Urban Salinity Management Plan.

A preliminary risk assessment was then undertaken to determine the requirement for further site investigations. The risk assessment was based on a review of the construction and operation activities during the preliminary design stages, particularly ground disturbance works such as track lowering and other work requiring excavation or other work with the potential to impact existing groundwater conditions, based on the available hydrogeological desktop information.

2.2 Field investigations

2.2.1 Field investigations - EAD

As part of the EAD, field investigations included the drilling, monitoring well installation, water level monitoring and water quality monitoring at six locations where the preliminary risk ratings identified the high potential for impact or where data gaps existed. These locations were:

- Albury precinct (Albury Yard clearances and Riverina Highway bridge enhancement sites)
- Wagga Wagga precinct (Uranquinty Yard clearances, Pearson Street bridge and Edmondson Street bridge enhancement sites)
- Junee precinct (Olympic Highway underbridge enhancement site).

Three groundwater monitoring events (GMEs) were completed in 2–5 February (GME1), 29–31 March (GME2) and 26–27 May (GME3) 2021. GMEs involved monitoring standing water levels (SWL) (Table 2) and water quality (electrical conductivity (EC), pH, redox conditions and temperature) (Table 3) in groundwater monitoring wells.

TABLE 2: GROUNDWATER LEVELS RECORDED BY MANUAL DIP MEASUREMENTS

Bore ID	Enhancement site	Groundwater source	GME 1 (Feb 2021)		GME 2 (March 2021)		GME 3 (May 2021)	
			SWL ¹ (mBGL)	SWL ¹ (mBGL)	SWL ¹ (mBGL)	SWL ¹ (mBGL)	SWL ¹ (mBGL)	SWL ¹ (mBGL)
BH201	Albury Yard clearances	Upper Murray - shallow	8.11	152.53	8.38	152.26	8.49	152.15
BH204	Riverina Highway bridge	Upper Murray - shallow	7.48	153.91	7.72	153.67	7.66	153.73
BH206	Pearson Street bridge	Lachlan fractured rock shallow	2.22	184.25	1.98	184.49	2.49	183.98
BH210	Edmondson Street bridge	Lachlan fractured rock shallow	10.75	172.93	10.45	173.23	11.14	172.53
BH215	Olympic Highway underbridge	Lachlan fractured rock shallow	9.99	299.56	9.85	299.70	9.72	299.83
BH219	Uranquinty Yard clearances	Lachlan fractured rock shallow	Dry (>30.00)	Dry (<168.36)	Dry (>30.00)	Dry (<168.36)	Dry (<30.00)	Dry (<168.36)

1. Standing water level (SWL)

TABLE 3: GROUNDWATER QUALITY MONITORING DATA

Groundwater quality		BH201 ⁴	BH204 ⁴	BH206 ⁴	BH210 ⁴	BH215 ⁴
GME 1	Field reading (EC $\mu\text{S/cm}$) ¹	2,031	1,688	729	547	2,442
	Classification ²	Brackish	Brackish	Fresh	Fresh	Brackish
	Category ³	B	A3	A1	A1	B
GME 2	Field reading (EC $\mu\text{S/cm}$) ¹	1,374	1,591	566	577	2,148
	Classification ²	Marginal	Marginal	Fresh	Fresh	Brackish
	Category ³	A3	A3	A1	A1	B
GME 3	Field reading (EC $\mu\text{S/cm}$) ¹	1,616	1,499	631	580	2,662
	Classification ²	Marginal	Marginal	Fresh	Fresh	Brackish
	Category ³	A3	A3	A1	A1	B

1. $\mu\text{S/cm}$ = microsiemens per centimetre

2. Based on calculated median value and classification ranges provided in Hounslow (1995)

3. Refer to Table 4 for water quality category descriptions

4. BH201 is located at Albury Yard clearances in the Upper Murray - shallow groundwater system; BH204 is located at the Riverina Highway bridge in the Upper Murray - shallow groundwater system; BH206 is located at Pearson Street bridge in the Lachlan fractured rock – shallow groundwater system; BH210 is located at Edmondson Street bridge in the Lachlan fractured rock – shallow groundwater system; BH215 is located at Olympic Highway underbridge in the Lachlan fractured rock – shallow groundwater system.

Comparison of the data against the beneficial use categories for groundwater outlined in Table 4 indicate that the existing groundwater can be used for all beneficial uses with the exception of category B, which is not suitable to be used as raw drinking water.

2.2.2 Field investigations – Detailed Design

Following the completion of the EAD investigations, Martinus undertook additional field investigations which included drilling, monitoring well installation, water level monitoring and water quality monitoring at eight locations where the EAD identified a greater than low risk rating potential to intersect or where significant excavation was proposed as part of the project scope. These locations were:

- Kemp Street Bridge
- Wagga Wagga Station Footbridge
- Cassidy Street Bridge
- Edmondson Street Overbridge
- Pearson Street Bridge
- Billy Hughes Highway
- Riverina Highway Bridge
- Albury Station Footbridge

Dataloggers were installed and monitored groundwater levels at six-hour intervals across a three-month period at each location. The dataloggers were installed in a non-vented state and the data has not been corrected for atmospheric conditions.

