

Application Form

Environmental Protection Act 1994

Site specific application for an EA for a Prescribed ERA

This is the approved form to make a site-specific application for an environmental authority (EA) under sections 124 and 125 of the Environmental Protection Act 1994 (EP Act) for an environmentally relevant activity (ERA) which is prescribed under section 19 of the EP Act.

For applications to the Department of the Environment, Tourism, Science and Innovation (the Department), you can apply through Online Services at: <https://business.qld.gov.au/running-business/environment/online-services>.

It is recommended that prior to making an application for a new environmental authority (EA) for an environmentally relevant activity (ERA), you read the information on what to provide with an application. This information is located on the Business Queensland website (formerly the Queensland Government's Business and Industry Portal) at www.business.qld.gov.au (use the search term "Environmental licence"). This website also has a diagnostic tool called the "forms and fees finder" which will help identify any fees and supporting information you need to make an application.

Only use this application form if you are applying for a new environmental authority (EA) where:

- ☒ All applicants are registered as suitable operators¹. A suitable operator is a person or a corporation assessed under section 318I of the EP Act as being suitable to carry out an ERA and is listed on the suitable operator register².
- ☒ The ERA/s being applied for do not form part of an ERA project under an existing EA.
- ☒ If more than one ERA is being applied for, the ERAs must be carried out as part of a single integrated operation:
 - the ERAs will be carried out under the day to day management of a single responsible individual (e.g. a site manager or operations manager); and
 - all of the ERAs are operationally interrelated, that is, the operation cannot function without all of the ERAs. Separate applications will need to be made for the ERAs that cannot be carried out as a single integrated operation; and
 - the ERA/s are, or will be, carried out at one or more places; and

¹ Your EA application must be refused if you are not a registered suitable operator when the application is decided. To become a registered suitable operator, apply using the form "Application to be a registered suitable operator - ESR/2015/1771" (available at www.qld.gov.au, using the publication number ESR/2015/1771 as a search term)).

² The register is available on the Queensland Government website at www.qld.gov.au, using the search term "suitable operator register".

- the places where the ERAs will be carried out are close enough to make the integrated day to day management of the activities feasible.
- ☒ The ERA/s being applied for are prescribed under section 19 of the *Environmental Protection Act 1994* (EP Act).
- ☒ The ERA/s being applied for do not require a development permit for a material change of use under the *Planning Act 2016*, unless an application for the required development permit has been made.
- ☒ The ERA/s being applied for do not require a State development area approval (SDA approval) under the *State Development and Public Works Organisation Act 1971*, unless an application for the required SDA approval has been made or a current SDA approval is in effect and has not lapsed.
- ☒ The application is not to dredge or extract more than 10,000 tonnes of material a year in the North Stradbroke Island region.

If you would like to have a pre-lodgement meeting:

- for intensive animal industry ERAs (prescribed ERAs 2, 3 and 4)—contact the Department of Primary Industries by email at livestockregulator@dpi.qld.gov.au.
- for any other ERA—please complete and lodge the form “Application for pre-lodgement services” (ESR/2015/1664³), prior to lodging this application for an environmental authority.

³ This application form is available at www.qld.gov.au, using the publication number ESR/2015/1664 as a search term.

The fields marked with an asterisk * are mandatory, if they are not completed then your application may be considered not properly made under section 128 of the *Environmental Protection Act 1994*.

1 Applicant details

To nominate a site or application contact for this application please provide details at Questions 14 and 15.

Is there more than one applicant? *	☒ No—provide applicant's details below. ☐ Yes—provide the principal applicant's details below and all other applicants' details in Attachment 1—"Joint applicants and appointment of principal applicant"	
Name - individual or contact person if applicant is a organisation* Oliver Broadhurst	Suitable Operator Reference Number* TBA - refer application submitted	
Organisation name, including any trading name (*if an organisation) Acciona Energy Oceania Construction Pty Ltd	ABN/ACN (*if an organisation) 85 164 011 723	
Residential or registered business address (not a post office box)* Level 8, 11 Eastern Road, South Melbourne, VIC, 3205	Phone* 0413 266 685	
Postal address (if same as above, write "AS ABOVE")* AS ABOVE	Facsimile	
Email* oliver.broadhurst@acciona.com	☐ Indicate if you want to receive correspondence via email	

1.1 Nomination of an agent for this application

I/we nominate the below agent to act on my/our behalf and to receive correspondence relating to this application.

Do you want to nominate an agent for this application?*	
☐ No → Go to Question 2 ☒ Yes → Complete the agent's details here.	
Name of agent – individual or contact person if agent is an organisation Adam James	
Organisation name, including trading name if an organisation Remote Water Treatment Services	ABN/ACN (if an organisation) 72 143 206 820
Postal address 52 Industry Place, Wynnum, QLD, 4178	Phone 0417 264 417
Email adam.james@remotewts.com.au	☐ Indicate if you do not want to receive correspondence via email

2 Details of the ERA(s) being applied for

Complete the table below by advising which ERA(s) you are applying for. If the ERA has eligibility criteria and standard conditions⁴, identify whether you can comply with them. Select "N/A" where there are no eligibility criteria and standard conditions for that ERA. If you cannot comply with all of the applicable standard conditions, select "no" and attach details of the standard conditions you cannot comply with.

ERA number*	Threshold*	Name of ERA*	I can comply with the eligibility criteria*	I can comply with all the standard conditions*
63	(b)(i)	Operating sewage treatment works, other than	☐ Yes ☒ N/A	☐ Yes ☒ No
		no release works, with a total daily peak design	☐ Yes ☐ N/A	☐ Yes ☐ No
		capacity of more than 100 but not more than	☐ Yes ☐ N/A	☐ Yes ☐ No
		1500 equivalent persons - where treated effluent	☐ Yes ☐ N/A	☐ Yes ☐ No
		is discharged from the works to an infiltration	☐ Yes ☐ N/A	☐ Yes ☐ No
		trench or through an irrigation scheme	☐ Yes ☐ N/A	☐ Yes ☐ No
			☐ Yes ☐ N/A	☐ Yes ☐ No
			☐ Yes ☐ N/A	☐ Yes ☐ No

☐ I have attached details of the standard conditions that I cannot comply with.

3 Description of land where the ERA/s will be carried out

Where activities will be undertaken at more than one location, provide details in Appendix 2.

Will the ERA(s) be carried out at a fixed location?*				
☒ Yes NOTE: If there is more than one location please complete Attachment 2	Number*	Street Name*	Suburb/Town*	Postcode*
	Real Property Description*		Specific area within the location ie GPS or other descriptor*	
	Lot 22 Plan BNT1041			
	Port (*if applicable)		Project Name (*if applicable)	
			Macintyre Wind Farm	
☐ No	Where there is no fixed location, the location will be recorded as "State of Queensland"			

4 Regulated waste transport ERA(s)

⁴ ERAs with eligibility criteria and standard conditions are listed at: www.business.qld.gov.au (use the search term "eligibility criteria").

Is your application for an ERA 57 Regulated waste transport?*	
☒ No	Go to question 5
☐ Yes	<p>What type of regulated waste will be transported?</p> <p>☐ Only end-of-life tyres. Go to question 5</p> <p>☐ Only other regulated waste. Provide vehicle details below.</p> <p>☐ Both end-of-life tyres and other regulated waste. Provide vehicle details below for the vehicles that transport regulated waste other than end-of-life tyres (i.e. do not provide details for vehicles used to transport only end-of-life tyres).</p>
<p>Provide details below or attach a separate list of the vehicles used for transporting regulated waste other than end-of-life tyres. If the vehicle registration details are not known at the time of application, please insert the number of vehicles and the letters TBA for "to be advised" in the first row (e.g. 5 vehicles TBA).</p> <p>The number of vehicles listed will determine the annual fee. The AES is 1 for each vehicle up to 35 vehicles, and 36 for 36 or more vehicles.</p>	
Type (trailer or vehicle)*	Registration number*

5 Details of contaminated land

Is there a site management plan in effect for contaminated land that relates to the land that is the subject of this application?*		
☒ No	Go to <i>Question 6</i> .	
☐ Yes	Description of land*	
	Lot and plan number(s)	Local Government Area*
	Lot	Plan
	Lot	Plan
	Lot	Plan
	Lot	Plan

6 Existing environmental authorities at the location

Do you have any existing environmental authorities at this location?*		
☐ No	Go to <i>Question 7</i> .	
☒ Yes	Existing EA number(s)*	Certification*
	EA0002882	☒ I certify that the ERA(s) being applied for do not form part of any existing environmental authority/ies

7 Other related approvals

To avoid the possibility of your environmental authority application being invalid, you need to ensure any other required applications have been made prior to lodging this application. If you are not sure what approvals are required you should contact the planning area of your local government authority or if the area is within a State development area, visit the Department of State Development, Infrastructure and Planning website at:

<http://www.statedevelopment.qld.gov.au> (search for state development area).

Are you required to obtain any of the following approvals to conduct the ERA(s)?*					
<ul style="list-style-type: none"> A development approval from your Local Government Authority (for ERA/s which may trigger within the local planning scheme the need for an approval under the <i>Planning Act 2016</i>), or An approval for the use of land under the <i>State Development and Public Works Organisation Act 1971</i>? 					
☒ No	Go to <i>Question 8</i>				
☐ Yes	Approval name*	Legislation*	Application number*	Date lodged*	Approval status*

8 Environmental offsets

An environmental offset, under the *Environmental Offsets Act 2014*, may be required for an ERA where, despite all reasonable measures to avoid and minimise impacts on certain environmental matters, there is still likely to be significant residual impact on one or more of those matters.

You must verify the presence, whether temporary or permanent, of those environmental matters. For more information refer to the Queensland Environmental Offsets Policy and the Significant Residual Impact Guideline at the Queensland Government website at www.qld.gov.au, using the search term "environmental offsets".

Will the ERA(s) being applied for result in a significant residual impact to a matter of State environmental significance (MSES)?*	
☒ No	Go to <i>Question 9</i> .
☐ Yes	<p>You must attach supporting information that:</p> <ol style="list-style-type: none"> Details the magnitude and duration of the likely significant residual impact on each prescribed environmental matter (other than matters of local environmental significance) for the entire activity; and Demonstrates that all reasonable measures to avoid and minimise impacts on each of those matters will be undertaken.

8.1 Notice of election

Has a notice of election been submitted to the administering authority, or is being submitted as part of this application?	
☐ No	Go to <i>Question 8.2</i> .
☐ Yes	☐ You can attach the notice of election, if it has not been submitted to the department. Go to <i>Question 8.3</i> .

8.2 Staged environmental offsets

Offset delivery can be staged, however for this to occur, the condition of any approved environmental authority needs to state that both the activity and the offset may be staged. As part of your notice of election for each stage under the *Environmental Offsets Act 2014*, you are required to provide a detailed assessment of the quantum of impact of that stage and the offset obligation requirement to be delivered for that stage.

Will the proposed ERA(s) and delivery of an environmental offset be undertaken in stages?	
☐ No	Go to <i>Question 8.3</i>
☐ Yes	You must attach supporting information that details of how the activity/activities are proposed to be staged.

8.3 Nature conservation environmental offset

Has another authority issued under the <i>Nature Conservation Act 1992</i> required an environmental offset for the same, or substantially the same, impact and the same, or substantially the same, MSES?	
☐ No	Go to <i>Question 8.4</i>
☐ Yes	Provide permit number:

8.4 Marine parks environmental offset

Has marine park permit issued under the <i>Marine Parks Act 2004</i> required an environmental offset for the same, or substantially the same, impact and the same, or substantially the same, MSES?	
☐ No	Go to <i>Question 9</i>
☐ Yes	☐ You must attach a copy of the marine park permit to this application.

9 Matters of national environmental significance

There are currently nine matters of national environmental significance (MNES) which have been defined in the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act). These are:

- world heritage properties
- national heritage places
- wetlands of international importance (listed under the Ramsar Convention)
- listed threatened species and ecological communities
- migratory species protected under international agreements
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mines)
- a water resource, in relation to coal seam gas development and large coal mining development

To determine whether the proposed ERA(s) will have a significant impact on MNES and for referral requirements, please refer to the guidance provided by the Federal Government's Department of Environment on www.environment.gov.au.

Would the carrying out of the proposed ERA(s) be likely to have a significant impact on a MNES?*	
☒ No	Go to <i>Question 10</i> .
☐ Yes	Has the proposal been referred to the Federal Department of Environment for formal assessment and approval? ☐ No → Go to <i>Question 10</i> . ☐ Yes → Go to <i>Question 9.1</i> .

9.1 EPBC Act approval for environmental offsets

Has an approval issued under the EPBC Act required an environmental offset for the same, or substantially the same, impact and the same, or substantially the same, MSES?	
☐ No	Go to <i>Question 10</i> .
☐ Yes	I have attached a copy of the approval under the EPBC Act. Are there any MNES which were assessed under the EPBC Act which are the same, or substantially the same as an MSES, but that were not conditioned in the approval? ☐ No → Go to <i>Question 10</i> ☐ Yes → List these MNES:

10 Environmental impact statement under the *State Development and Public Works Organisation Act 1971*

Certain stages of the EA application process may not apply if the proposed activities were assessed as part of a coordinated project declared under the *State Development and Public Works Organisation Act 1971* (State Development Act), you are only required to answer Questions 10 to 10.1 if you have a current Co-ordinator General's (CG's) evaluation report for the project.

Has an environmental impact statement (EIS) process under State Development Act been completed?*	
☒ No	Go to <i>Question 11</i> .
☐ Yes	What is the title and project name of the completed EIS?*
	☐ The EIS was completed for all activities that are the subject of this application. ☐ The environmental risks or the way the activity/activities are proposed to be carried out have not changed since the EIS was completed. ☐ The environmental risks or the way the activity/activities are proposed to be carried out have changed since the EIS was completed.
	☐ The EIS was not completed for all activities that are the subject of this application. ☐ The environmental risks or the way the activity/activities are proposed to be carried out have not changed since the EIS was completed. ☐ The environmental risks or the way the activity/activities are proposed to be carried out have changed since the EIS was completed.
	Was the EIS completed for all activities that are the subject of this application?*

	Please list the activities that were not included in the EIS or attach documentation with this information to this application:
	☐ I have attached the required supporting information.

10.1 Coordinator-General's conditions

Are there CG's conditions that relate to the ERA(s) being applied for?*	
☐ No →	Go to <i>Question 11</i> .
☐ Yes →	Name of the CG's evaluation report:

11 Assessment of the environmental impact

This question is **not applicable** if an EIS process under the State Development Act has been completed for all the ERA(s) that are the subject of this application and the environmental risks of the activities **and** the way they are proposed to be carried out has not changed since the EIS was completed.

This question may also not be applicable where the activity is proposed as a trial based on research technologies, to the extent that the information is not available.

You must attach to this application an assessment of the likely impact of each ERA on environmental values (*if applicable), including:

- a description of the environmental values likely to be affected by each relevant activity
 - details of any emissions or releases likely to be generated by each relevant activity
 - a description of the risk and likely magnitude of impacts on the environmental values
 - details of the management practices proposed to be implemented to prevent or minimise adverse impacts
 - details of how the land the subject of the application will be rehabilitated after each relevant activity ceases
- ☐ I have attached a complete assessment of the environmental impacts and specific supporting information.
For a trial: I have attached a partial assessment of the environmental impacts due to the activity being of a trial nature and included specific supporting information that demonstrates that the environmental activities are for the purpose of conducting research, or testing, technology or processes which are otherwise unknown.

12 Details of waste management

Describe the proposed measures for minimising and managing waste generated by the activity/ies below *

☒ I have attached the proposed measures.

13 Take effect date (when fees will commence being charged)

You may nominate when the EA will take effect should it be approved. The date the environmental authority takes effect will be the date from which you can commence the activities as well as the date your annual fees will commence to be charged (your anniversary date). Under section 200 of the EP Act, if a development permit for a material change of use under the *Planning Act 2016* or a State development area (SDA) approval is required in order to carry out the ERA the EA cannot take effect until the development permit or SDA approval takes effect (known as taking effect pending development approval).

Do you want the EA to take effect on the decision date, nominated date, or pending development approval?*	
☒ Decision date	The take effect date will be the date of the decision.
☐ Nominated date	Details of nominated take effect date:
☐ Pending development approval	The take effect date will be the day the development approval is granted. You must notify the administering authority when the development approval takes effect.

14 Term of the EA (for short term EAs for trial activities)

If you are applying for an EA that relates to new or emerging technologies and a complete assessment of the environmental impacts (section 11 above) was not provided, you must nominate a term for the short term EA for trial activities of no more than three years. Following this term the EA will expire. There is no ability to extend the term once set.

Nominate the EA term	
☐ Maximum 3 years	Expiry will be three years from the date of the decision.
☐ Nominated term	Details of the required term if less than 3 years:

☒ Not applicable	This application is not for a short term environmental authority for a trial activity
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15 Nomination of site contact

An alternative contact nominated by the legal person which holds, or will in future hold, a relevant authority issued by the department. The department may direct correspondence relating to actual or potential compliance matters to the site contact.

Do you want to nominate a site contact?*			☒ No ☐ Yes, provide details below
Title*	First Name*	Surname*	
Email Address*			☐ Indicate if you want to receive correspondence via email
Phone			

16 Nomination of application contact

An alternative contact nominated by the legal person which has submitted, or will in future submit, applications to be assessed by the department. All departmental correspondence relating to the assessment of applications will be directed to the application contact, however, if the application results in the issuing of a relevant authority, the relevant authority will be sent to the applicant.