A summary of the results is outlined in Table 5 below. No correlation was identified between rainfall and groundwater recharge as a result of the monitoring, refer to Appendix A.

TABLE 4: WATER MONITORING DATA TO SUPPORT DETAILED DESIGN

Site	SWL (mBGL)	October 2024	November 2024	December 2024
Kemp Street Bridge (BH5007)	Min	6.23	6.26	6.41
	Mean	6.36	6.48	7.85
	Max	6.52	6.68	15.01
Wagga Wagga Station Footbridge (BH5101)	Min	12.58	12.54	12.54
	Mean	12.64	12.65	16.49
	Max	12.68	12.69	30.25
Cassidy Street Bridge (BH5201)	Min	11.05	11.04	11.04
	Mean	11.27	11.10	22.95
	Max	29.44	11.15	29.44
Edmondson Street Overbridge	Min	13.19	12.84	12.48
	Mean	14.31	13.02	13.32

Site	SWL (mBGL)	October 2024	November 2024	December 2024
(BH5314)	Max	14.82	13.18	14.78
Billy Hughes Highway (BH5501)	Min	19.55	19.55	19.55
	Mean	19.58	19.58	19.57
	Max	19.59	19.60	19.59
Riverina Highway Bridge (BH5601)	Min	6.79	6.87	6.96
	Mean	7.01	7.02	11.41
	Max	7.16	7.11	24.73
Albury Station Footbridge (BH5703)	Min	4.86	4.85	5.13
	Mean	5.01	5.02	5.33
	Max	5.13	5.21	5.88

3 GROUNDWATER QUALITY CONSTRUCTION MONITORING

3.1 Overview

Based on the risks presented by construction activities, potential sources of groundwater impacts include:

- dewatering resulting in groundwater level decline, potential impact to groundwater resources and sensitive receptors
- changes to groundwater flow paths, by constructing below ground infrastructure that intersects the water table creating hydraulic barriers
- groundwater extraction by dewatering could impact groundwater quality
- dewatering could change groundwater quality by drawing saline groundwater towards the feature being dewatered which could impact sensitive receptors such as registered bores and GDEs
- changes to soil moisture content causing compression or settlement that could adversely impact infrastructure.
- degradation of water quality through the introduction of new contaminants or the migration of existing contaminate plumes within the aquifer
- reduction in groundwater recharge by the addition of additional hardstand areas or roofs where rainwater is directed to stormwater, locally reducing groundwater recharge and the water available for sensitive receptors, including GDEs.

Section 3.3 contains the parameters to be tested as part of this CGMP. Water quality criteria are identified in Section 3.4 and will be used to assess potential impacts on sensitive receiving environments.

Variation in physio-chemical parameters provides an indication of a change to overall water quality triggering the assigned performance criteria (Section 3.4) and further impact assessment.

3.2 Sampling location and frequency

Groundwater level and quality monitoring will be undertaken at eight sites, as identified in Section 2.2.2 and shown in Appendix B, where the EAD identified a greater than low risk rating potential to intersect or where significant excavation was proposed as part of the project scope. Groundwater sampling will continue to be undertaken at a monthly frequency during the construction phase or until works with the potential to impact groundwater are completed at the discrete location.

Additional groundwater investigations are currently in progress at other enhancement sites requiring excavations greater than 0.5m BGL where no potential groundwater interaction was identified by the EAD. In the event that the results show potential interaction with groundwater at these enhancement sites as a result of the project works, this monitoring program will be updated to include monitoring at any relevant sites.

3.3 Sampling parameters

Table 5 details the analytes that will be monitored during the construction phase groundwater monitoring. The parameters are selected to indicate if the project has potentially caused impact to groundwater quality due to construction activities. Groundwater gauging will also be conducted. Groundwater samples will be collected in appropriate laboratory supplied bottles and sent to a NATA accredited laboratory for analysis under the Chain of Custody process outlined in Section 4.6.

TABLE 5: GROUNDWATER MONITORING PARAMETERS

Category	Parameters
Physio-chemical parameters (field)	▪ Temperature ▪ Electrical conductivity ▪ Total dissolved solids ▪ pH ▪ Reduction-oxidation potential

Category	Parameters
Major anions and cations	▪ Calcium ▪ Magnesium ▪ Sodium ▪ Potassium ▪ Bicarbonate ▪ Carbonate ▪ Chloride ▪ Sulfate
Identified contaminants of concern that reflect the risk being monitored	▪ N/A

Groundwater quality analysis results will be assessed and compared to baseline conditions and the performance criteria described below.

3.4 Performance criteria

The key performance criteria (trigger values) for groundwater quality are discussed in the following section.

Trigger values comprising NEPM Groundwater investigation levels (GILs) and ANZECC (2000) / ANZG (2018) 95-99% species protection criteria have been adopted as the indicator values of the performance criteria for groundwater quality. Any changes in groundwater quality will be compared to these trigger values.

A reportable change in groundwater quality will be defined as:

- A parameter exceeding either NEPM GIL, ANZECC (2000) or ANZG (2018) 95% level of species protection over a sustained period (i.e. for at least three consecutive monitoring events, or
- A parameter increasing in concentration over a sustained period (i.e., for at least three consecutive monitoring events) to more than 2x the baseline trigger value, where the baseline trigger value exceeds the NEPM GIL value or ANZECC (2000) or ANZG (2018) values, or
- An increase of salinity (measured as total dissolved solids, TDS, monitored through continuous salinity data loggers) over a sustained period (i.e., for at least three, consecutive months) to more than 2x the recorded 95th percentile ANZECC (2000) or ANZG (2018) value prior to construction.

Once a reportable change for groundwater quality and/or salinity has been identified, statistical analysis (via Mann Kendall trend analysis or other means) will assess whether it is a significant change in groundwater quality. A minimum requirement of four monitoring events at each location is required for each parameter to apply the Mann Kendall trend analysis.

Where a significant trend in groundwater quality is identified (defined in Section 3.4), this will trigger a further desktop investigation. The objectives of the desktop investigation are to assess whether:

- The contaminant concentrations are likely to present a potential immediate risk to human health or the environment (e.g. concentration significantly exceeds site concentration maximums), or
- The contaminants have potentially been introduced to groundwater directly due to construction activities (e.g. TRH introduced from leaks or spills), or
- Contaminant migration is potentially occurring resulting in degradation of groundwater quality within and around sensitive receptors (including GDEs and registered groundwater supply bores)

The desktop investigation may include but not be limited to:

- Assessment of potential sources of contamination
- Comparison to existing site data
- Investigation of recent site activities (e.g. unexpected finds, incidents)
- Development of a contamination conceptual site model
- Assessment of contaminant migration pathways

Additional monitoring and management responses are to be undertaken in circumstances where the desktop review demonstrates that any of the above-mentioned scenarios are likely. The monitoring frequency will be reviewed to support management responses.

4 MONITORING METHODOLOGY / SAMPLING PROTOCOL

4.1 Overview

The adopted groundwater monitoring methodology for the Project is summarised below and detailed in the following sections.

- Groundwater levels will be monitored via manual gauging.
- The methodology of the groundwater quality monitoring will be dependent on the bore condition.
- Quality assurance and control processes will be implemented.
- All groundwater monitoring will be conducted by suitability qualified and experienced personnel.

Monthly groundwater monitoring should be conducted in the first week of the month to allow sufficient time to receive laboratory analytical results and prepare the monthly report to satisfy the reporting requirement to submit the report within five business days prior to the end of each month (Section 5.5).

4.2 Manual groundwater level measurements

Manual measurement of the standing groundwater levels will be conducted using an electronic groundwater level meter (dip meter) from a known (surveyed) point at the top of the bore casing. Measurements will be recorded to the nearest millimetre, in metres below the top of the casing (mbTOC). Data will be converted to mAHD. Data will be recorded in mBGL and mAHD. Monitoring frequency is summarised in Section 3.2.

4.3 Recording of field results

Results for each monitoring location will be recorded on appropriate field sheets (hard copy or digital) using unique sampling identification nomenclature consisting of the sample date, location, standing water level (mBGL), any comments regarding the condition of the monitoring well and sampler details.

4.4 Groundwater quality

4.4.1 Groundwater bore monitoring

Representative groundwater samples will be collected from selected bores prior to and during the construction phase. The method of sampling will be use of hydrasleeves. Groundwater samples will be collected in appropriate laboratory supplied bottles and sent to a NATA accredited laboratory for analysis under the Chain of Custody process outlined in Section 4.4.5. Samples collected for metals will be filtered onsite through a 45 micron filter.

4.4.2 Field measurements

Water quality parameters will be measured during groundwater quality sampling using a calibrated water quality meter. Water quality meter accuracy will be reviewed against known calibration standards daily and if needed, re-calibrated in accordance with the manufacturer's instructions. Records of review against calibration standards and any recalibration will be maintained. The water quality meter will monitor pH, electrical conductivity, redox conditions and temperature.

4.5 Decontamination

Sampling equipment will be cleaned (decontaminated) between each sample. Where a sample site shows evidence of contamination (i.e. a strong odour or sheen on the water) equipment will need to be cleaned thoroughly.

The following decontamination method will be followed:

- Rinse the equipment in tap water;
- Clean with De-Con 90 (a phosphate free detergent), or equivalent;
- Rinse again with tap water;
- Rinse three times with de-ionised water; and
- Allow to dry.

De-ionised and tap water will be available for decontaminating equipment in the field.

4.6 Quality assurance

Any sample to be sent to a laboratory will be subject to quality assurance protocols. Quality assurance and control protocols during sampling and recording of physio-chemical (field) parameters will be undertaken monthly (each sampling event) in

accordance with ANZECC/ARMCANZ (2000b) to ensure the integrity of the dataset. As part of the sampling program the following samples will be collected:

- Rinsate blanks (one per sampling event only);
- Interlaboratory duplicates (at a rate not less than 20 per cent of total samples);
- Intralaboratory duplicates (at a rate not less than 20 per cent of total samples);
- Trip blank and spike blank (one per batch), only if volatiles are being analysed.

Samples are to be transported to a National Association of Testing Authorities (NATA)-accredited laboratory under chain-of custody protocols in a container containing ice. The water samples are to be submitted to the laboratory within the holding time for each analyte. Field results will be checked for accuracy before leaving the site and errors or discrepancies will be cross-checked, and further investigation initiated if required. Monitoring and calibration records will be maintained in accordance with the appropriate standards. Trip and spike blanks will only be required if volatiles are included in the analytical suite.