Name or Position*
Primary Phone*
Secondary Phone
Email Address*

17 Payment of fees

You are required to pay an application fee at the time of application. If your application is approved you will be required to pay a fee annually. Each ERA has a regulated fee and the annual fee will be the highest annual fee of any ERA associated with the project. The first annual fee will be invoiced when the permit becomes effective. Information on fees is available on the Business Queensland website at www.business.qld.gov.au.

The application fee is*: \$3,299.02

Please select your payment method for the application fee below:

For fees payable to the Department of the Environment, Tourism, Science and Innovation:

Application Form

Site specific application for an EA for a Prescribed ERA

- ☐ For credit card payments for applications to the Department of the Environment, Tourism, Science and Innovation you must complete the application using Online Services at <https://business.qld.gov.au/running-business/environment/online-services>; or
- ☒ Email the completed application with a request to pay the application fee by Bpoint. Please do not email your credit card details – we will send you a link to pay securely by credit card via BPoint.

For fees payable to the Department of Primary Industries:

- ☐ Please contact me (the applicant) for credit card payment (Department of Primary Industries only):

Phone number:

18 Applicant declaration

I declare that the information I have provided is true and correct. I understand that it is an offence under the *Environmental Protection Act 1994* to give information that I know is false, misleading or incomplete.

I will comply with all conditions on my environmental authority as well as any relevant provisions in the *Environmental Protection Act 1994*.

I understand that I am responsible for managing the environmental impacts of these activities, and that approval of this application is not an endorsement by the administering authority of the effectiveness of the management practices proposed or implemented.

Applicant's full name*	Applicant's position*
Oliver Broadhurst	Senior Manager, Commercial
Applicant's signature*	Date*
<i>Oliver Broadhurst</i>	22/05/2026

Submit your completed application:

for ERA 2, ERA 3 or ERA 4 via email to livestockregulator@dpi.qld.gov.au or:

Post:

Senior Environmental Scientist
Department of Primary Industries
GPO Box 102
TOOWOOMBA QLD 4350

Further information:

www.business.qld.gov.au
Email:
livestockregulator@dpi.qld.gov.au
Phone: 13 25 23
Fax: (07) 4529-9233

for all other ERAs via email to palm@detsi.qld.gov.au or:

Post:

Permit and Licence Management
Department of the Environment,
Tourism, Science and Innovation
GPO Box 2454
BRISBANE QLD 4001

Further information:

www.business.qld.gov.au
Email: palm@detsi.qld.gov.au
Phone: 13 QGOV (13 74 68)

Privacy statement

The Department of the Environment, Tourism, Science and Innovation (the department) and the Department of Primary Industries are collecting the information on this form in accordance with and as authorised by Chapter 5 of the Environmental Protection Act 1994 (EP Act).

Pursuant to section 540 of the EP Act, the Department is required to maintain a register of certain documents and information authorised under the EP Act. A copy of this document will be kept on the public register. The register is available for inspection by members of the public who are able to take extracts, or copies of the documents from the register. Documents that are required to be kept on the register are published in their entirety, unless alteration is required by the EP Act. There is no general discretion allowing the Department to withhold documents or information required to be kept on the public register. For more information on the Department's public register, search 'public register' at www.qld.gov.au. For queries about privacy matters please email privacy@detsi.qld.gov.au or telephone 13 74 68.

Attachment 1**Joint applicants and appointment of principal applicant**

We are joint applicants for this environmental authority application and hereby appoint _____ as the principal applicant to receive statutory documents relating to this application.

Name - individual or contact person if applicant is an organisation*	Suitable Operator Reference Number*
Organisation name, including trading name (*if an organisation)	ABN/ACN (*if an organisation)
Residential or registered business address (not a post office box)*	Phone*
Postal address (if same as above, state "AS ABOVE") *	Facsimile
Email*	☐ Indicate if you want to receive correspondence via email
Signature*	Date*

Name - individual or contact person if applicant is an organisation*	Suitable Operator Reference Number*
Organisation name including trading name (*if an organisation)	ABN/ACN (*if an organisation)
Residential or registered business address (not a post office box)*	Phone*
Postal address (if same as above, state "AS ABOVE") *	Facsimile
Email*	☐ Indicate if you want to receive correspondence via email
Signature*	Date*

Name - individual or contact person if applicant is an organisation*	Suitable Operator Reference Number*
Business name including trading name (*if an organisation)	ABN/ACN (*if an organisation)
Residential or registered business address (not a post office box)*	Phone*
Postal address (if same as above, state "AS ABOVE") *	Facsimile
Email*	☐ Indicate if you want to receive correspondence via email
Signature*	Date*

Attachment 2

List of locations where the ERA(s) will be carried out.

Where there is more than one location list all locations and which ERA(s) will be conducted at each location.

Number*	Street Name*	Suburb/Town*	Postcode*	ERA/s*
Real Property Description*		Specific area within the location ie GPS or other descriptor (*if applicable e.g. dredging)		
Lot	Plan			

Number*	Street Name*	Suburb/Town*	Postcode*	ERA/s*
Real Property Description*		Specific area within the location ie GPS or other descriptor (*if applicable e.g. dredging)		
Lot	Plan			

Number*	Street Name*	Suburb/Town*	Postcode*	ERA/s*
Real Property Description*		Specific area within the location ie GPS or other descriptor (*if applicable e.g. dredging)		
Lot	Plan			

Number*	Street Name*	Suburb/Town*	Postcode*	ERA/s*
Real Property Description*		Specific area within the location ie GPS or other descriptor (*if applicable e.g. dredging)		
Lot	Plan			

Number*	Street Name*	Suburb/Town*	Postcode*	ERA/s*
Real Property Description*		Specific area within the location ie GPS or other descriptor (*if applicable e.g. dredging)		
Lot	Plan			

Number*	Street Name*	Suburb/Town*	Postcode*	ERA/s*
Real Property Description*		Specific area within the location ie GPS or other descriptor (*if applicable e.g. dredging)		
Lot	Plan			

Number*	Street Name*	Suburb/Town*	Postcode*	ERA/s*
Real Property Description*		Specific area within the location ie GPS or other descriptor (*if applicable e.g. dredging)		
Lot	Plan			

100KL MBR WWTP AND EFFLUENT REUSE SYSTEM

Remote Water Treatment Services
McIntyre Wind Farm
Ausco Accommodation Facility

DESIGN CERTIFICATION

REVISION	DATE	AUTHOR	DESCRIPTION	CHECKED	APPROVED
A	08/2/2022	Adam James	Issued for review		



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2 PROJECT INFORMATION

CLIENT INFORMATION	
Name	Jamie Smith
Company	Ausco Modular
Date	08/02/2022
Position	Project Lead Ausco Modular - McIntyre Wind Farm Accommodation Village
Phone	0431 607 884
Email	Jamie.Smith@ausco.com.au

PROJECT INFORMATION	
Project Name	McIntyre Wind Farm Energy Project
Client	Acciona Energy
Client Representative	Laura Cleary – 0474 192 719
Location	Acciona Energy Level 5, 15 Green Square Close, Fortitude Valley Brisbane QLD
	McIntyre Wind Farm Project 40 klms west of Warwick and 70 klms south of Toowoomba. Queensland
RWTS Internal Job No.	RWTS-TBA
Contract No.	TBA
Production Volume	125,000 litres per per day Maximum
Assembly	Biological Waste Water Treatment System MBR MLE

3 DESIGN CERTIFICATION INFORMATION

PROJECT:	McIntyre Wind Farm Project
ADDRESS:	40 klms west of Warwick and 70 klms south of Toowoomba - Queensland
CLIENT:	Ausco Modular Pty Ltd
PRINCIPAL:	Accionia Energy Australia
CONTRACT No:	TBA
SCOPE OF WORK:	Containerised Sewage Treatment System Fabricated sewage treatment plant Poly water storage tanks for Balance, Treated Effluent and Chlorine Contact

The water treatment packaged has been constructed by / factory rebuilt and tested by Remote Water Treatment Services Pty Ltd, 186 New Cleveland Rd, Tingalpa 4173, ABN: 72 143 206 820.

Remote Water Treatment Service Pty Ltd (RWTS) hereby certify that the Biological Waste Water Treatment System has been designed for site specific operating conditions for the McIntyre Wind Farm Project – and hereby certify that the system has been designed to provide the quality of effluent as set out further in this documentation.

This certificate certifies that all items listed below comply with the equipment and workmanship requirements of the RWTS engagement order including standard specification.

- AS1547:2012 - On-site domestic Wastewater Management – Accepted by RWTS
- AS1546.3:2017 - On-site domestic Wastewater Treatment Plants – Accepted by RWTS
- AS1170 - Structural Design for steel fabricated reactors
- AS4020:2002 & AS2070 - Poly tank material for food contact
- AS4766:2006 - Tank manufacturing guidelines
- AS3500.2:2015 Plumbing – Sanitary signed off on by QLD contracted plumber
- AS1657:2013 – Ladders and Platforms
- AS3990 – Mechanical Equipment – Steel work

4 GENERAL PROJECT OVERVIEW

4.1 PROJECT DESCRIPTION OVERVIEW – MCINTYRE WIND FARM PROJECT - RENEWABLE ENERGY SUPPLY

The MacIntyre Wind Farm Precinct is located approximately 40km west of the township of Warwick and 70km south west of Toowoomba, as shown in Figure 1. The region is predominantly rural land and used for stock grazing. The wind turbines and ancillary buildings are located within the Southern Downs Regional and Goondiwindi Regional and the 64 km of overhead transmission line will be located across Goondiwindi and Toowoomba Regional Councils.

Figure 1 – Project Location



The Project will include the construction and operation of a two independent wind farms within the MacIntyre Wind Farm Precinct as follows:

the **Karara Wind Farm**, comprising 18 Nordex N163 5.7MW wind turbines with a hub height of 148 meters with a total power generation name plate capacity of 102.6MW; and

the **MacIntyre Wind Farm**, comprising 162 Nordex N163 5.7MW wind turbines with a hub height of 148 meters and a total power generation name plate capacity of 923.4MW.

Site map and relevant drawings

The MIWF project Camp is located approximately 8.4km south along Carbean Rd from the Cunningham Hwy/Carbean Rd Intersection. The site is located on private property within the Goondiwindi Regional Council Local Government area. Figure 2 below, details the location of the MIWF Camp.

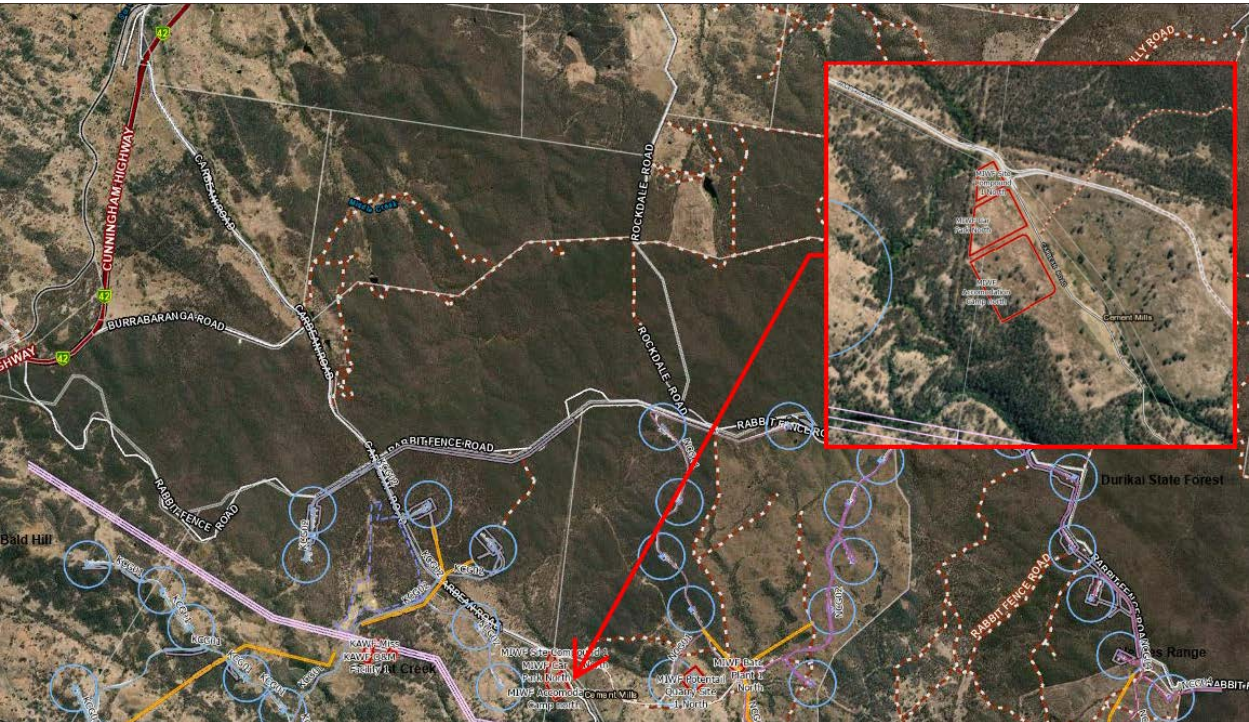


Figure 2

Location of the Works

The below **Table 1** outlines the new Wastewater Treatment Facility Characteristics Summary

Location	McIntyre Wind Farm Accommodation Village
	As per the above location description
	Queensland - Australia
Maximum Throughput	Maximum throughput capacity of the sewage treatment facility – 125,000 L/day Maximum Total Wastewater available for reuse – 125,000 litres per day
Storage Tanks	4 x 50,000 litre Raw Sewage Storage Tanks, 1 x 20,000 litre Waste Sludge Storage Tank, 4 x 50,000 litre poly Treated Effluent Storage Tanks – interconnected to allow for backup storage. (Tanks will be staged and installed as the site manning increases in stages.
Maximum Irrigation Area	Not Applicable – Construction Reuse for soil conditioning and dust suppression
Key Nutrient Outputs	BOD < 20 mg/l

	Total N < 30 mg/l
	Total P < 8 mg/l
	Suspended Solids < 10 mg/l
	E-Coli/Coliform < 10 cfu/100 ml (Non detectable)
	Ph 6.5 – 8.5

The peak daily inflow to the system is 500 persons @ 250 litres per person per day peak allowance - 125,000 ltrs. As a result – the system has a maximum design EP of 500 persons @ 250 litres per person per day.

	Raw Influent	Treated Effluent Required
ADWF (m ³ /day)	75 m ³	125 m ³ Max Flow -
BOD (mg/L)	300	<20
SS (mg/L)	300	<30
Total N (mg/L)	80	<30
Total P (mg/L)	20	<8
Coliforms (units/100 mL) -	-	<10 (Non detectable)
Ph	6.5 – 8.5	6.5 – 8.5

As a result, the following design loads are to be used for the site:

Design daily loads	BOD = 125,000 ltrs x 300 mg/l = 37.5 kgs/day BOD
	Total Ammonia Nitrogen = 10.00 kgs
	Total Phosphorous = 2.5 kgs
	Suspended Solids = 37.5 kgs
	Daily Peak Hydraulic Load Max = 125,000 litres

Average daily loads are expected to be approximately 70% of the above designed requirement for the system (87,500 litres per day –per day maximum based on current occupancy modelling during the construction phase and the maximum available site accommodation of 480 rooms installed).

5 WASTE WATER SYSTEM OVERVIEW

From the standpoint of sources of generation, wastewater may be defined as a combination of the liquid or water-carried wastes removed from residences, institutions, and other establishments.

If untreated waste is allowed to accumulate, the decomposition of the organic materials it contains can lead to the production of large quantities of foul-smelling gases. In addition, untreated wastewater usually contains numerous pathogenic or disease-causing organisms, micro-organisms that dwell in the human intestinal tract. Wastewater also contains nutrients, which can stimulate the growth of aquatic plants and it may contain toxic compounds. For these reasons, the immediate and nuisance-free removal of wastewater from its sources of generation, followed by treatment and disposal is not only desirable but also necessary in any society.

5.1 WASTE WATER CHARACTERISTICS

The important contaminants of concern in wastewater treatment are listed in Table 2.

Table 2.1 - Important contaminants of concern in waste water treatment

Contaminants	Reason for Importance
Suspended Solids	Suspended solids can lead to the development of sludge deposits and anaerobic conditions when untreated wastewater is discharged into the aquatic and land based environment. Example: faeces, dirt, and grit.
Biodegradable organics	If discharged untreated to the environment, their biological stabilisation can lead to the depletion of natural oxygen resources (which can kill animal life) and to the development of septic (unsanitary and noxious) conditions. Biodegradable organics are measured most commonly in terms of BOD (Biochemical Oxygen Demand). Example: carbohydrates, proteins, fats.
Pathogens	Communicable diseases can be transmitted by the pathogenic organisms in wastewater. Example: Hepatitis A, Giardia, and Cryptosporidium.
Nutrients	Both nitrogen and phosphorous, along with carbon and alkalinity, are essential nutrients for growth. When discharged to the aquatic environment, these nutrients can lead to the growth of undesirable aquatic life resulting in ecological changes. When discharged in excessive amounts on land, they can also lead to the pollution of groundwater.

The composition and quantity of wastewater produced will vary depending on the nature of the facilities, number of persons using the facilities, upstream management and the local environmental conditions. Typical compositions of domestic wastewater are presented in Table 2.2.