5 COMPLIANCE MANAGEMENT

5.1 Roles, responsibility and training

The project's organisational structure and overall roles and responsibilities are outlined in Section 6.2 of the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in the Construction Soil and Water Management Plan (CSWMP).

All employees, contractors and utility staff working on site will undergo site induction and targeted training relating to groundwater management issues, detailed in the CSWMP. Further details regarding staff induction and training are outlined in Section 6 of the CEMP.

5.2 Monitoring and inspection

This Program details the monitoring requirements for groundwater. Additional soil and surface water inspection requirements (including weekly site inspections) are detailed in the CSWMP.

In accordance with Section 7.2 of the CEMP, the Martinus Rail Environmental and Sustainability Manager will be responsible for ensuring monitoring activities are undertaken.

Additional requirements and responsibilities in relation to inspections are documented in Section 7.1 of the CEMP.

5.3 Data analysis and management response

Results from the construction monitoring program will be compared with the criteria and with previous results.

Monthly monitoring results for groundwater quality will be compared against the project criteria and reported in the construction compliance monitoring reports. If a trigger exceedance is observed, a review will be initiated to assess the significance of the exceedance(s) and possible causes.

5.4 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this CGMP, CoA, and other relevant approvals, licenses and guidelines.

Audit requirements are detailed in Section 9.1 and 9.2 of the CEMP.

5.5 Reporting

During construction, groundwater quality data will be collected, tabulated and assessed against baseline conditions and performance criteria. Reporting requirements associated with this CGMP for the construction phase of the project are presented in Table 6.

TABLE 6: REPORTING REQUIREMENTS

Schedule	Requirements	Recipient (relevant authority)
Monthly Environmental Report (every month)	Monitoring program performance will be documented in the Monthly Environmental Report. Any incidents and key environmental issues will be documented. The Monthly Environmental Reports will be submitted within five business days prior to the end of each month, or as otherwise agreed to with IRPL	IRPL
Water Monitoring Reports (every six months)	Data summary reports presenting tabulated groundwater monitoring data collected during the reporting period. Water quality results will be presented and performance criteria exceedances will be highlighted. Applicable management responses will be documented. The Water Monitoring Reports will be submitted for information 60 days after the reporting period ends.	N/A

6 REVIEW AND IMPROVEMENT

6.1 Continuous improvement

Monitoring data will be reviewed throughout the construction period to provide potential requirements to increase, or decrease, the number of sampling locations and/or the analytical suites. The criteria will be reviewed for appropriateness following 12 months of construction monitoring. Alterations to criteria, monitoring locations, analytical suites, or frequencies will be reported in the Water Monitoring Reports.

Continuous improvement of this Program will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets, and the project performance outcomes of the EAD for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance;
- Determine the cause or causes of non-conformances and deficiencies;
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies;
- Verify the effectiveness of the corrective and preventative actions;
- Document any changes in procedures resulting from process improvement;
- Make comparisons with objectives and targets.

6.2 Update and amendment

The processes described in Section 10.4 of the CEMP may result in the need to update or revise this CGMP.

Revisions of this CGMP will be in accordance with the process outlined in Section 10.4 of the CEMP.

This CGMP, including any amendments, will be implemented throughout Stage B construction.

7 REFERENCES

Colquhoun, Hughes & Deyssing et al., 2019. Seamless Geology of NSW Dataset. Geological Survey of NSW. Department of Primary Industries and Regional Development, Maitland.

Hounslow, 1995; Water Quality Data. pp416, published by CRC Press.

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Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ, 2000a) (the ANZECC guidelines);

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Inland Rail – Albury to Illabo Environmental Impact Statement (ARTC, August 2022);

Albury to Illabo Response to Submissions (ARTC, November 2023);

Albury to Illabo Preferred Infrastructure Report (ARTC, November 2023);

Albury to Illabo Preferred Infrastructure Report Response to Submissions (ARTC, February 2024);

Inland Rail – Albury to Illabo (SSI-10055) Response to request for additional information – Air Quality Assessment (letter dated 1 May 2024);

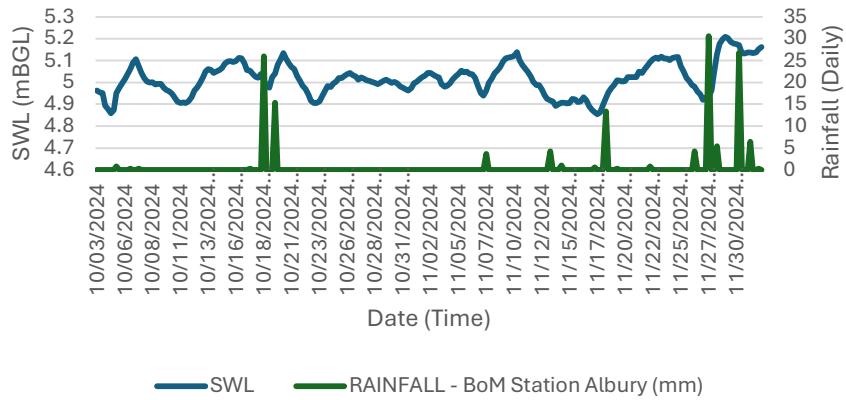
Part 1 - Revised Technical Paper 8: Biodiversity Development Assessment Report (WSP, February 2024);