Table 2.2 Typical domestic untreated wastewater composition

Contaminants	Concentration		
	Weak	Medium	Strong
Suspended Solids (mg/L)	100	200	400
Chemical Oxygen Demand (mg/L)	250	500	900
Biochemical Oxygen Demand (mg/L)	110	250	400
Nitrogen (Total as N) (mg/L)	20	60	90
Organic N (mg/L)	8	15	35
Free Ammonia (mg/L)	20	50	80
Nitrites (mg/L) & Nitrates (mg/L)	0	0	0
Phosphorous (Total) (mg/L)	5	10	20
Chlorides (mg/L)	30	100	400
Sulphate (mg/L)	20	30	50
Alkalinity as CaCO₃ (mg/L)	50	200	300
Grease (mg/L)	2	5	15
Total Coliform (orgs/100mL)	10 ⁶ -10 ⁷	10 ⁷ -10 ⁸	10 ⁷ -10 ⁹

6 PLANT DESIGN PERFORMANCE SPECIFICATIONS

6.1 BASIS FOR DESIGN

When designing a wastewater treatment system, hydraulic and organic loadings must be fixed as a basis for design. The wastewater treatment system is then sized according to this basis and the effluent standard requirements. This Sewage Treatment Plant has been designed in this manner. Failure to observe the hydraulic and organic loadings may result in the discharge of effluent that does not meet the required standards. If the loadings are not exceeded (and upstream management and servicing procedures are adequate) the treatment plant will produce a high quality secondary treated effluent.

Table 3.1 presents the effluent quality that can be expected from the Sewage Treatment Plant if the influent loadings are not exceeded. The treatment plant is designed for specific influent concentrations. The influent concentrations relative to the hydraulic load for design are proportional, meaning the influent concentrations can be higher, if the hydraulic load is lower. The system will need to be tuned to the site concentrations experienced. These influent characteristics are detailed in the table below.

Characteristic	Influent	Desired Effluent Quality
PDWF ¹ (m ³ /day)	125 m3 Max Flow	-
BOD (mg/L)	300	<20
SS (mg/L)	300	<10
Total N (mg/L)	80	<30
NH ₃ – N (mg/L)	60	-
Total P (mg/L)	20	<8
Faecal Coliforms (units/100 mL)	-	<10 (Non detectable)

6.2 TANKS & SIZING

Tank Description	Function	Capacity L x W x H
Balance Tanks	Helps with high peak flow periods. Delivers primary treated effluent to the SBR flow balance/decant pump.	D: TBC Capacity: 4 x 50,000 L
Waste Activated Sludge Tank	Waste Solids Storage Tank to assist in managing MLSS levels and system biological sludge age	D: INTERNAL PLANT Capacity: 1 x 20,000 L
Process Reactor (MBR), Anoxic, Aerobic and Plant Room	Aeration, Anoxic, MOS, Digester. Treats effluent with a combination of aeration and mixing schedules controlled via the PLC an air delivery system adds the oxygen and then mixes the process area for nitrogen conversion	Overall D: 12000 L x 3000 H x 2400 W Nominal Usable MBR Process Area Capacity: 150,000 L
Final Effluent/Chlorine Contact Tanks	Treated effluent is received and blended with Reverse Osmosis Brine - and disinfected with Sodium Hypochlorite via chlorine dosing system and stored within the 4 storage tanks before being controlled discharged to irrigation.	D: TBA (External Poly Tank) Capacity: 4 x 50,000 L

7 TREATMENT PROCESS OVERVIEW

The plant process design offered is a Modified Ludzack-Ettinger (MLE) process with MBR membrane polishing and disinfection using liquid chlorine to achieve the required pathogen Log reduction for Class A recycled water.

The treatment process is arranged in an MBR (Membrane Bioreactor) configuration consisting of an anoxic stage, screening and balance tank front end. The MBR Process features a combined anoxic/aerobic biological suspended growth treatment process. This relies on bacterial action to achieve the following:

- Coagulate and remove the non-settle able colloidal solids and carbonaceous organic matter
- Convert the colloidal and dissolved carbonaceous organic matter into various gases and cell mass
- Reduce the nutrients such as nitrogen and phosphorus and other trace organic compounds

7.1 ANOXIC DEGRADATION

The anoxic phase is designed to provide:

- Combined unheated but mixed Anoxic degradation / digestion
- Sludge storage in suspension
- De-Nitrification

7.2 DEGRADATION MECHANISM

Anoxic digestion is the process whereby which anoxic organisms use oxidised inorganic compounds such as nitrate and nitrite as electron acceptors instead of oxygen in the respiratory metabolism to convert the colloidal and carbonaceous organic matter into gases and cell tissue.

The equation provides a simplified representation of the decomposition process.

Complex Organic and Inorganic Compounds = > Energy + Waste Products

Energy is derived from the biochemical decomposition of the complex organic and inorganic molecules in processes similar to the way animals obtain energy from food. The energy is used for cell growth, maintenance and reproduction.

The waste products of these processes may be either gases (e.g. CO₂ or CH₄) or metabolic end products (e.g. alcohols and organic acids). The gases escape from the system and the soluble waste products are further degraded in subsequent treatment units.

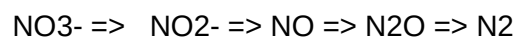
The nitrate used in respiration will be reduced to nitrite and then to nitrogen gaseous forms, including N₂ or N₂O: this anaerobic respiration process is referred to as denitrification.

Denitrification is performed by denitrifying bacteria, which are facultative aerobes (i.e. aerobic bacteria also capable of utilising oxidised nitrogen compounds e.g. nitrate in place of oxygen as electron acceptor in the respiration).

The bacteria use the carbon contained in the organic matter and the oxygen available from the nitrate to decompose organic matter. Under normal aerobic conditions, these bacteria will respire by aerobic respiration using oxygen. When the oxygen source is depleted, they will respire by anoxic respiration using nitrate as the electron acceptor.

BOD reduction is essential to maintain the efficiency of the subsequent nitrification process; Nitrate conversion to gaseous compounds (nitric oxide, nitrous oxide and N₂) in the overall nutrient removal process.

Via the internal recycles of the process, nitrate produced by nitrification in the aerobic phase is recycled to the anoxic phase to result in denitrification. Prior to being converted to nitrogen gas (N₂), nitrate undergoes a series of transformations shown under the following chemically simplified equation:



The denitrification process is governed by a number of factors such as the amount of dissolved oxygen, available carbon, available alkalinity/pH and temperature. The gaseous nitrogen products escape to the atmosphere and are therefore removed from the treated wastewater (final effluent).

The efficiency of the denitrification process is further governed by the supply of a good carbon source, which originates primarily from the incoming raw sewage supplied to the anoxic reactor, and to some extent also contained in the sludge recycled back from the aerobic phase through to the anoxic phase.

7.3 MIXED LIQUOR SUSPENDED SOLIDS

Even though the volume of solid material being deposited is being reduced continually by anoxic or aerobic respiration (decomposition), a net increase of solids in suspension will always occur in an activated sludge system that is fed raw sewage due to the accumulation of non-biodegradable solids originating from the sewage as well as the net production of biomass originating from bacterial growth processes. If sludge is wasted from the system (as waste activated sludge), at steady state the inventory (concentration) of mixed liquor solids in suspension in the system will be constant. The mass of sludge wasted will be equal to the production due to processes of bacterial growth or accumulation of non-biodegradable organic matter. The system operator will need to tune the WAS system to achieve steady state inventory, based on the influent quality and system performance.

7.4 AEROBIC PROCESSES

Aerobic growth and digestion takes place in the Aerobic stage and consists of the conversion of organic matter by aerobic microorganisms to new cell mass (biomass), followed by a series of death and cell regeneration processes sometimes called aerobic digestion.

The bacteria oxidize only a portion of the original waste stream (maximum net amount of 80%) introduced into the reactor into low-energy compounds such as nitrate, sulphate, carbon dioxide and water and through this will release energy to synthesize the remainder of the organic matter into new cellular material (biomass).

The cells produced (along with accumulated non-biodegradable organic material, collectively named the 'biomass') is settled out during the settle/decant phase of the system operation - and is recycled back through the bioreactor upon restart of the next batch treatment to reseed the process with active organisms and to maintain a desired mixed liquor solids concentration. The mixture of old and new synthesized cellular material must be managed by the system operator in order to allow stable and efficient settling of this material based on a suitable sludge age and biomass performance.

The bacterial re-seeding of the process allows the continuous degradation of organic compounds (carbonaceous organic matter) fed to the process as raw sewage.

Simultaneously with the aerobic degradation of organic compounds, specific bacteria named "nitrifying bacteria" will convert ammonia into nitrate (or sometimes small amounts of nitrite - that forms nitrogen as part of the overall nitrogen removal process). This conversion process is referred to as nitrification.

Nitrification consists of converting the ammonia present in the incoming sewage to nitrate. This conversion is represented by the following:



The conversion of nitrite to nitrate occurs so rapidly that nitrite is usually non-detectable in the overall process. Low concentrations may be detected when part of the nitrification pathway is blocked (typically under conditions of low dissolved oxygen or low pH/ low wastewater alkalinity).

Degradation occurs under aerobic conditions (presence of oxygen). The efficiency of the process is highly dependent upon the BOD load, available amount of dissolved oxygen and pH. A high or low BOD load will reduce the nitrification efficiency since the nitrifying bacteria are slower growing and cannot easily compete for available oxygen supply conditions with bacteria oxidising carbonaceous (organic or BOD) compounds.

Optimum aerobic conditions required for successful aerobic digestion and nitrification are maintained by the use of dissolved air introduction in the aerobic tank, this air introduction system also provides the minimum mixing intensity required to keep the bacterial culture and all other compounds contained within the reactor in suspension.

7.5 MBR MEMBRANE FILTRATION SYSTEM

MBR membrane filtration is an advanced wastewater treatment technology using submerged membranes to extract liquid from an activated sludge treatment system. The Membrane Bioreactor (MBR) process replaces the secondary clarifiers and/or typically used in conventional waste treatment methods for solid/liquid separation. Unlike secondary clarifiers, however, the treated water quality is not dependent on the mixed liquor suspended solids concentration, or the settling characteristics of those solids. In fact, MBR systems can operate at much higher mixed liquor suspended solids (MLSS) concentrations than conventional activated sludge systems. This also results in dramatically reduced plant bioreactor volumes and overall system footprint as well as providing a larger range of flexibility in the overall operation of the system. The membrane system and overall STP design we propose can operate with an MLSS as low as 6000 mg/l (to allow for lower incoming load periods) all the way up to 12,000 mg/l to accommodate maximum design loadings needed. The target system design proposed for this STP is designed at an MLSS operational level of 8,000 mg/l to 9,000 mg/l – providing a suitable upper and lower adjustment at the target design.

For this packaged plant, there is a Stand Alone MOS (Membrane Operating System). A MOS typically incorporates one or more Membrane filtration cells located adjacent to or within the biological treatment system. The use of a separate MOS tank for the Membrane filtration modules provides a number of benefits, including;

- A controlled membrane environment
- Positive fluid transfer of mixed liquor through the membrane filtration modules and uniform distribution of flow and of solids (MLSS)
- Independent optimisation of biological and membrane processes

- A clean in place (CIP) system that allows chemical cleaning without membrane removal, providing safer operation and reduced downtime
- Separation of biological processes from chemical cleaning systems

The MOS for this plant will include the following;

- One MOS tanks will be installed. The MOS tank is a rectangular tank located inside the fabricated epoxy coated steel shell bioreactor vessel, in which membrane 'cell or cells' are fitted. The MOS tank shall hold Membrane Filtration modules totalling 600m² and has manifolds to collect filtrate and distribute low pressure air. The membranes are Hydranautics HSMM200-ES modules with a nominal membrane pores size of 0.05µm.
- An aeration system which continuously supplies low pressure air to the membrane filtration modules in the MOS tank. The MOS shall utilise the main aeration roots blower for air scour on the membrane cells.
- A Filtrate pump, which draws filtered liquid from the membrane filtration modules in the MOS cell. The filtrate pump system for the MOS tank shall be 1 duty only variable speed drive pump fitted with fabricated Schedule 80 UPVC suction and discharge manifolds including automatic and manual isolation valves for the pumps.
- Valves, instrumentation, Magnetic Flow Meters and controls.

7.6 MAINTAINING MEMBRANE PERFORMANCE

During membrane filtration, filtered solids tend to form a compressible filter cake on the membrane surface. The filter cake forms a filter in itself and so adds to the filtration performance of the systems, but at the same time it increases the head loss or pressure drop across the membrane, commonly referred to as the Trans-membrane Pressure (TMP). This filter cake must be controlled to maintain a reasonable TMP across the membranes during filtration.

The minimisation of this fouling layer or filter cake is regulated by three processes, namely;

- Relaxation and Air Scour
- Maintenance Clean (MC)
- Clean In Place (CIP)

Filtration rates are principally maintained by air scour and relaxation of the membrane fibres. However, a small residual amount of foulant remains on the membrane surfaces and accumulates over time. This is reflected by a slow increase in membrane resistance to flow. To remove these foulants, occasional chemical cleaning is carried out, either with a maintenance clean (MC) cycle, or with a Clean-in-Place (CIP) cycle.

These three processes are described below;

1.) Relaxation/Air Scour

To maintain low TMP and prevent solids accumulation on the feed side of the membrane fibres, air is continuously supplied to a coarse bubble air diffuser located below the membranes. Coarse bubbles, generated by the diffuser, rise through the membrane fibre

bundles, creating a scouring effect which limits the amount of solids deposition on the outer membrane surface and pore plugging, thereby helping to maintain a low TMP.

After a set amount of filtration time, the membranes enter a relaxation step, or soak step. During the relaxation step, filtration stops while coarse air bubbles continue to create a scouring effect to remove extraneous particulate matter from the feed side of the membrane which may have been accumulated during filtration.

2.) Maintenance Clean (MC)

Typical MBR operation will include a MC every 1 to 2 weeks of operation. A MC is usually performed automatically after a pre-set total time in filtration.

During a MC, chlorinated filtrate is passed in the reverse direction through the membrane filtration modules to inhibit biological growth and reduce fouling on the membranes and in filtrate pipe work. During this process, membrane aeration continues and the cell remains full of mixed liquor, although the mixed liquor feed is turned off. The whole cycle typically lasts for about 30 minutes after which the cell is returned to service.

A MC sequence is as follows;

- Reverse flow backwash of clean water dosed with approximately 200mg/l chlorine. The chlorine is dosed via the installation of a chemical metering pump. Magnetic flow meters installed on the filtrate pumps, which feed the backwash enable automatic flow paced control of the chlorine dosing pump. The dosing pump shall be mounted on a fabricated UPVC dosing skid incorporating 60 litre chlorine dosing tank and bund, fitted with a dosing pump shelf.
- Relaxation for 5 to 10 minutes
- Repeat of reverse flow backwash with chlorine solution and relaxation steps up to a total of 3 times
- Resume mixed liquor recirculation with aeration for 5 minutes
- Start filtration, returning the first few minutes of filtrate production to the MOS cell. Confirm rinse effectiveness by automatic measuring the pH of the filtrate via the installation of a Prominent DMT series pH analyser on each membrane train filtrate outlet pipe line.
- Return cell to normal operation

During a MC the membranes remain fully submerged in mixed liquor. No neutralisation is required as the small amount of chlorine used in the MC is consumed by the mixed liquor.

3.) Clean in Place (CIP)

The MBR process is designed so that a CIP is typically required only once every 3 to 6 months of operation. During a CIP cycle, the mixed liquor is drained from the MOS cell, and the cell is flushed with filtrate before being filled again with dilute cleaning solution made up with clean water.

For biological systems using coagulant for phosphorus removal, both acid and chlorine cleaning solutions are typically used. In these systems the Acid CIP cycle uses a blend of

Citric Acid (0.5%). The chlorine CIP solution is made to a concentration of up to 1500 mg/l of free chlorine. A CIP cycle will usually be performed when;

- The filtration TMP reaches a pre-set maximum value
- The total filtration time reaches a pre-set value
- An operator starts the CIP cycle manually

The MOS cell in the plant will be cleaned periodically. A CIP sequence is generally from around 6 hours in duration, and typically includes the following steps;

- Drain mixed liquor from the cell
- Fill the cell with filtrate from the filtrate storage tank
- Fill the cell with clean water and add the cleaning solution concentrate, recirculating the cleaning solution through the membranes with the filtrate pump and back into the cell for 45 minutes
- Soak in the cleaning solution for 15 minutes
- Aeration – For an acid CIP, the membranes continue to soak for about 5 minutes with aeration on. For chlorine CIP, this step is skipped.
- Repeat the soak and aeration (for acid CIP) steps for a total soak period of about 3 hours
- Drain the used cleaning solution from the cell and the membrane modules to the neutralisation tank (which is built into the fabricated reactors beside the digester chambers)
- If a dual (acid followed by chlorine) clean is in progress, refill the cell with clean water and chlorine concentrate and repeat the relevant steps as described above
- After cleaning solution has been drained, reverse flush the filtrate pipe work and membrane modules with filtered water
- Fill the MOS cell with mixed liquor then continue mixed liquor recirculation with aeration on for 5 minutes
- Start filtration, returning the first few minutes of filtrate production to the MOS cell. Confirm rinse effectiveness by automatic measuring the pH of the filtrate via the installation of a Prominent DMT series pH analyser on each membrane train filtrate outlet pipe line.
- Return cell to normal operation

During the CIP cycle the membrane modules are fully submerged in the cleaning solution. This process is performed in the MOS cell, providing operational simplicity by eliminating the need to remove the membranes to a separate location for cleaning.

Filtrate from the MOS system will be delivered to a 5kL poly chlorine contact/filtrate tank installed inside the main plant container. The chlorine contact tank shall be fitted with a level transmitter, and based upon tank level the treated effluent will be transferred from the contact tank to the final proposed re-use scheme via an automatic actuated ball valve.

7.7 CHEMICAL DOSING SYSTEMS

The proposed system incorporates fully automated chemical dosing systems to provide a number of duties within the treatment process. These include the following;

- Carbon dosing to provide additional supplementary BOD to sustain biomass during low capacity system operation and periods of low hydraulic throughput and to balance the BOB/COD to Ammonia ratio needed to achieve efficient nitrification and ammonia conversion.
- pH correction and alkalinity buffering via liquid Caustic or Soda Ash dosing.
- Aluminium Sulphate dosing for increased Phosphorus removal capacity
- Liquid chlorine dosing to provide residual disinfection
- Citric acid dosing for membrane system maintenance cleaning

For all chemicals the chemical storage tanks of sufficient capacity for several weeks of normal system operation will be included in the package. These storage tanks will require periodic refilling by plant operators, and will include custom fabricated HDPE chemical containment bunding fit for purpose. The chemical dosing tanks and bunds shall be installed in the plant container in a segregated area complete with safety shower and positive ventilation.

All chemical dosing pumps shall be mounted on appropriately designed dosing skids, with duty only dosing pump configuration for each chemical in the system. As all the pumps are a common model, a boxed spare pumps shall provide redundancy for the entire dosing system. The skids shall each incorporate all required pipe work and ancillary valving. The dosing pumps chosen for this project are all high quality Prominent or Grundfos chemical metering pumps.

7.8 RESIDUAL CHLORINE ANALYSING AND DOSING SYSTEM

To maintain residual disinfection on the treated effluent held in storage prior to discharge, a recirculation based chlorine analysing and dosing system will be installed to maintain a set level of chlorine in the water stored in the effluent storage tank. This will ensure that the effluent produced is guaranteed to achieve full disinfection prior to being released.

An end suction pump system shall constantly recirculate water through the chlorine contact tank at a stable flow rate. The pump shall be mounted on a fabricated HDG steel base, and shall include fabricated Schedule 80 UPVC suction and discharge pipe work including isolation valves for the pump. On the discharge of the recirculation pump system, a sample line off-take will deliver a sample through a probe holder containing a flow switch, Ph and chlorine residual probe. An E&H Memosens series chlorine analyser receives the signals from the flow switch and probes, and controls chlorine dosing pump to deliver chlorine into the return line to the tank. A chlorine set-point programmed into the control system enables the system to maintain the required level of chlorine to guarantee residual disinfection of the Treated Effluent.

Treated effluent water shall be available for delivery to the nominated discharge or re-use scheme via a flanged discharge connection on the plant battery limit.

7.9 CONTROL PANEL AND SYSTEM CONTROLS

The entire system is controlled via a PLC, with the operator interface done through a panel mounted “touch screen”.

A live display of the operating state of the STP is active most of the time on screen, showing tank levels and what phase the STP is currently operating in. A menu button on the bottom of the status screen allows access to the settings and alarm menu for the system, with the submenus available as follows:

- Active alarms
- Totaliser
- System settings
- Status display

Active alarms show any currently active alarm.

Totaliser shows the total processed volume in litres, as well as the total WAS volume sent to the digester. (7 days history with dates). System settings allow access to the system sequencing timers, DO target and phase control settings, and the WAS % of daily flow target adjustment. None of these can be accessed without a password to ensure that only authorised operations personnel have access to change system settings.

The control system includes remote dial in facility to enable plant operators and service technicians to remotely view plant operation and adjust plant operational settings remotely as required. Plant alarms can also be sent to nominated mobile phones via text message if required.

7.10 DATA LOGGING

30 day visual data log on HMI – download capable SD card for continuous log download to limit of memory available on SD card.

System provides the following logged information:

- Total WAS Flow Daily
- Total Purge Flow Daily
- Sludge Age Daily
- Total Treated Effluent Daily (discharged to chlorine contact)
- Hours in each operating mode
- Run Hour Meters for Dosing Pumps, Hiblo and two main pumps.

8 GENERAL TIPS ON GOOD SYSTEM OPERATIONAL PRACTICES

The following information is intended for an audience that already has previous experience and is qualified in Water and Waste Water Operations to a minimum level of Certificate 111 (NWP30215 or equivalent).

Please note: RWTS cannot provide the equivalent orientation/training skills needed to meet the Certificate 111 level of experience – this is a formal qualification via the National Training Platform in Australia.

RWTS can provide basic training and orientation for the intended system operator – and provide support through onsite visits, via phone and e-mail.

It is recommended that the system operator be already qualified to Certificate 111 Water and Waste Water Operations, or immediately be enrolled in the course.

9 UPSTREAM MANAGEMENT REQUIREMENTS

9.1 UPSTREAM MANAGEMENT OVERVIEW

Any location that requires an on-site stand-alone sewage treatment system will need to consider the overall site conditions and the requirements of the sewage treatment system to ensure the biological process operates as designed – and final treated effluent quality meets the site environmental license conditions and requirements.

Locations that don't have accommodation, laundry, kitchen and meals preparation occurring on site should consider the overall raw water quality characteristics and ensure the Sewage Treatment System is balanced chemically – providing the Biomass and individual Bacteria the correct balance of Nutrients, Food and Trace Elements for optimum operation. A qualified site operator with the correct tools and instruments will be able to make the required assessment and ensure the system is balanced – adding individual products to the system to ensure it is balanced and operating correctly.

For all “Traditional Remote Sites” that have on site accommodation, laundry, kitchen and in some cases potable water treatment waste water and would be considered a small city where all wastewater generated has to be treated and disposed of on-site – the following considerations should be given to the management of the site and how waste streams are controlled – ensuring optimum conditions are provided for the sewage treatment facility – allowing environmental compliance and stable system operation.

9.2 CLEANING AND BLEACHING LIQUIDS

Harsh cleaning chemicals have the “potential” to impact greatly on sewage treatment systems – but if used correctly will not impact the systems operation.

Bleaches/Oxidising Agents – are used for disinfection, whitening, removal of moulds and scum and are a common product used in traditional domestic and commercial living environments. Conservative use of these products will provide the required cleaning outcome – with little to no impact on your sewage treatment facility.

The key to ensuring the impact is minimal is to avoid large left over volumes of liquid solutions (such as mop buckets full of bleach) being dumped down the drain – which end up in the sewage treatment system – the dumping of “left over cleaning chemicals” to sewer should be avoided at all times. It is best to spread the left over products over a suitable paved (concrete or bitumen) area and allow them to evaporate.

The same principal is applied when cleaning commercial kitchens – with cooking equipment usually cleaned with a spray on foam product – however larger material is generally cleaned by physical removal first and the overall strategy should not involve large amounts of cleaning products being wasted – ending up down the drain and on their way to the sewage treatment facility.

9.3 CAUSTIC AND ACIDIC CLEANERS

Typically used in the kitchen environment – these cleaners, if used correctly are safe and will not impact on the sewage treatment facility.

Your cleaning product supplier should be consulted and notified about the site operation and management requirements (Running an on-site Sewage Treatment System) – with most major suppliers now providing products that are more suited to this type of operation.

Again – care should be taken to avoid large amounts of additional unused chemical entering the sewer network – as these “shock doses” in one large hit can provide unbalanced conditions and result in a failure of the sewage treatment system biomass – in some cases the system will take weeks to recover in the event the biomass suffers “die back” as a result of the shock dose received.

Chemicals with Phosphate/Phosphorous based “builders”

Some chemicals used for cleaning, laundry and general housekeeping practices are traditionally sold by weight” – with chemical companies charging a fee per “kg” for the products they sell.

A common practice for many companies is to add “builders” to these products to increase weight – resulting in a higher return for the product.

Many of these builders are inert – and have no impact on sewage treatment systems, however Phosphates/phosphorous builders can sometimes lead to downstream issues with nutrient compliance.

Many site environmental licenses issued by the governing regulatory authority in your Australian State of operations have different levels of nutrients nominated as a “condition” on your environmental authority or “site license of operation and compliance”.

Nitrogen and Phosphorous are typically included in these limits, and need to be reduced in levels or sometimes almost completely removed to ensure the site license conditions are met.

Added builders can introduce large levels of these nutrients, resulting in increased operating costs to remove them from the waste water – and in some cases the cost of managing these high levels can be very expensive.

Consult your chemical supplier for low phosphorous based chemicals – usually resulting in you buying a more concentrated product with fewer builders. It is possible the supplier will charge slightly higher for these products – however with less shipping involved due to buying more concentrated product – as well as the added benefit of reducing the overall phosphorous entering the sewage treatment system, the slightly higher purchase price will be worthwhile and offset by the benefits.

Phosphorous can be removed fully from waste water – however the more the system needs to remove the more the system needs to be changed to accommodate the removal – usually resulting in a much larger system, or a system that has assisted chemical removal and additional waste sludge pump out and removal program to get rid of the additional waste produced.

In summary – most larger chemical suppliers will have suitable products that work with your site conditions and sewage treatment facility – so it is best to consult them with the information they require up front and prior to purchasing any products.

In addition – the sewage treatment operator (if qualified and experienced enough) should be able to provide guidance, however you can always contact the sewage treatment system manufacturer for guidance and direction on a particular chemical you wish to use on site – that may be new or have unknown impacts on the sewage treatment system.

9.4 FATS OILS AND GREASE (FOG) AND GREASE TRAP MANAGEMENT

One of the largest problems in any sewage treatment system is FOG carry over – resulting in compliance failure most of the time, and at a minimum – expensive repairs and system recovery costs.

Typically – THREE key contributors lead to FOG breakthrough into the sewage treatment network – and are outlined below:

Grease Trap Sizing is Inadequate – in at least 60% of all cases tested – grease trap sizing is a major contributor to FOG breakthrough. A Grease Trap that is too small will result in the waste water temperature remaining too high all the way through the unit – and as a result the fats oil and grease stay in a dissolved state due to the water still being too hot.

Grease traps rely on “cooling” of the waste stream through a labyrinth path – and as the water cools below 40 degrees Celsius through the trap – the fats oil and grease “congeal” back into a solid form and float on the surface of the retention chamber in each compartment

of the unit. It is quite easy to determine if a grease trap is being overloaded – as they usually have three compartments – with the first compartment designed to complete most of the removal of FOG, the second compartment to catch the remainder – and the third is an insurance only and should catch minimal material. During inspection of a grease trap the depth of material in each compartment can be checked to determine how the unit is performing.

In addition – temperature testing of the fluid in each compartment during kitchen peak periods (cooking and dishwashers active) will also provide live data as to how well the unit is performing.

If the Grease Trap is undersized – the FOG will continually break through and impact the sewage treatment system – causing huge issues with the system operation, high costs continually due to pump outs and unplanned maintenance and make the system painful in all aspects to own and manage.

This is a regular problem that is almost always overlooked or considered “trivial” when the site planning stages are considered.

Grease Trap is Inadequately Maintained

Even if the grease trap is sized correctly – poor management of the unit will result in the same conditions as having a unit that is undersized.

The reason for this is that as material is removed and floated off into the top of each chamber – the available room for water is reduced – effectively the system removes material and stores it from the top down. As the unit continues to get full of removed material – the available water for temperature reduction is reduced.

If allowed to get too full of material – eventually the unit will foul all three compartments and allow FOG breakthrough to occur – and carry over into the sewage treatment system.

Regular inspection of the grease trap should be completed – usually every two days on a new site to gain an understanding of how rapidly the unit fills up with material – and then once a baseline is established every four to five days – usually completed by the site waste water treatment plant operator and recorded on the daily log sheet for the site records.

On average – a correctly sized grease trap will require pump out once every four weeks – however this can also be as low as every 7 days depending on site kitchen staff behaviour – type of food being cooked and the clean-up methodology used in day to day kitchen practices.

9.5 KITCHEN WASTE MANAGEMENT

It has been noted that in a lot of cases when inspecting site systems and problems with FOG carry over that although the grease trap is adequately sized – the site cannot obtain more than 7 days between pump outs – and the question is regularly asked – “why?”

The contributor – in most cases that have been investigated is poor kitchen management practices.

Poor training of kitchen staff – lacking procedures on how to manage clean up and waste oil recovery, gristle clean-up resulting in scraping of all waste being dropped into floor wastes and generally poor ongoing behaviour/thinking of staff due to lack of time or a “lazy” approach. Once its down the drain the evidence is gone has been the mentality found in a lot cases.

This however is very untrue – as the above editorial has explained.

It is recommended that the nominated facility manager and the kitchen supervisors have a solid management system in place – with clear requirements that are “best industry practice” to ensure that all recoverable fats, oil and grease are recovered and placed into recovery storage drums for collection and removal from site – therefore reducing the pump out requirements for the grease trap and the high costs involved in doing this more regularly than should be normally required.

Ultimately – it everyone’s responsibility to ensure the upstream management is completed in a manner that protects the downstream system from operating problems, damage and unplanned maintenance.

The final determination on effectiveness of upstream management should be provided by weekly feedback during team meetings via the nominated Qualified Water and Waste Water Treatment Plant Operator (Minimum Certificate Three Qualification). Investigations can be completed by means of independent site Auditing – completed by a representative of the waste water system manufacturer. Documented findings with photographic evidence and a written report provided, outlining the site operating conditions. It is advisable to complete at least one independent audit every six months – or quarterly, in the event that the site is experiencing ongoing operational challenges – each audit is also an opportunity to provide additional training to the system operator.

In addition – General housekeeping and maintenance should be completed to minimise water leaks on site – as these cost money to manage due to increased hydraulic load on wastewater systems not to mention the cost of the water in the first place.

9.6 GOOD PRACTICE SYSTEM MANAGEMENT TIPS:

- Ensure pump station inspections are completed – and debris periodically removed via pump truck – this will ensure pump reliability is maintained and reactive maintenance is minimized.
- Ensure the inlet screen on the STP is kept clean and free of fouling – adjust the nozzle wash system interval if needed to reflect a screen clean regime that is suitable for site conditions. Manually clean any major fouling if required – using safe work practices and lock out methodology to complete the task.
- It is noted in the above specifications that the MLSS level is designed to operate at 10,000mg/l (system in standby). This equates to a full operational system that is running a designated sequence (full operating height) as an MLSS of 8500mg/l – which is the likely state the system will be in when testing of settle ability and MLSS samples are being taken from the sample points.
- Settle ability testing using a “settle-ometer” should be completed multiple times per week to establish biomass behaviour and system stability. A system that is running at optimum efficiency and has healthy biomass behaviour will provide the following results as a rule of thumb:

A settleability test should be completed over a 30 minute period – recording the value of the sludge settling rate at the 5 minute, 10 minute, 20 minute and 30 minute intervals.

30% Activated sludge and 70% demineralised water should be used for checking of sludge volumes – with a calculation completed after testing is complete to provide a guide on total MLSS or system solids.

The majority of the biomass in the sample taken should coagulate and settle within 5 minutes of the sample being taken and gently mixed for 10 seconds.

The following 25 minutes will see only a minor increase in sludge compression (possibly another 5 % compression) with the final result recorded at 30 minutes.

If being managed correctly, with a healthy biomass – the settled sludge volume should be approximately 30% of the total cylinder height – and the fluid above the sludge should be extremely clean and clear – we refer to this clear fluid as the supernatant.

- If the system has a biomass behaviour that would typically be deemed in the lazy or in the poor category – the individual results will see a much slower settling rate, and may also see less compression in the final result.
- A note of warning – if the settling rate is still fast – with visible compression nice and tight (not fluffy flocs floating around) – and the final result provides a settled result that is considerably higher than 30 % - we suggest that the MLSS WAS settings may need to be increased and that the actual operating MLSS is higher than it should be.

- If in doubt, or if in need of establishing a baseline value for MLSS – take a sample and send it to a suitable laboratory for MLSS testing via the bake out method – and complete a settle ability test at exactly the same time as the lab sample are taken from the system – thus allowing a settleability result as a reference to the MLSS result from the LAB once received.

Nutrient results – although possibly not required for the site Environmental compliance requirements – are necessary to trend the system biomass performance and overall system health. The following individual items should be tested regularly each week to ensure the system behaviour is stable and within design:

- Ammonia mg/l
- Nitrate mg/l
- Phosphorous mg/l
- Alkalinity mg/l
- Ph (Ph units)
- Free chlorine mg/l
- Turbidity (FNU)

The above results will allow a system performance trend to be developed, showing nitrification, denitrification, clarification and biomass performance.

In the event that the system is difficult to manage biologically, the above results should be tested on the raw influent, along with BOD and FOG (Total Fats Oil and Grease) - to determine the quality of fluid the system is treating is within the design requirements.