Part 2 - Revised Technical Paper 8: Biodiversity Development Assessment Report (WSP, February 2024);

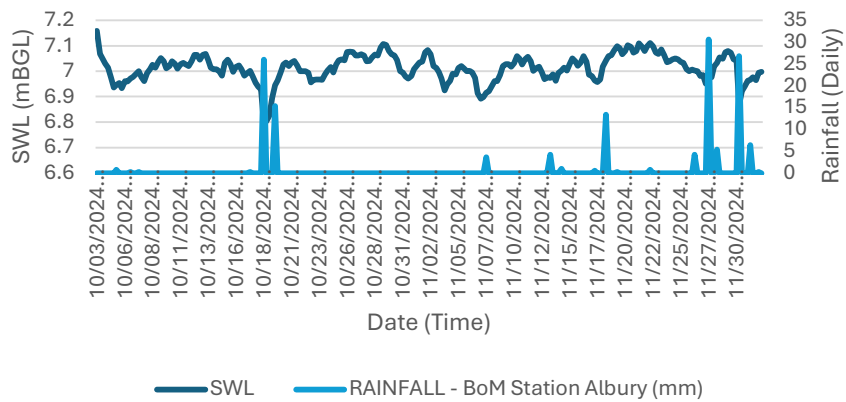
APPENDIX A

Rainfall and groundwater recharge correlation

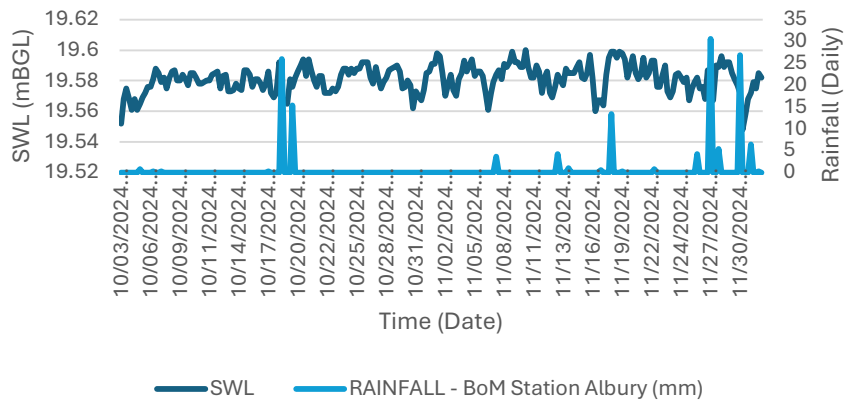
Albury Station Footbridge BH5703 SWL vs Rainfall Correlation



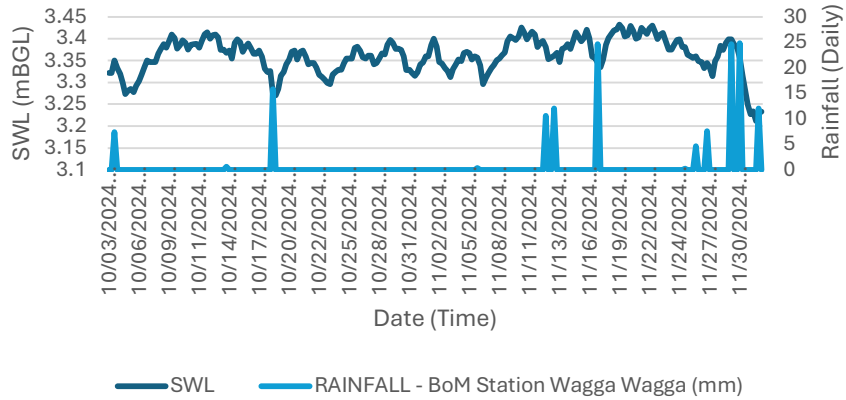
Riverina BH5601 SWL vs Rainfall Correlation



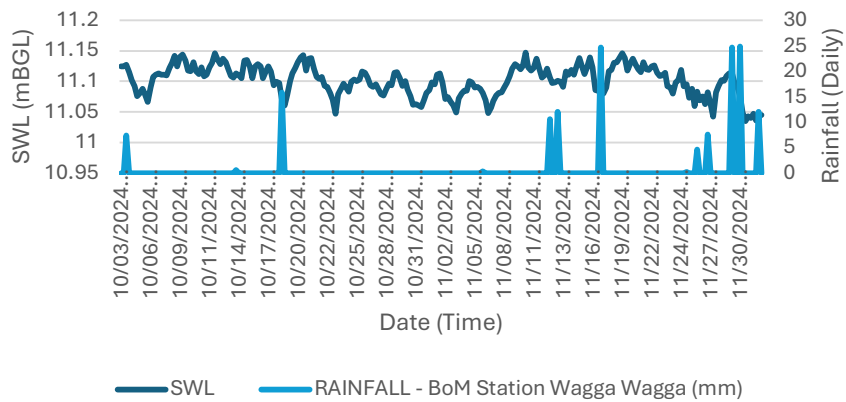
Billy Hughes TP5501 SWL vs Rainfall Correlation