- Complete regular inspections of the bioreactor (usually done when inspecting the inlet screen) to ensure that elevated levels of crusting and debris are not forming on the surface of the fluid in the reactor. In the levels are deemed too high, it is advised to use a vacuum truck to remove the scum and crust only from the system. High levels of crust build up typically occur when higher than normal levels of FOG (Fats Oils and Grease) are entering the system – or the MLSS operating Level is higher than normal – which will require manual wasting of MLSS to the WAS tank to correct it.
- Sucrose dosing is a carbon based BOD supplement/ additive used to balance the AMMONIA:BOD ratio on the system and enable better complete Nitrification/Denitrification performance by the system. In addition, the Sucrose will support the system in lower inflow periods of operation by providing some supportive carbon as food for the biomass – noting that this will only support the system to a point where the nutrient imbalance will become problematic and result in a hard to manage biomass – RWTS can provide support and advice on this if the situation arises.
- Ensure the chemicals for the system are topped up regularly and do not “run out” as this will likely result in non-compliant final effluent quality and a hard to manage system. Keep a record of chemical usage to enable trending – and make sure the system is using consistent amounts in relation to the volume of fluid being treated.
- Ensure the daily log sheet for the system is being completed to maintain a record of system operation – this is important as the information will be needed by DES QLD.

10 EFFLUENT DISPOSAL REUSE CALCULATION DETAILS AND DESIGN METHODOLOGY

10.1 500 EP OCCUPANCY DESIGN

The nominated Effluent Reuse methodology involves two key reuse options for the treated effluent:

- Soil conditioning (moisture addition to soil) prior to compaction and construction use
- Dust suppression for access roads and laydown areas on the project

Program of works / staging details (as per Ausco Accommodation Village program)

Dust suppression re-use details, which include things such as

- m² of areas to be sprayed for dust suppression
- km of road to be sprayed for dust suppression
- Number and size of trucks to be engaged
- Timeline and staging of works specifically related to dust suppression

The project has various construction operations and dust suppression obligations to meet the requirements of the project earthworks specification, and management of the project site.

The dust suppression demand has been derived utilising the pavement areas, either in production or completed. The following calculations have been used.

Dust Suppression

Work Area	Completed Area
0.6 L/m ² /pass/day	0.6 L/m ² /pass/day
3 # passes/day	1 # passes/day
1.8 L/m ² /day	0.6 L/m ² /day

Table 1 – Dust Suppression Quantities

Dust Suppression	
Total Water (kl)	494,287.83
Total Water Added (kl)	494,287.83

Table 2 – Total Quantity-Construction Water in kl

SERVICING

10.2 DAILY CHECKLIST

STP & WTP Daily Checklist

	Item	Yes	No
1	Record System Data Log readings		
2	Visually inspect surrounding area for leaks & valving position, report on findings		
3	Inspect plants for visual alarms report & comment on such events		
4	Record tank levels		
5	EXAMPLE: balance tanks ½ full at time of inspection. This will allow for habitual timing, if the tank levels stray from this point dramatically we may possibly over a crisis through the peak periods of the day. Inspect the process Aeration for its correct operation		
6	Record the PLC display For example: At time of inspection the PLC stated the plant was in settling		
7	Inspect the Soda Ash dosing tank fill as required		
8	Inspect the Alum dosing tank fill as required		
9	Inspect the chlorine dosing tank fill as required		
10	Inspect the levels within the final effluent tanks and record		
11	Inspect irrigation pump set for leaks and valving position		
12	Walk irrigation field and isolate and reinstate areas as needed		
13	Record chemical consumption on site and re order as required		
14	Record usage of chemical stocks on site remaining		
15	Record pressures on Recirculation/ Irrigation Pump		
16	Sample effluent and test for free chlorine level and nutrients		

11 DESIGN LIFE AND BIOLOGICAL PROCESS/TREATED EFFLUENT CERTIFICATION

Accionia Australia has engaged Ausco Modular Pty Ltd to provide a suitable accommodation village, including water and wastewater infrastructure for a term of up to 3 years to support the construction of the project.

Ausco Modular – have supplied a rental Sewage Treatment System from there fleet of assets – called the 100kl MBR system, originally manufactured in 2016/2017 and put into service in early 2017 at Rio Tinto's Amrun site in Weipa, Qld.

Remote Water Treatment Services – engaged by Ausco Modular for the project to provide water and wastewater equipment, installation and ongoing operational support and maintenance hereby provide the following statements:

RWTS have completed a full design review of the 100kl MBR sewage Treatment System being installed at the Marble Bar Camp for the Iron Bridge Project – and hereby confirm the system will easily perform to the design calculations stated in the supporting documentation provided with this application.

The system has been designed and fabricated in a transportable/ semi-permanent or permanent installation arrangement to provide continuous service with the required maintenance for a minimum 15 years life expectancy.

Any corrosion areas that are left unmanaged will result in a life expectancy reduction on the system core structure.

With correct maintenance and coating management the system core structure service life will exceed 15 years.

For any queries or assistance required in managing the 100kl MBR Sewage Treatment System please contact the Remote Water Treatment office in Tingalpa Qld.

Adam James



Signed _____

Water and Waste Water Engineering/Technical Design and Operations Support

Remote Water Treatment Services – Brisbane Office

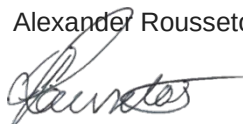
12 EXCECUTION

Signed signatory on behalf of the company Remote Water Treatment Services Pty Ltd.

Director

Name: Alexander Roussetos

Signature:



Dated: 18th May, 2026

Position: Managing Director

QBCC license #: 1286708

Signatory Process and Technical Design Lead

Name: Adam James

Signature:



Dated: 18th May, 2026

Position: Senior Design Lead Process and Water

Signatory Process Engineer

Name: Shane Law

Signature:



Dated: 18th May, 2026

Position: Senior Process Engineer



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MacIntyre Windfarm & OHTL Erosion and Sediment Control Plan



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1. Introduction

1.1 Project background

GHD Pty Ltd (GHD) has prepared this Concept Erosion and Sediment Control Plan on behalf of ACCIONA Energy Australia Global Pty Ltd (ACCIONA) in support of a development application for a Material Change of Use (MCU) for a Wind Farm and Operational Work for Clearing Native Vegetation to facilitate the MacIntyre Wind Farm and 330 kV Overhead Transmission Line (OHTL).

The Project is located approximately 40 kilometres (km) south-west of the township of Warwick and 70 km south west of Toowoomba. The Project is proposed over thirty-three (33) freehold lots, as well as road reserves and easements, totalling approximately 45,370 ha and is located within Southern Downs Regional Council (SDRC), Goondiwindi Regional Council (GRC) and Toowoomba Regional Council (TRC) Local Government Areas (LGA).

The Project will include the construction and operation of a wind farm involving the installation of up to 169 wind turbines, approximately 64 km of 330 kV OHTL and ancillary infrastructure including:

- Wind turbine foundations and hardstand areas
- Main site access from Carbean Road
- Access tracks
- Overhead 33 kV electrical reticulation
- Underground 33 kV electrical reticulation
- Up to two (2) substations
- Two (2) switching stations
- A potential battery energy storage facility
- Up to six (6) permanent meteorological masts
- Up to two (2) construction compounds
- Up to three (3) laydown areas
- A workers' accommodation facility
- Up to two (2) operations and maintenance facilities.

1.2 Purpose of this report

This Concept Erosion and Sediment Control Plan (CESCP or Report) has been prepared at the development application stage and provides preliminary guidance to help establish appropriate site erosion and sediment control (ESC) management measures to reduce potential adverse impacts during the construction phase of the project. It is expected that prior to any construction activity within the project area a detailed site-specific Erosion and Sediment Control Plan (ESCP) will be developed by the Contractor as part of the Construction Environmental Management Plan (CEMP). The Contractor should review this Report as preliminary guidance and provide greater detail based on construction methodology and timing of works.

This Report does not prescribe or locate any permanent or temporary erosion or sediment control measures in detail; however, it provides indicative locations for ESC devices as one measure of meeting the Contractor's responsibilities to manage soil disturbance and sediment risks.

During preparation of the detailed site specific ESCP, as a minimum, the Contractor should comply with the International Erosion Control Association's (IECA) Best Practice Erosion and Sediment Control Guidelines (2008) as outlined below:

- Ensure sufficient soil data is collected and site constraints identified

- Ensure appropriate consideration of erosion and sediment control requirements, plan, size and installation of site controls prior to commencing disturbance. Adaptive measures should cater for constraints and environmental sensitivities before, during and following the construction phase
- Identify, implement and manage erosion hazards associated with any on-site land disturbance activity
- Demonstrate to the Department of Environment and Science (DES) that the erosion and sediment controls meet best practice requirements during construction works to preserve surrounding environmental values.

This Report has been prepared to respond to the relevant requirements of State Code 16: Native Vegetation Clearing (State Code 16) and Performance Outcome 13 of State Code 23: Wind Farm Development (State Code 23).

This CЕСP has been reviewed by a Certified Professional in Erosion and Sediment Control (CPESC). As part of the preparation of the site-specific ESCP, the ESCP will require the certification of a Registered Professional Engineer of Queensland (RPEQ) and CPESC.

1.3 Scope and limitations

The following outcomes will be delivered in this Erosion and Sediment Control Site Assessment Report:

- Identification of disturbed catchment areas throughout the project site, where applicable
- Identification of the type of controls likely required for each disturbed catchment and indicative locations
- Preliminary guidance on erosion and sediment control measures
- Preliminary sketches displaying the type and indicative location of the erosion and sediment control types.

1.4 Relevant guidelines and legislation

Sediment and erosion controls should be established to comply with the relevant legislative requirements outlined below, as well as Books 1 – 6 of the *Best Practice Erosion and Sediment Control*, International Erosion Control Association (Australasia) (IECA 2008).

1.4.1 *Environmental Protection Act 1994*

All persons have a legal duty under the *Environmental Protection Act 1994* Section 319 to take all reasonable and practicable measures to minimise or prevent environmental harm. Such harm can be caused if sediment from construction sites enters (washes, blows, falls or otherwise) into stormwater drains, roadside gutters or waterways. Stormwater runoff must be managed so that it is not released into waters, a roadside gutter, or stormwater drain at more than 50 mg/L Total Suspended Solids (TSS). Under section 443 of the *Environmental Protection Act 1994* a person must not cause or allow a contaminant to be placed in a position where it could reasonably be expected to cause serious or material environmental harm or environmental nuisance (e.g. placing a stockpile adjacent to a waterway).

In addition, people who are in positions of management in a corporation have an additional duty under the *Environmental Protection Act 1994* to ensure that their corporation complies with the Act. This means supervisors need to take reasonable and practicable steps to ensure that the people under their control do not breach environmental laws.

People who become aware of environmental harm in association with their work (e.g. significant loss of sediment from their site works into a watercourse) have a legal duty under the *Environmental Protection Act 1994* to notify DES.

1.4.2 *Environmental Protection Policy (Water and Wetland Biodiversity) 2019*

This policy sits under the *Environmental Protection Act 1994*. The *Environmental Protection Policy (Water and Wetland Biodiversity) 2019* provides environmental values and water quality objectives for Queensland waters.

These are utilised when determining environmental harm and to inform other statutory and non-statutory decisions. The water quality objectives assist in identifying whether the environmental values are protected. These values and objectives should be utilised when determining risk of environmental harm from water releases or runoff, and appropriate erosion and sediment controls implemented.

1.4.3 *Planning Act 2016 and Planning Regulation 2017*

The *Planning Act 2016* is the mechanism for assessing all developments within Queensland. This Act establishes the process for sustainable planning and development assessment in an ecologically sustainable way. This project will be subject to assessable development triggers under the Planning Act and subordinate regulation, which will each require erosion and sediment control risks to be approved as part of those specific activities. This Report forms part of the Development Application package under State Code 16: Native Vegetation Clearing and State Code 23: Wind Farm Development.

1.4.3.1 **State Code 16: Native Vegetation Clearing**

State Code 16 is contained within the State Development Assessment Provisions (SDAP) and lists numerous POs that must be addressed by a proposal to clear native vegetation when such an activity qualifies as assessable development. Importantly, relevant to this project and this Report are the requirements within PO11 and PO20 to ensure that vegetation clearing does not result in accelerated soil erosion, and protects bank stability of watercourses.

1.4.3.2 **State Code 23: Wind farm development**

State Code 23 is contained within the SDAP and details the requirements when preparing development applications for material change of use for new or expanding wind farms. Relevant to this project and this Report are the requirements within PO13 regarding the need to avoid, minimise and mitigate adverse impacts on environmental values through construction activities.

2. Site description

2.1 Location

The project is located across the Southern Downs Regional Council (SDRC), Goondiwindi Regional Council (GRC) and Toowoomba Regional Council (TRC), approximately 40 km west of the township of Warwick. The region is predominantly rural land use and used for stock grazing and associated agricultural activities. ACCIONA is proposing to connect the wind farm into the Powerlink transmission network via a 64 km OHTL, which spans over GRC, within the wind farm area, through the western part of SDRC and connects to Powerlink's network within the southern end of TRC.

The project is proposed over 33 freehold lots, as well as road reserves and easements, totalling approximately 45,370 ha. The Project will include a site access from Cunningham Highway along Carbean Road. Carbean road does not follow the road reserve and as such the Project will impact on land within the adjacent State Forest. The majority of the vegetation across the Project area has been cleared over time, however some areas of native vegetation remain within the Project area including Category B and Category C Regulated Vegetation containing Regional Ecosystems, which are classed as endangered, of concern or least concern under the VM Act.

The project Footprint includes the outermost extent of the land which the Project infrastructure will be located within the Study Area. The area of the Project Footprint will be provided within the MCU Development Application package. This ESC assessment report forms part of the material to support the Development Application.

A 1,500 m setback from existing or approved non-host sensitive land uses has been applied to the development of the layout, and infrastructure has been positioned to avoid and minimise ecological impacts where possible.

The location of the MacIntyre wind farm and OHTL is identified in Figure 2-1, and the proposed layout of the wind farm is detailed in Figure 2-2 below.

Figure 2-1 MacIntyre wind farm location

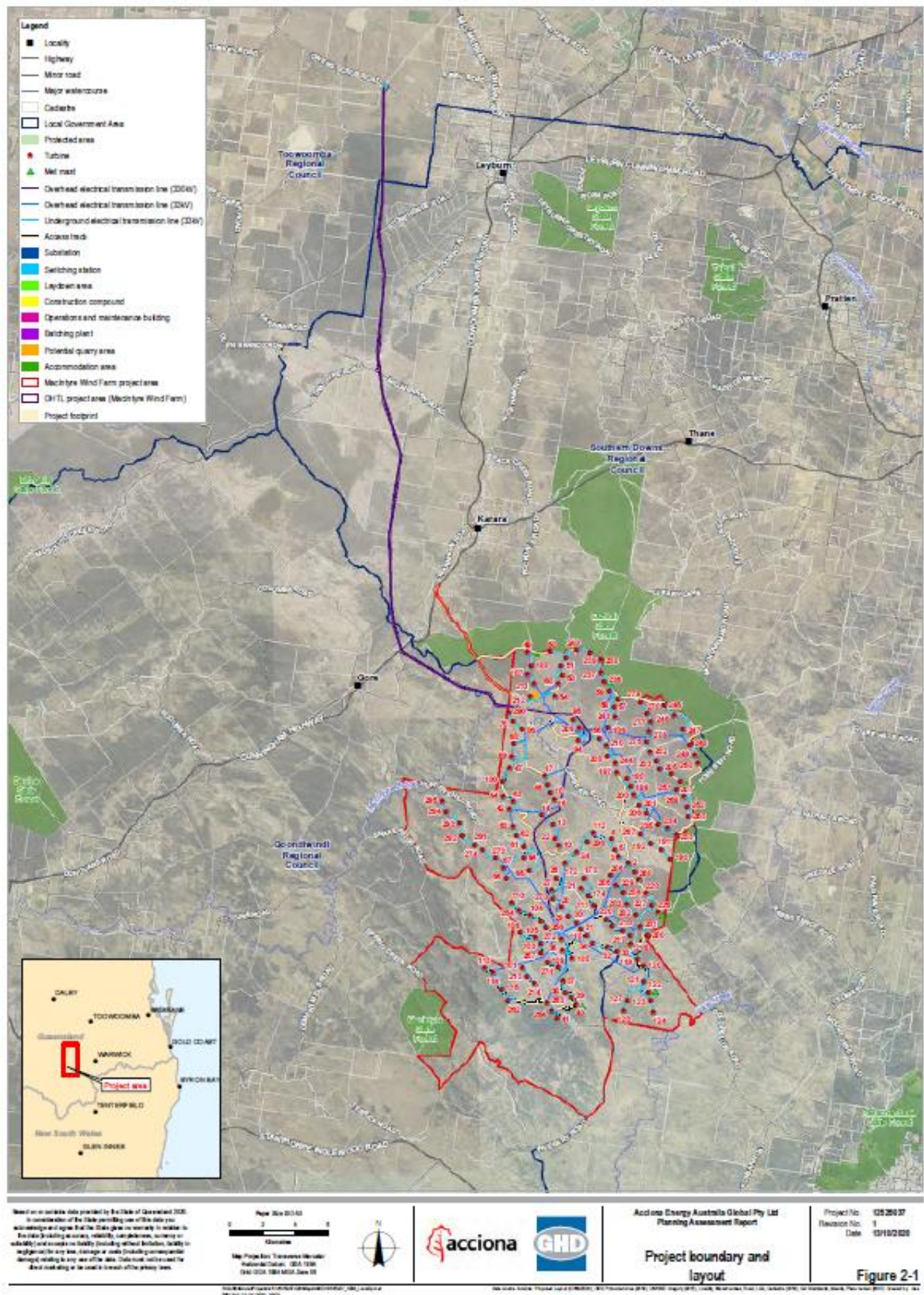
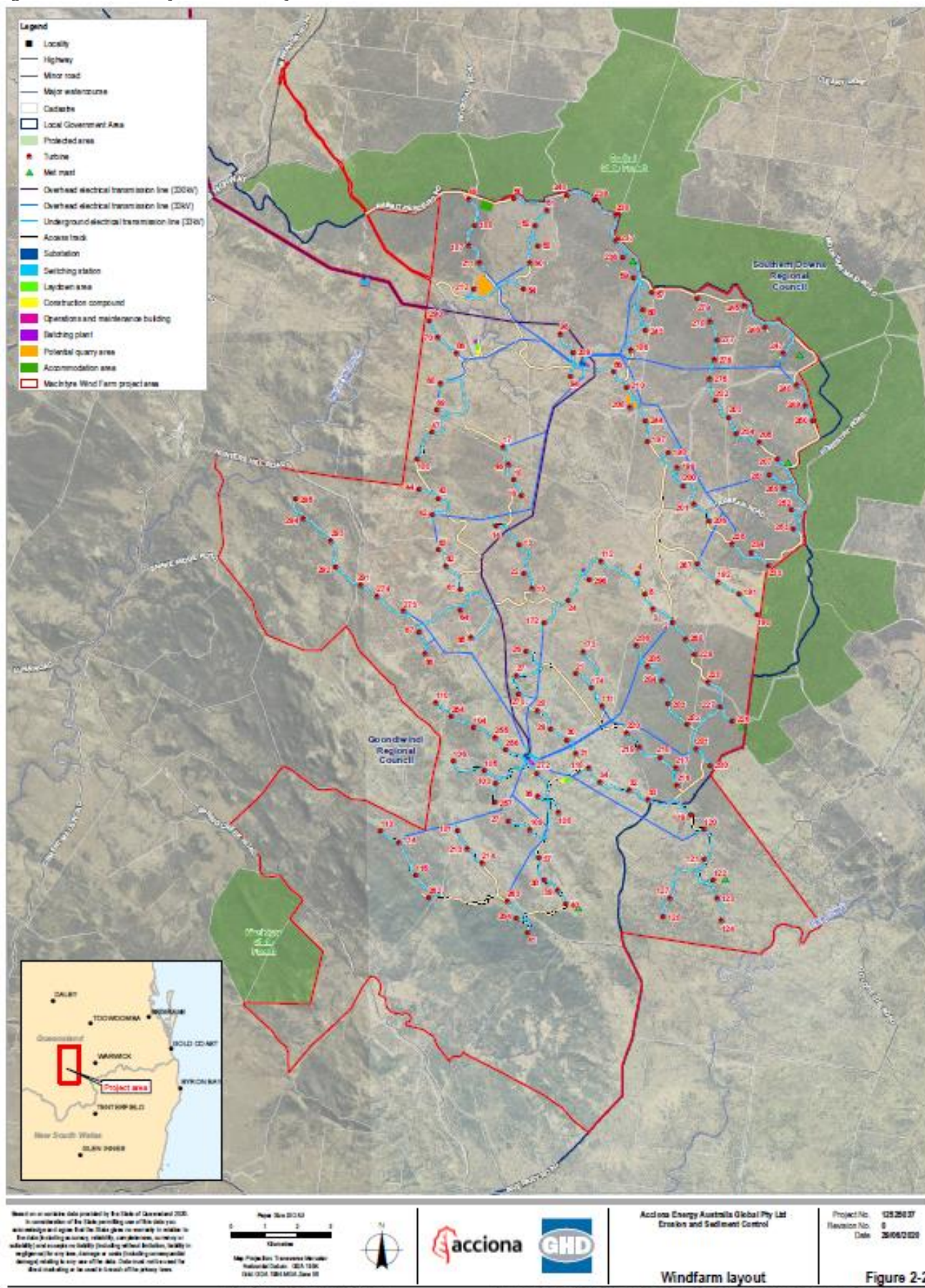


Figure 2-2 MacIntyre wind farm layout



2.2 Topography

The project is proposed on the edge of the Stanthorpe Plateau sub-region of the New England Tablelands Bioregion (adjacent to the Brigalow Belt South Bioregion), and is characterised by low hills and mountains, with large areas of rock outcrop and granite tors.

Elevations across the wind farm site range between 780 mAHD in the east, and 450 mAHD in the west, with a number of 600 mAHD – 700 mAHD peaks throughout the wind farm. It is noted that the majority of the wind turbine foundations and supporting infrastructure hardstands are to be built along the ridgeline with the access track designed to utilise the existing topography of the land. In this regard, there will be portions of the access track that run along steep slopes that will trigger the requirement for additional erosion and sediment controls.

Elevations across the OHTL range from 610 mAHD in the south and 430 mAHD in the north. The topography along the OHTL contains less hills and mountains compared to the wind farm footprint.

2.3 Vegetation

The project site is located within an undulating landscape that has been subject to intensive historical land clearing and decades of sheep grazing. This activity has led to widespread vegetation loss and long term exposure of surface soils to the elements, particularly along the ridgeline where the construction of infrastructure is proposed.

Areas of high ecological value border the study area to the north east (i.e. Durikai State Forest) and south (i.e. Macintyre State Forest). Large patches of remnant vegetation occur within the north, east and south west portions of the wind farm. These areas provide habitat for a range of flora and fauna, including numerous conservation significant species. The detailed design of the project will aim to avoid these high ecological value areas, and during construction, erosion and sediment control measures are to be implemented to avoid the release of disturbed runoff into these areas.

Proposed turbine locations are located on elevated rocky rises that have been subject to high levels of disturbance from historical land clearing for sheep grazing. These are fringed by patches of remnant and regrowth vegetation that provide potential habitat for a range of conservation significant species listed under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or *Queensland Nature Conservation Act 1992* (NC Act).

2.4 Geology

A desktop assessment was undertaken across the project site, to collate information in relation to the geology across the wind farm. This information was obtained from the Department of Natural Resources and Mines 1:100,000 mapping scale for the underlying geology present.

Table 2.1 and Table 2.2 details the description and approximate locations of the geology underlying the wind farm and OHTL, respectively. The geology of the wind farm and the southern portion of the OHTL extension is quite similar; predominantly consisting of sedimentary rock in the form of siltstone and mudstone. The most northern portion of the project, where the OHTL tracks towards the Powerlink transmission network, predominantly consists of Arenite mudrock, in the form of sandstone and siltstone.

Table 2.1 *Wind farm surface geology*

Symbol	Rock unit name	Dominant rock type	Lithological summary	Location (approximate)
Ctx	Texas beds	Sedimentary Rock	Thin to thick-bedded, volcanoclastic arenite, siltstone, mudstone and slate; local phyllite; sporadic lenses of jasper, chert, limestone and mafic volcanics; rare conglomerate.	This geology type is present for the majority of the proposed wind farm.
Ctx/j	Texas beds/j	Chert	Thin-bedded to locally massive, pink to brown jasper; subordinate interlayered mudstone; locally grades into grey chert.	This geology type is present at isolated locations in the centre of the proposed wind farm.
Ctx/al	Texas beds/al	Arenite-Mudrock	Arenite, siltstone and mudstone affected by metasomatic quartz-tourmaline alteration.	This geology type is present at one location in the north west of the proposed wind farm.
Par	Alum Rock Conglomerate	Arenite-Rudite	Conglomerate, locally pebbly sandstone, and siltstone; rhyolitic to locally dacitic breccia, tuff and lava; minor calcareous arenite and limestone.	This geology type is present at one location in the south east of the proposed wind farm.

Table 2.2 *OHTL surface geology*

Symbol	Rock unit name	Dominant rock type	Lithological summary	Location (approximate)
Ctx	Texas beds	Sedimentary Rock	Thin to thick-bedded, volcanoclastic arenite, siltstone, mudstone and slate; local phyllite; sporadic lenses of jasper, chert, limestone and mafic volcanics; rare conglomerate.	This geology type is present for the majority of the area surrounding the proposed OHTL.
Ctx/v	Texas beds/j	Chert	Thin-bedded to locally massive, pink to brown jasper; subordinate interlayered mudstone; locally grades into grey chert.	This geology type is present adjacent to the proposed OHTL at Chainage 14 km.
Ctx/j	Texas beds/v	Mafites (Lavas, Lastics and high-level Intrusives)	Mafic lava and associated pyroclastic deposits; some subvolcanic intrusives; minor chert, jasper and volcanoclastic sediments.	This geology type is present at isolated locations from Chainage 16 km to 23 km of the proposed OHTL.
Qa	Qa-QLD	Alluvium	Clay, silt, sand and gravel; flood-plain alluvium.	This geology type is present from Chainage 28 km to 29 km.
Jbm	Marburg Subgroup	Arenite-Mudrock	Lithofeldspathic labile and sublabile sandstone, siltstone, shale, minor coal, ferruginous oolite marker.	This geology type is present for the majority of the area surrounding the transmission line from Chainage 23 km to 45 km.

Symbol	Rock unit name	Dominant rock type	Lithological summary	Location (approximate)
Qs	Qs-SQ	Miscellaneous Unconsolidated Sediments	Sand, red sandy soil, silt and some gravel; floodout and sheet sand with some alluvium.	This geology type is present from Chainage 41 km to 42 km.

2.5 Soils

A desktop assessment was undertaken across the project site, which indicated that a range of different soil types are present across the wind farm and OHTL. This information was obtained from the Department of Natural Resources and Mines 1:250,000 mapping scale for each of the soil types present.

Table 2.3 and Table 2.4 details the description and approximate locations of the different soils types for the wind farm and OHTL, respectively.

Table 2.3 Wind farm soil types

Symbol	Soil description	Location (approximate)	Reference
TUm-D	Shallow, gravelly loams (lithosols) and shallow, gravelly texture contrast soils (soloths, solodics, solodized solonetz). Developed on Traprock.	This soil type is present across the majority of the proposed wind farm.	Granite and Traprock Area of South Queensland
TD	Shallow, gravelly, texture contrast soils (soloths, solodics, solodized solonetz). Developed on Traprock.	This soil type is present at a number of isolated locations across the proposed wind farm.	Granite and Traprock Area of South Queensland

Table 2.4 OHTL soil types

Symbol	Soil description	Location (approximate)	Reference
TUm-D	Shallow, gravelly loams (lithosols) and shallow, gravelly texture contrast soils (soloths, solodics, solodized solonetz). Developed on Traprock.	This soil type is present at a number of isolated locations from Chainage 10 km to 27 km.	Granite and Traprock Area of South Queensland
TD	Shallow, gravelly, texture contrast soils (soloths, solodics, solodized solonetz). Developed on Traprock.	This soil type is present at a number of isolated locations from Chainage 10 km to 27 km.	Granite and Traprock Area of South Queensland
SDy-Db	Yellow to brown, neutral to alkaline, texture contrast soils (solodics, solodized solonetz). Developed on Sandstone (less gravelly soil).	This soil type is present adjacent to the transmission line from approximately Chainage 21 km to 24 km.	Granite and Traprock Area of South Queensland
SDy-Uc	Yellow, acid, texture contrast soils (soloths). Deep, bleached siliceous sands (siliceous sands). Developed on Sandstone (less gravelly soil).	This soil type is present from approximately Chainage 18 km to 21 km.	Granite and Traprock Area of South Queensland
SDr-Dy	Shallow, gravelly, acid, texture contrast soils (soloths). Developed on Sandstone (gravelly soil).	This soil type is present adjacent to the transmission line from approximately Chainage 18 km to 20 km.	Granite and Traprock Area of South Queensland.

Symbol	Soil description	Location (approximate)	Reference
Ub62	Hard pedal mottled-yellow duplex soils. Duplex yellow-grey, hard setting A horizon, A2 horizon conspic bleached, neut pedal mottled B horizon.	This soil type is present from approximately Chainage 24 km to 45 km.	ASRIS

2.5.1 Soil sodicity

Sodic (dispersive) soils are soils that have a high proportion of sodium ions, relative to the amount of other cations within their chemical composition. They are considered 'sodic' when the amount of sodium impacts and degrades the soils properties through weakening the bonds between the soil particles. Soil sodicity is a natural feature of many Queensland soils types, with approximately 45% considered sodic in nature.

Sodic soils are structurally unstable in water and tend to break down into their basic particles. These soils are highly susceptible to '*chemical erosion*' processes on slopes areas, or where soils are exposed or disturbed.

Figure 2-3 details the distribution of naturally occurring sodic soils across Queensland, with the project site highlighted in red.

The subsoils found within the wind farm are likely non-sodic to variable, while there is potential for the exposure of strongly sodic soil within the northern extension of the OHTL footprint. Therefore prior to detailed design and the construction of the OHTL, soil sodicity needs to be identified and characterised as part of the site-specific Erosion and Sediment Control Plan by the Contractor, to ensure adequate treatment of sodic soils is undertaken by implementing appropriate erosion and sediment controls, as well as soil treatments.

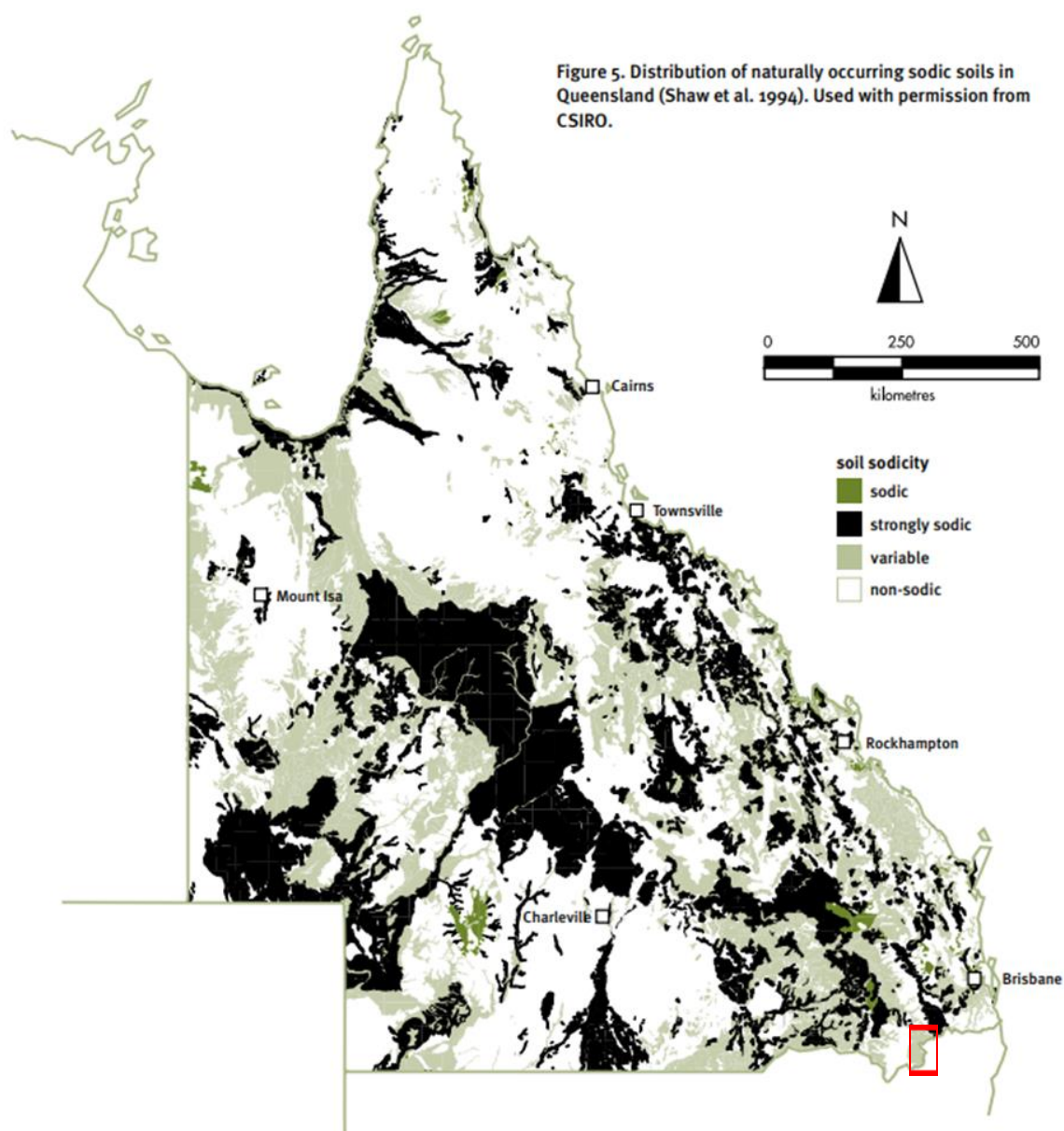


Figure 2-3 Distribution of naturally occurring sodic soils in Queensland

2.5.2 Soil erodibility

Soil erodibility is a function of the rate of infiltration at the surface, permeability of the soil and the coherence of the soil particles. To assist with the determination of soil erodibility, a number of field and/or laboratory tests can be undertaken including tests for dispersion, pH and sodicity.

Sub-surface geology needs to be identified and characterised prior to the development of the site-specific Erosion and Sediment Control Plan by the Contractor, to appropriately identify soils within the project site that are highly erodible and to implement erosion and sediment controls accordingly.

2.6 Hydrology and drainage

There are a number of waterways traversing the wind farm footprint, all of which flow in a westerly direction and ultimately discharge into Macintyre Brook, approximately 6 km west of the project site. The proposed access tracks for the wind farm area cross a number of low to high risk waterways as shown on Figure 2-4.