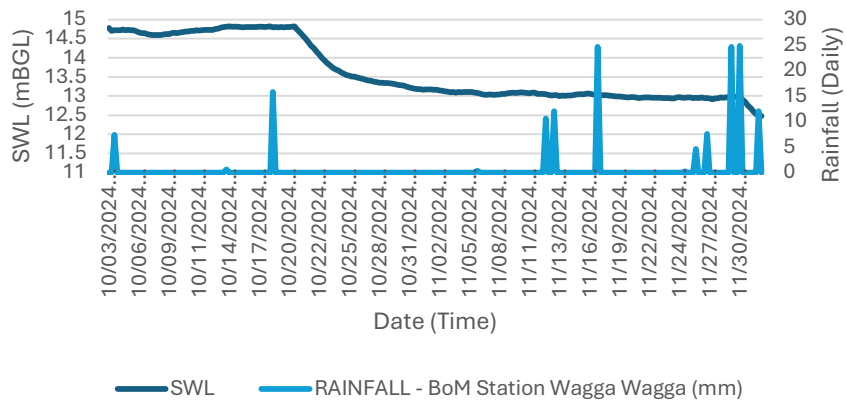
Pearson Street Bridge BH5401 SWL vs Rainfall Correlation



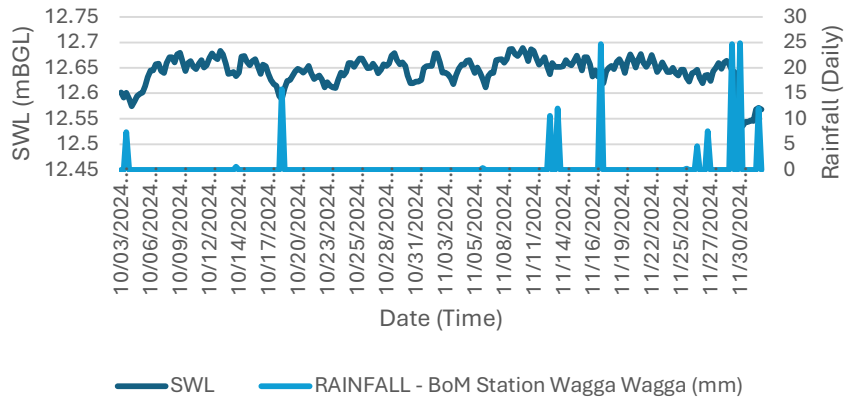
Cassidy Parade BH5201 SWL vs Rainfall Correlation



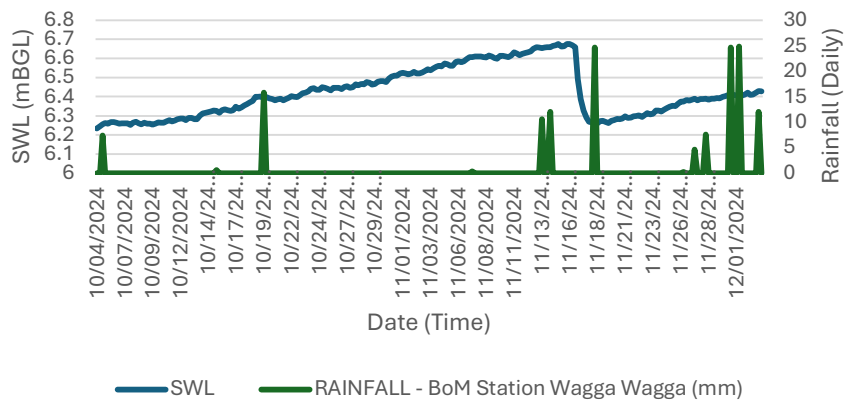
Edmondson Street Overbridge BH5304 SWL vs Rainfall Correlation