The potential for ecological impact at waterway crossings was determined through intersect analysis using the Department of Agricultural and Fisheries Queensland Waterways for waterways barriers work data set. This data set provides an indication of the risk of impact due to crossing waterway barrier works, based upon a categorisation of mapped waterways, as set out in Department of Agriculture and Fisheries Code for Self-assessable Development – Minor Waterway Barrier Works, Part 3 Culvert Crossings, WWBW01 April 2013 (DAF, 2013).

The DAF manual applies to new, or replacement of existing, waterway barriers. Waterways are classified as either low (green), moderate (amber), high (red), major (purple) risk of impact. 47 road waterway crossings are proposed within the wind farm footprint, as detailed in Table 2.5, which will require the incorporation of culvert crossing for example, a bottomless, box, pipe, slab, open or arch culvert underneath the access tracks.

Table 2.5 MacIntyre access track waterway crossing classifications

Waterway Barrier Works risk category	Northern Catchment	Central Catchment	Southern Catchment
Purple (Major)	0	0	0
Red (High)	3	0	0
Amber (Moderate)	7	3	2
Green (Low)	23	9	0

It is likely that a permanent access track will be constructed and maintained along the OHTL, which will need to consider the intercepted waterways. At this stage, the exact location of the OHTL access track is unknown however the proposed OHTL crosses a number of low to major risk waterways as shown on Figure 2-4 and detailed in Table 2.6.

Table 2.6 OHTL waterway crossing classifications

Waterway Barrier Works risk category	OHTL alignment
Purple (Major)	2
Red (High)	6
Amber (Moderate)	8
Green (Low)	17

Waterway crossings, in the form of fords or culverts, can physically impact aquatic fauna habitat, stream stability and fish passage, by the removal of riparian and in-stream vegetation, and disturbance and blockage to the bed and bank of the waterway which can potentially increase sedimentation or alter geomorphic processes of bed and banks.

As a minimum, the following requirements must be met for the waterway crossing with high, moderate and low classification as outlined in Waterway Barrier Works guidance, as part of the detailed design of waterway crossings as outlined in Table 2.7.

Table 2.7 Waterway crossing requirements

Waterway Barrier Works risk category	Minimum requirements
High	<ul style="list-style-type: none"> – Works must commence and finish within a maximum time of 180 calendar days and instream sediment and instream silt control measures associated with the works must be removed within this period – The width of the culvert cell aperture or total width of the combined culvert aperture width (culvert array) must span a minimum of 100% of the low flow channel width – The culvert must be installed at no steeper gradient than the waterway bed gradient – The outermost culvert cells must incorporate roughening elements such as baffles on their bankside sidewalls 30. These must be installed to a minimum of 95% of the full height of the vertical extent of the culvert sidewalls with a gap of no greater than 30 mm at the bottom – Roughening elements must be installed on the upstream wingwalls on both banks to the height of the upstream obvert or the full height of the wingwall. If roughening elements are baffles, the design must be as follows – maximum 150 mm horizontal protrusion into the flow – Bed and bank scour/erosion protection and blockage allowance designed in accordance with QUDM and Austroads' Guides to Road Design.
Moderate	<ul style="list-style-type: none"> – Works must commence and finish within a maximum time of 360 calendar days and instream sediment and instream silt control measures associated with the works must be removed within this period – The crossing must have a minimum (combined) culvert aperture width of 2.4 m or span 100% of the main channel width – All new or replacement culvert cells must be installed at or below bed level. The internal roof of the culverts must be >300 mm above 'the commence to flow' water level – Where the cell is installed at less than 300 mm below bed level, the culvert floor must be roughened throughout to approximately simulate natural bed conditions – The culvert must be installed at no steeper gradient than the waterway bed gradient – Apron and stream bed scour protection must be provided in line with the design requirements of the guidelines.
Low	<ul style="list-style-type: none"> – Works must commence and finish within a maximum time of 360 calendar days and instream sediment and instream silt control measures associated with the works must be removed within this period – In all crossings the minimum (combined) culvert aperture width must be 1.2 m or span 100% of the main channel width – All new or replacement culvert cells must be installed at or below bed level – The culvert must be installed at no steeper gradient than the waterway bed gradient – Apron and stream bed scour protection must be provided in line with the design requirements of the DAF, 2013.

The project is located at the headwaters of two major catchments, the Macintyre Brook and Dumaresq River catchments. A desktop topographic review highlighted that two catchments will naturally discharge from the project at three distinct locations, forming three sub catchments. These catchments are highlighted on Figure 2-5 and detailed below. Additionally, surface water flows out of the project at two other distinct locations.

- The upper reach of the Macintyre Brook sub catchment, referred to as the Northern Catchment. The catchment discharges through the Macintyre Brook from the south west of the catchment flowing off site at

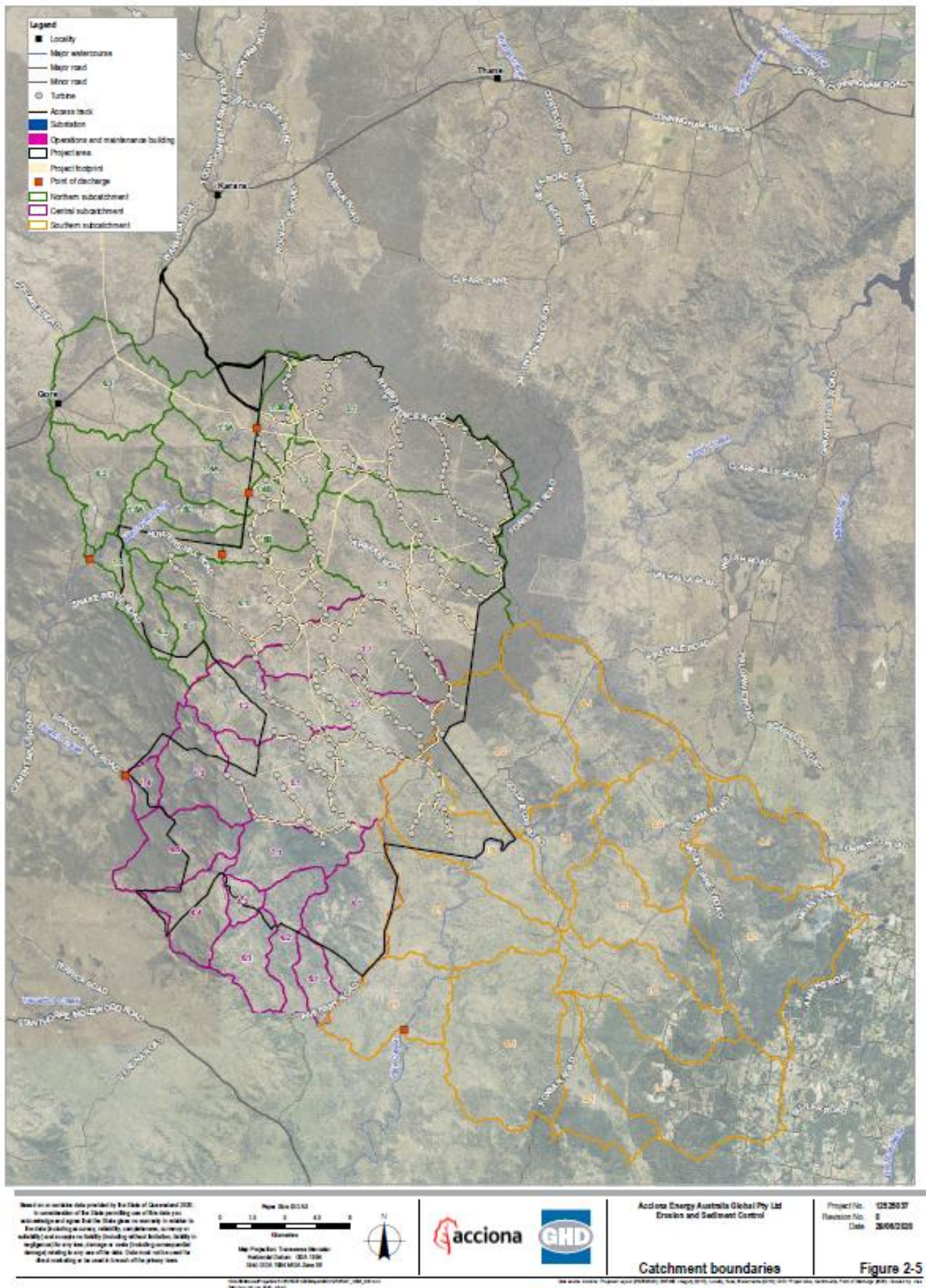
three different locations and subsequently flows in a west / south westerly direction. This portion of the Macintyre Brook travels approximately 5.8 km to the south west of the project boundary before converging with a downstream tributary

- The Macintyre Brook tributary sub catchment, referred to as the Central Catchment. This catchment predominantly flows from east to west through the aforementioned downstream tributary of the Macintyre Brook. The tributary travels approximately 7 km downstream of the site boundary before the point of confluence with the Macintyre Brook
- The Pike Creek sub catchment, referred to as the Southern Catchment. This catchment discharges through Pike Creek, which predominantly flows from north east to south west. The Creek travels approximately 60 km before converging with the Severn River downstream of the Project boundary.

Waterway barrier works



Figure 2-5 Catchment boundaries



2.6.1 Receiving water quality objectives

The *Healthy Waters Management Plan* (HWMP) is a planning mechanism to improve the quality of Queensland waters. It aims to meet the requirements set out in the *Environmental Protection (Water) Policy 2009* (EPP Water), this being the subordinate legislation of the *Environmental Protection Act 1994* (Qld).

Receiving Water Quality Objectives (WQOs) are tangible long-term objectives to protect the environmental values (EV) for specific receiving waters. WQOs outline the measures, levels or indicators of water quality that are adopted to preserve the prescribed EVs of a catchment. In accordance with the HWMP (DES, 2019), the project site is located within the Trap Rock catchment in the Border Rivers basin. The specified receiving WQOs for consideration for the proposed development area are detailed below in Table 2.8.

Table 2.8 Receiving water quality objectives, HWMP (DES, 2019)

Water Quality Objective	Trap Rock catchment waters (Low Flow)	Trap Rock catchment waters (High Flow)
Turbidity (NTU)	4	9
Total Phosphorus (µg/L)	30	40
Total Nitrogen (µg/L)	520	600
Dissolved Oxygen (% Sat.)	60 - 100	60 - 100
pH	7.1 - 8.0	6.9 - 7.7
Salinity	N/A	N/A
Temperature (Monthly median with the range)	Between the 20th and 80th percentiles of natural monthly water temperature	Between the 20th and 80th percentiles of natural monthly water temperature
Electrical Conductivity (µS/cm)	290	215
Total Suspended Solids (mg/L)	5	10
Alkalinity (mg/L as CaCO ₃)	40	55
Oxidised Nitrogen (µg-N/L)	6	Insufficient data to develop a target value
Ammonium N (µg-N/L)	10	Insufficient data to develop a target value
Filterable Reactive Phosphorus (µg-P/L)	8	Insufficient data to develop a target value
Sulphate as SO ₄ (mg/L)	25	18
Chlorophyll-a (µg/L)	Insufficient data to develop a target value	Insufficient data to develop a target value

3. Construction activities and erosion risk assessment

The section provides an overview of the activities likely to occur throughout the construction of the wind farm and associated ancillary infrastructure that may have the potential to cause soil erosion across the project site.

3.1 Construction infrastructure

As part of the construction of the wind farm and OHTL, a variety of ancillary infrastructure is proposed, throughout the construction and operation phases. The proposed construction infrastructure includes:

- Up to 169 wind turbines
- Approximately 64 km of 330 kV overhead transmission line
- Access tracks
- Wind turbine foundations and hardstands
- Wind monitoring towers
- Laydown areas
- Quarry / borrow pit areas (potential)
- Batching plants
- Operations and maintenance facilities
- Substations
- Switching stations
- Construction compounds.

Site access

It is anticipated that the site access will utilise the existing access point on Carbean Road off the Cunningham Highway to facilitate access to the wind farm.

This access point will be used during construction and operation of the wind farm and will be where the majority of all roads will access the site. New fencing alignments, together with grids and gates, will also be installed on site where required.

Access tracks

The internal access tracks have been designed to utilise the existing topography of the land, minimising the amount of land required where possible. Access tracks located in proximity to regulated vegetation have been individually refined to avoid and minimise impacts to regulated vegetation. It is likely that approximately 195 km of access track will be required for the wind farm, however this will be updated as the design is further refined.

It is likely that a permanent access track will be constructed and maintained along the OHTL, however the location and total length is unknown at this stage.

The following design criteria and mitigation measures were applied to the access track layout to mitigate potential impacts:

- Tracks will typically be 5.5 m wide within a construction corridor and will be constructed from well graded crushed rock
- Tracks may be wider in some areas to allow for regular passing places, turning areas and to account for site terrain
- The number of watercourse crossings have been minimised as far as practicable, with the possibility of larger waterways requiring the introduction of culverts or ford crossings

- Track margins will be vegetated to reduce potential sediment-laden run-off.

The construction of access tracks will vary depending on localised ground conditions. Conditions impacting construction include the existing vegetation, nature of the topsoil, level of moisture in the ground, geotechnical base and localised topography.

3.2 Construction methodology

Land disturbance activities that are expected to occur during the design, preconstruction and/or construction phases of the project include:

- Soil and geotechnical investigations, as part of the detailed design
- Detailed site investigations, including the establishment of roads, and clearing for the purposes of micro-siting the turbines
- Site mobilisation and establishment (temporary site facilities, laydown areas, equipment and materials)
- Possible off-site road works
- Installation of wind monitoring towers and establishment of roads and clearing for their installation
- Clearing and grubbing (including vegetation removal)
- Earthworks, paving (with gravel cap) and drainage for access roads and wind turbine hardstands
- Excavation for the foundations
- Construction of wind turbine foundations (ground anchors, bolt cage, reinforcement and concrete)
- Installation of electrical and communications cabling and equipment
- Installation of towers for the wind turbines, delivery of the wind turbine components to the site
- Installation of wind turbines (nacelles and blades), using large mobile cranes
- Installation of switching turbines
- Commissioning and reliability testing of wind turbines
- Installation of transmission line, including temporary laydown area clearing for the erection of structures and electrical cables
- Site stabilisation
- Progressive rehabilitation/landscaping of the site where possible.

The activities listed above will predominantly occur in the order listed; however, some of these activities will be carried out concurrently to minimise the overall length of the construction programme, such as the concurrent construction of the OHTL alignment and wind farm construction activities.

3.3 Rainfall and erosion risk

Rainfall data presented in Table 3.1 was sourced from the Bureau of Meteorology (BOM, 2020) Leslie Dam Weather Station (Station ID: 041445), which is located approximately 20 km north east of the project. The majority of rain falls between October and March, with the highest mean rainfall occurring in December with 97.8 mm and the lowest mean rainfall occurring in August with 31.0 mm. The mean maximum temperature for the area is 24.9 °C, whilst the cooler months have a mean minimum temperature of 10.5 °C.

The rainfall and erosion risk for the project has been determined according to the criteria listed in Table 33 from IECA, 2008 (refer to Table 3.2).

Table 3.1 Rainfall and erosion risk for Leslie Dam Weather Station

	January	February	March	April	May	June	July	August	September	October	November	December
Average rainfall (mm)	88.0	73.0	56.6	34.6	37.0	35.2	39.2	31.0	34.6	64.2	68.2	97.8
Erosion risk rating	M	M	M	L	L	L	L	L	L	M	M	M

Table 3.2 Erosion risk rating based on average monthly rainfall (IECA, 2008)

Erosion risk rating ^[1]	Expected 24 hour rainfall	Average monthly rainfall
Very Low	0 to 2 mm	0 to 30 mm
Low	2+ to 10 mm	30+ to 45 mm
Moderate	10+ to 25 mm	45+ to 100 mm
High	25+ to 100 mm	100+ to 225 mm
Extreme	>100 mm	>225 mm

Note: ^[1] Erosion risk rating based on worst case of expected rainfall within any 24-hour period or average monthly rainfall.

3.4 Preliminary erosion hazard assessment

Soil erosion hazard refers to the susceptibility of a parcel of land to the prevailing agents of erosion. The preliminary erosion hazard assessment adopted is based on the 'point score hazard assessment system' established in IECA (2008) and is included as Appendix A.

Based on this assessment, the site is considered to be 'high risk' erosion hazard as the total score is 29 (disturbances with scores <17 are considered 'low risk').

As the preliminary erosion hazard assessment of the proposed construction identifies that the project is 'high risk', the revised universal soil loss equation (RUSLE) is required to estimate the annual soil loss from the proposed development without controls, as part of the site-specific Erosion and Sediment Control Plan.

It is noted that the preliminary erosion hazard assessment was completed for the project as a whole, and it is expected that selected areas of the construction site will reveal lower erosion risk than others. During the development of the site-specific Erosion and Sediment Control Plan, a more detailed erosion hazard assessment will be undertaken to determine the minimum required erosion and sediment controls.

3.5 Construction staging and timing

Land disturbance activities are expected to occur across both the wet and dry seasons. Ideally, the majority of the land disturbance or minor earthworks within or near waterways would be completed between April and September, with the remainder of the works completed during the wet season, which typically begins in October and lasts through to March, to avoid the potential risk of increased soil erosion.