Wagga Wagga Footbridge BH5101 SWL vs Rainfall Correlation



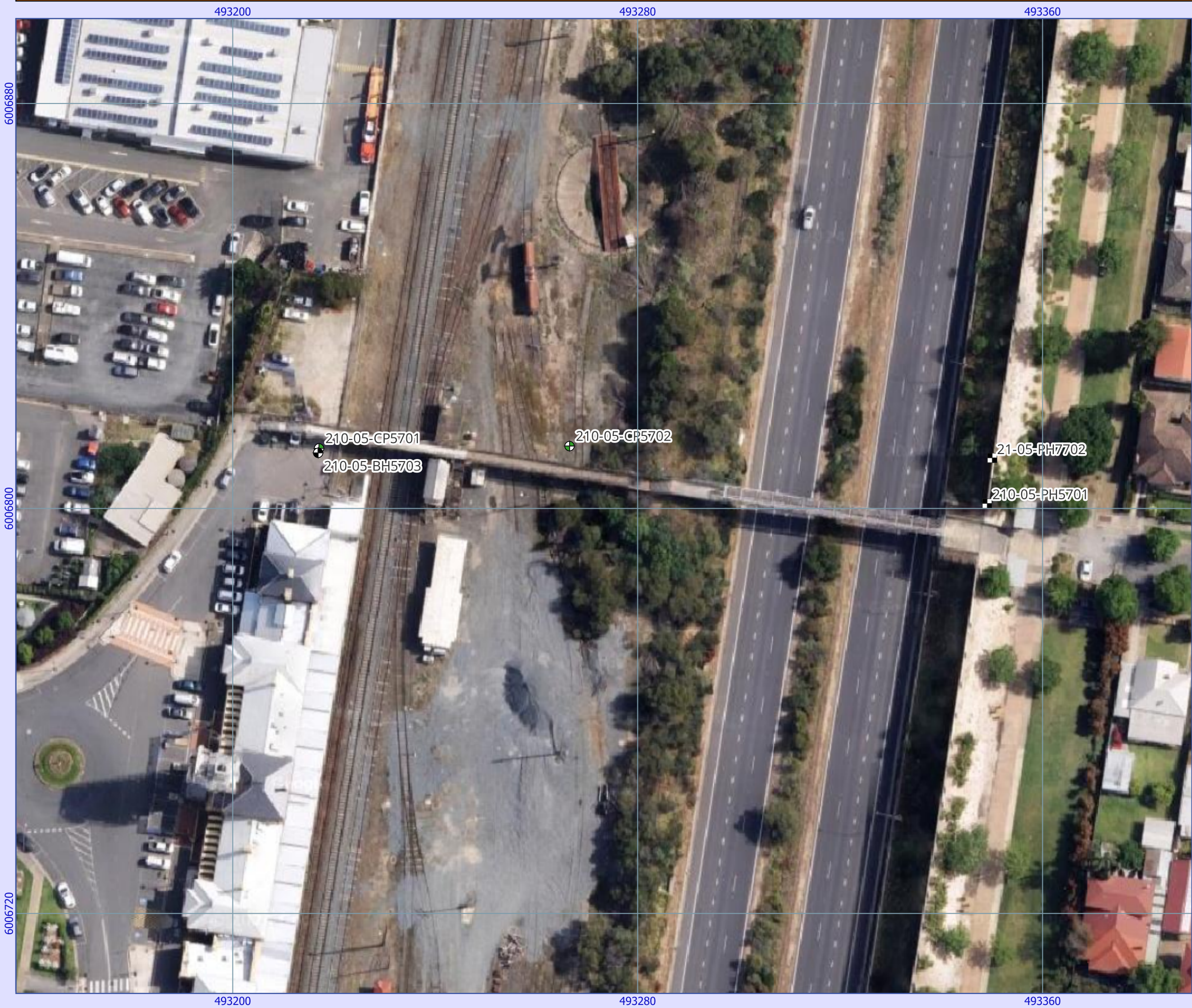
Kemp Street Bridge BH5007 SWL vs Rainfall Correlation



APPENDIX B

Groundwater monitoring locations

C-1859.00 A2P Inland Rail - Albury Station Footbridge - Investigation location Plan



- Legend**
- Approximate Borehole Location
 - Approximate CPT Location
 - Approximate Slot Trench Location

Project Number: C-1859.00
Project Title: A2P Inland Rail - Albury Station Footbridge
Figure Number: 1
Figure Title: Investigation Location Plan
Data Source:
https://maps.six.nsw.gov.au/arcgis/rest/services/public/NSW_Imagery/MapServer

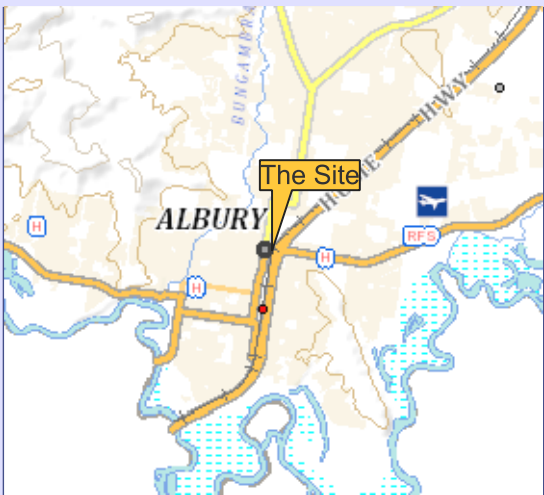
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Datum: MGA2020
Coordinate Unit: Metres
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D&N
Geotechnical

Company: D&N Geotechnical
Drawn: SC
Approved: AW
Original size: A3
Date Drawn: 06/05/2024
Client: Martinus Rail Pty Ltd

C-1859.00 A2P Inland Rail - Riverina Highway Bridge - Investigation Location Plan



Legend

- Approximate Borehole Location
- Approximate Slot trench Location

Project Number: C-1859.00
Project Title: A2P Inland Rail - Riverina Highway Bridge
Figure Number: 1
Figure Title: Investigation Location Plan

Data Source:
https://maps.six.nsw.gov.au/arcgis/rest/services/public/NSW_Imagery/MapServer

Cartographic Data and Orientation:

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Datum: MGA2020
Coordinate Unit: Metres
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D&N Geotechnical

Company: D&N Geotechnical
Drawn: DM
Approved: AW
Original size: A3
Date Drawn: 5/04/2024
Client: Martinus Rail Pty Ltd

C-1859.00 A2P Inland Rail - Billy Hughes Bridge - Investigation Location Plan



- Legend**
- Approximate Slot Trench Locations
 - Approximate Borehole Locations

Project Number: C-1859.00

Project Title: A2P Inland Rail - Billy Hughes Bridge

Figure Number: 1

Figure Title: Investigation Location Plan

Data Source:
2024 Google Sattelite Imagrey

Cartographic Data and Orientation:

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Datum: MGA2020
Coordinate Unit: Metres

0

30 m

D&N
Geotechnical

Company: D&N Geotechnical
Drawn: AW
Approved: LP
Original size: A3
Date Drawn: 01/10/2024
Client: Martinus Rail Pty Ltd

C-1859.00 A2P Inland Rail - Pearson Street Overbridge - Investigation Location Plan



Legend

- Approximate Borehole Location
- Approximate Slot Trench Location

Project Number: C-1859.00
Project Title: A2P Inland Rail - Pearson Street Overbridge
Figure Number: 1
Figure Title: Investigation Location Plan
Data Source:
https://maps.six.nsw.gov.au/arcgis/rest/services/public/NSW_Imagery/MapServer

Cartographic Data and Orientation:

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Datum: MGA2020
Coordinate Unit: Metres

0 20 m

D&N Geotechnical

Company: D&N Geotechnical
Drawn: SC
Approved: AW
Original size: A3
Date Drawn: 5/04/2024
Client: Martinus Rail Pty Ltd

C-1859.00 A2P Inland Rail - Cassidy Street Footbridge - Investigation Location Plan



Legend

- Approximate Borehole location

Project Number: C-1859.00

Project Title: A2P Inland Rail - Cassidy Street Footbridge

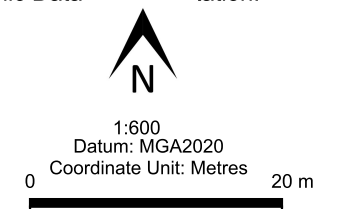
Figure Number: 1

Figure Title: Investigation Location Plan

Data Source:

https://maps.six.nsw.gov.au/arcgis/rest/services/public/NSW_Imagery/MapServer

Cartographic Data and Orientation:



Company: D&N Geotechnical
Drawn: DM
Approved: AW
Original size: A3
Date Drawn: 14/03/2024
Client: Martinus Rail Pty Ltd

C-1859.00 A2P Inland Rail | Edmondson Street Bridge | Investigation Location Plan



Legend
● Approximate Borehole Location

Project Number: C-1859.00
Project Title: A2P Inland Rail - Edmondson Street Bridge
Figure Number: 1
Figure Title: Investigation Location Plan
Data Source:
https://maps.six.nsw.gov.au/arcgis/rest/services/public/NSW_Imagery/MapServer

Cartographic Data and Orientation:

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Coordinate Unit: Metres 30 m



Company: D&N Geotechnical
Drawn: DM
Approved: AW
Original size: A3
Date Drawn: 22/05/2024
Client: Martinus Rail Pty Ltd

C-1859.00 A2P Inland Rail - Wagga Wagga Station Footbridge - Investigation Location Plan



- Legend**
- Approximate Borehole location

Project Number: C-1859.00
Project Title: A2P Inland Rail - Wagga Wagga Station Footbridge
Figure Number: 1
Figure Title: Investigation Location Plan
Data Source:
https://maps.six.nsw.gov.au/arcgis/rest/services/public/NSW_Imagery/MapServer

Cartographic Data and Orientation:

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Coordinate Unit: Metres


Company: D&N Geotechnical
Drawn: SC
Approved: AW
Original size: A3
Date Drawn: 12/03/2024
Client: Martinus Rail Pty Ltd

C-1859.00 A2P Inland Rail - Kemp Street Bridge - Investigation Location Plan

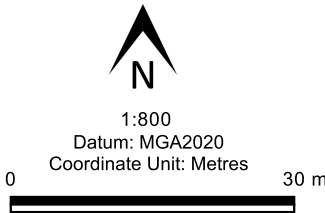


Legend

- Approximate Borehole Location
- Approximate Testpit Location

Project Number: C-1859.00
Project Title: A2P Inland Rail - Kemp Street Bridge
Figure Number: 1
Figure Title: Investigation Location Plan
Data Source:
https://maps.six.nsw.gov.au/arcgis/rest/services/public/NSW_Imagery/MapServer

Cartographic Data and Orientation:



Company: D&N Geotechnical
Drawn: DM
Approved: AW
Original size: A3
Date Drawn: 17/05/2024
Client: Martinus Rail Pty Ltd

C-1859.00 A2P Inland Rail - Pearson Street Overbridge - Investigation Location Plan



Legend

- Approximate Borehole Location
- Approximate Slot Trench Location

Project Number: C-1859.00
Project Title: A2P Inland Rail - Pearson Street Overbridge
Figure Number: 1
Figure Title: Investigation Location Plan
Data Source:
https://maps.six.nsw.gov.au/arcgis/rest/services/public/NSW_Imagery/MapServer

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D&N Geotechnical

Company: D&N Geotechnical
Drawn: SC
Approved: AW
Original size: A3
Date Drawn: 5/04/2024
Client: Martinus Rail Pty Ltd



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