Staging of works can be the most effective tool to minimise erosion risk, however ultimately the Contractor will be responsible for determining appropriate construction staging. At present, it is anticipated that construction will begin in the northern portion of the wind farm area, and progress in a southerly direction.

The works schedule should also consider the expected and predicted rainfall forecast for the region. In particular, clearing and rehabilitation activities shall aim to avoid periods of predicted significant rainfall. These factors are of the greatest importance when works are programmed to occur within or adjacent to major waterways. Clearing and

revegetation activities shall be halted during periods of significant rainfall, and appropriate temporary control measures may be required to be implemented and closely monitored during these events.

The Contractor shall ensure implementation of erosion and sediment controls, and shall also keep a record of rainfall forecast for the following week. Rainfall in excess of 10 mm significantly increases erosion risk. Therefore, the Contractor will have to ensure that there are no unprotected exposed surfaces, and that all sediment controls are functioning and have the required capacity prior to predicted (greater than 50% chance) rainfall events of greater than or equal to 10 mm.

4. Erosion and sediment control measures

The Contractor is responsible for implementing all erosion and sediment control measures and these must be implemented in accordance with best practice principles. A range of control measures are available for use across the project site, and those recommended in this section are based on the IECA '*Best Practice Erosion and Sediment Control*' documents (2008). The selection and implementation of appropriate ESC measures is dependent on a number of factors including the anticipated disturbance duration, slope, soil characteristics and availability of materials etc.

All erosion, sediment and drainage control measures listed in Table 4.1 must remain in place until all construction works are completed and surfaces are stabilised and revegetated.

Table 4.1 Erosion, sediment control and water quality mitigation measures

Aspect	Environmental management measures	Responsibility
Erosion control	Minimise disturbance area.	Construction Manager HSE Manager
	Vegetation and topsoil clearing is to be staged and undertaken, as soon as practicable prior to construction works, to minimise exposure.	
	Exposed soil is to be stabilised with appropriate cover material as soon as practicable.	
Sediment control	Appropriate sediment controls, based on the estimated annual soil loss at the site, are to be implemented prior to the commencement of construction works.	Construction Manager HSE Manager
	Where exposed soils cannot be stabilised, water tankers shall be deployed to suppress dust.	
	On-site stockpiles are to be located above flood extents, within close proximity to the project and covered, if appropriate.	
	Instream sediment controls may be required where access tracks cross flowing waterways.	
	Water quality monitoring may be required at locations and where instream controls are and where excess sediment-laden runoff has potential to be released off site.	
Drainage control	Divert upslope clean water flows around the construction areas towards site discharge locations.	Construction Manager HSE Manager
	Diversion drains to be constructed to direct on-site sediment-laden runoff towards sediment control devices.	
	Appropriate drainage controls be placed on exposed surfaces, to reduce velocities and minimise soil erosion.	
Waste water	Construction waste water is to be collected in holding tanks and trucked out.	Construction Manager HSE Manager
Stormwater	Stormwater management is to be undertaken in accordance with Stormwater Management Report (GHD, 2020b).	Construction Manager HSE Manager

4.1 Erosion control

Erosion is dependent on the likelihood and intensity of predicted and/or expected rainfall. Where construction activities are scheduled during the dry season when rainfall is unlikely or limited, the required erosion protection measures may be significantly less than if construction was to occur during the wet season (IECA, 2008).

Erosion control devices should be employed as soon as reasonably practicable to limit soil erosion, and to protect the exposed areas of soil from raindrop impact erosion. Best practice land erosion control and site rehabilitation is largely dependent on the likelihood and timing of rainfall and wind events.

Refer to Table 4.4.7 of the IECA Manual (summarised below as Table 4.2) for best practise measures associated with site rehabilitation depending on the overall site erosion risk based on monthly erosivity, determined in Section 3.3.

Table 4.2 *Best practice erosion requirements¹*

Risk	Best practice requirements
All cases	All reasonable and practicable steps taken to apply best practice erosion control measures to completed earthworks, or otherwise stabilise such works, prior to anticipated rainfall – including existing unstable, undisturbed, soil surfaces under the management or control of the construction works.
Low	Land clearing prior to the commencement of construction work to be limited to a period of time agreed upon by the parties Disturbed soil surfaces stabilised with minimum 70% cover within 30 days of completion of works within any area of a work site Unfinished earthworks are suitably stabilised if rainfall is reasonable possible, and disturbance is expected to be suspended for a period exceeding 30 days.
Moderate	Land clearing prior to the commencement of construction work to be limited to a period of time agreed upon by the parties Disturbed soil surfaces stabilised with minimum 70% cover within 20 days of completion of works within any area of a work site Staged construction and stabilisation of earth batters (steeper than 6H:1V) in maximum 3 m vertical increments wherever reasonable and practicable Unfinished earthworks are suitably stabilised if rainfall is reasonable possible, and disturbance is expected to be suspended for a period exceeding 20 days.

Minimise disturbance area

Although the proposed maximum construction footprint has been pre-defined, the area of disturbance shall be minimised by the Contractor through staged clearing activities, where possible. Specifically, the clearing phase shall minimise encroachment on sensitive areas, such as riparian vegetation, waterways and any mapped regional ecosystems. Exclusion zones are to be clearly set out and marked prior to clearing and bulk earthworks, as per the approved project footprint.

Vegetation clearing

Any vegetation to be retained on site shall be clearly marked to mitigate the risk of accidental clearing occurring. Where vegetation clearing is necessary, any cleared vegetation shall be mulched and/or retained for use, to provide a temporary blanket for erosion control on cleared slope batters or used as topsoil bunds for clean water diversion. Any mulch that is generated from the clearing activities may be used as temporary ground cover.

Vegetation clearing adjacent to waterways shall be minimised, where possible, and delayed until absolutely necessary. Progressive stabilisation and, where possible, revegetation of disturbed areas shall occur as reasonably practicable.

If vegetation clearing is required to be carried out well in advance of earthworks, the clearing Contractor shall aim to remove only woody vegetation, leaving the understory growth. Grubbing and removal of ground cover and understory is to be delayed until immediately prior to construction works occurring within that particular stage of development.

Surface treatments and stabilisation

Revegetation and ground coverage of low-growing ground cover vegetation can be one of the most effective forms of permanent erosion controls (IECA, 2008). Vegetation and groundcover increases the surface roughness, slowing stormwater runoff, protects the soil against raindrop impact and reduces the evaporation losses from the underlying soil.

¹ Reproduced from Table 4.4.7 of IECA (2008).

Soil stabilisation techniques that may be applied across the project site include those detailed below in Table 4.3.

Table 4.3 Soil stabilisation techniques

Technique	Typical use
Soil binders	<ul style="list-style-type: none"> Stabilisation of exposed soil surfaces and stockpiles to control wind and raindrop impact erosion Control of raindrop impact erosion on flat and mild slopes, greater than 1V:3H.
Erosion control blanket	<ul style="list-style-type: none"> Temporary erosion control on exposed soils not subjected to concentrated flow Temporary control of raindrop impact erosion on earth embankments before and during the revegetation phase.
Gravelling	<ul style="list-style-type: none"> Protection of non-vegetated soils from raindrop impact erosion Stabilisation of hardstand areas including site office area, process areas, temporary car parks and access roads.
Heavy mulching	<ul style="list-style-type: none"> Stabilisation of soil surfaces that are expected to remain non-vegetated for medium to long periods Suppression of weed growth on non-grassed areas.
Light mulching	<ul style="list-style-type: none"> Control of raindrop impact erosion on flat and mild slopes. May be placed on steeper slopes with appropriate anchoring Control water loss and assist seed germination on newly seeded soil.
Revegetation	<ul style="list-style-type: none"> Temporary and permanent stabilisation of soil Stabilisation of long-term stockpiles Includes turfing, hydromulch, and other native seed blends.

4.2 Sediment control

Sediment control techniques shall be applied across the disturbed areas to limit mobilisation of, and settle mobilised, soil particles across the site. Sediment control techniques slow the movement of water and allow the influence of gravity to settle out particles before discharging into the receiving environment.

Sediment control devices

Required sediment controls are site specific and are determined through calculating the estimated annual soil loss at the site, based on site conditions and proposed works. In accordance with IECA (2008), the RUSLE should be used to estimate this annual soil loss. Based on the determined annual soil losses, all sediment control measures must be designed to satisfy, as a minimum, the design standard outlined in Table G7 of IECA. It is a requirement of the Contractor to determine this soil loss, and associated sediment controls, as part of the site-specific Erosion and Sediment Control Plan.

Sediment control techniques that may be applied within the project site are detailed in Table 4.4.

Table 4.4 Sediment control measures

Sheet flow techniques	Minor concentrated flow techniques
<ul style="list-style-type: none"> Buffer zones 	<ul style="list-style-type: none"> Check dam sediment trap
<ul style="list-style-type: none"> Compost berm 	<ul style="list-style-type: none"> Coarse sediment trap
<ul style="list-style-type: none"> Fibre roll 	<ul style="list-style-type: none"> Filter tube dam
<ul style="list-style-type: none"> Filter fence 	<ul style="list-style-type: none"> Modular sediment trap
<ul style="list-style-type: none"> Mulch berm 	<ul style="list-style-type: none"> Sediment basin

Sheet flow techniques	Minor concentrated flow techniques
<ul style="list-style-type: none"> Sediment fence - woven fabric 	<ul style="list-style-type: none"> Rock filter dam
<ul style="list-style-type: none"> Sediment fence - non-woven composite fabric 	<ul style="list-style-type: none">

Instream works

Where the access tracks and other infrastructure pass through waterways, the need for additional sediment controls within the waterways may be required to prevent excess sediment from discharging off site and impacting on the downstream environment. During the construction of any works within a waterway, including temporary roadways, in addition to the above sediment controls, silt curtains, rock filter dams or instream bunds may require implementation depending on the state of the waterway.

Sediment controls within a waterway must ensure that control measures do not impede fish passage.

Dust suppression

The most effective control measure against wind erosion is revegetation; however, in some cases this is not reasonably practicable until the end of the construction period. In the interim, water tankers shall be employed to suppress dust on site during construction periods and other times, as necessary. Exposed channel surfaces must be rehabilitated as soon as practicable to minimise the potential environmental risk and in accordance with Table 4.4.7 of the IECA Manual.

Stockpile management

Large stockpiling sites and site laydown and office facilities are to be located in defined areas, above flood extents and within close proximity to the main site access ways. Sediment fencing and diversion drains are to be implemented downslope and upslope of all stockpiles, respectively, if demanded by the site conditions.

Stormwater discharge off site

Stormwater is discharged from the project site into a number of large and small tributaries that pass through the project site, and ultimately flow into the Macintyre Brook. It is likely that these are active waterways that contain water during the construction works. As bulk earthworks within these areas involve the construction of infrastructure within the waterways, as well as minor bank re-grading, water quality monitoring may be required to be undertaken as part of construction works.

4.3 Drainage control measures

The primary functions of drainage control measures are to minimise the risk of erosion, minimise the risk to the adopted erosion and sediment control measures, control the velocity and location of water flowing through the site, and to appropriately management 'clean' and 'dirty' water flows through the site during construction.

Proposed measures for the project site are as follows, noting that these best practice measures are to be applied only where upstream waters intercept the construction works area, if necessary:

- During all phases of construction, the management of upstream waters must be considered and appropriately managed. Upstream water must be either diverted, bunded or pumped through the site during periods of low flows. During periods of high flows, the Contractor must ensure upstream flows are channelled through the site via stabilised drainage paths
- Provide diversion works (for example, clean water topsoil bunds) to direct clean water flows from external catchments upslope of the project site towards existing discharge points, where possible. Diversion drains are to be constructed as trapezoidal bunds or channels and appropriately lined to minimise the risk of scour occurring
- Provide diversion drains (dirty water channels) to direct dirty water flows from internal catchments towards sediment treatment devices, where necessary
- Rock check dams are to be placed within the cleared areas where on slopes, where required, to reduce runoff velocities and minimise soil erosion caused during rainfall runoff events.

Low gradient slopes

The proposed wind turbines, wind farm supporting infrastructure and OHTL infrastructure are generally located on ridge lines where the land is characterised by a low gradient. Appropriate drainage controls that may be applicable to the site in these areas are detailed in Table 4.5.

Table 4.5 Low gradient drainage control measures

Technique	Typical use
Catch drain	<ul style="list-style-type: none"> – The collection and diversion of sheet flow across a slope or around soil disturbances – Best used in non-dispersive soils, otherwise the drain must be lined with non-dispersive soils (minimum 100 mm thick) prior to placement of channel liner.
Compost berm	<ul style="list-style-type: none"> – Primarily used as a sediment filter berm, but can be used as a flow diversion bank – Used when onsite land clearing produces sufficient quantities of organic matter.
Flow diversion banks (earth, sandbags, etc)	<ul style="list-style-type: none"> – Flow diversion at the base of fill slopes – Cross drainage on unsealed roads – Flow diversion upslope of excavation and trenches.

High gradient slopes

The proposed access tracks connecting the wind turbines, OHTL and other supporting infrastructure are distributed throughout the project on both flat and sloped land. Drainage controls more suited to sloped surfaces, with the aim of reducing soil erosion, are detailed in Table 4.6.

Table 4.6 Drainage slope control measures

Technique	Typical use
Chute	<ul style="list-style-type: none"> – Discharge of concentrated flows down steep slopes – Temporary drainage down the face of newly formed road embankments.
Level spreader	<ul style="list-style-type: none"> – Conversion of minor concentrated flows back to sheet flows – Discharge of flows down grassed slopes – Discharge of sheet flow into bushland.
Slope drain	<ul style="list-style-type: none"> – Discharge of minor flows down steep slopes – Discharge of minor flows through bushland and other areas where it is essential to minimise disturbance to vegetation and soil.

Excessive flow velocities can cause channel erosion, usually along the invert (bottom) of the drain. This type of erosion is usually found in newly formed drains, before stabilisation has occurred. The velocity of the flow can be reduced through:

- Increasing the width of the bottom of the channel
- Reducing the gradient of the bed slope
- Increasing the channel roughness.

In most cases, it is usually more practicable and economical to line the channel instead of attempting to reduce slope gradient and widening drains. Channel lining options and their typical use are detailed below in Table 4.7.

Table 4.7 Channel lining options

Technique	Typical use
Vegetation	<ul style="list-style-type: none"> – Permanent lining of low velocity chutes, catch drains and diversion channels.
Erosion control matting	<ul style="list-style-type: none"> – Temporary or permanent scour protection of medium velocity drains. Includes the use of erosion control mesh made from jute or coir.
Rock lining	<ul style="list-style-type: none"> – High velocity drainage channels – Drainage chutes

Technique	Typical use
	– Sediment basin spillways.

5. Monitoring and maintenance

5.1 Site inspections and monitoring

5.1.1 General

In accordance with Section 7.2 of the IECA Manual, the Contractor shall make allowance for the preparation of a formal monitoring and maintenance program prior to site establishment. The monitoring and maintenance program shall make allowance for required site inspections (detailed in Section 5.1.3), monitoring of erosion and sediment control devices (which may include the inclusion of water quality monitoring) and reporting of results, inspections and non-compliance.

5.1.2 Responsible persons

In accordance with Chapter 7 of the IECA Manual, the Contractor shall generally be responsible for all items prescribed in this Report. The Contractor shall identify appropriate persons (i.e. HSE Manager) to ensure compliance with erosion and sediment control requirements and objectives for the project duration.

In addition to the erosion and sediment control elements detailed in this report, the Contractor shall also ensure the following general management practices are incorporated:

- Establish an erosion and sediment control training program for site staff
- Appropriately control subcontractors and material suppliers
- Suitably control site traffic to minimise dust generation and undesirable soil compaction outside designated access roads
- Maintain adequate supplies of emergency erosion and sediment control materials and ensure that these items are available at all times, particularly prior to imminent rainfall
- Establish an appropriate site inspection routine as well as the staff responsible for these inspections.

For further information regarding general construction practice and the management of construction sites, refer to Chapter 7 of the IECA Manual and the IECA 'Site Management' fact sheet.

5.1.3 Inspections and monitoring

General

Site inspections and monitoring are to be undertaken in accordance with Sections 6.17, 7.4, 7.6 and Appendix I of the IECA Manual and as detailed below. ESCPs are living documents that can and should be modified as site conditions change, or if the adopted measures fail, to achieve the required treatment standard. When a site inspection detects a notable failure in the adopted ESC measures, the source of the failure must be investigated and appropriate amendments made to the site and the plans.

As per section 5.1.1 and 5.1.2 of this ESCP a Monitoring and maintenance program should be created by the Contractor based on the:

- Active areas of construction work as site conditions change
 - Extent of exposure
 - Revegetation/cover factor of exposed area
- Location and type of receiving environments

- Expected weather conditions during the period of soil disturbance
- Local soil conditions, particularly the zones of clayey, sandy and dispersive soils

Inactive sites can have a modified version of the below monitoring and inspection program. This must be justifiable based on the above parameters. Active sites program as a minimum shall meet the below in Table 5.1:

Table 5.1 *Erosion, sediment control and water quality inspection and monitoring*

Task	Monitoring frequency	Reporting mechanism	Responsibility
Inspection of all erosion, sediment and drainage control measures. as	At a minimum weekly, and : Daily during runoff-producing rainfall Prior to anticipated runoff-producing rainfall, and Following runoff-producing rainfall.	Erosion and Sediment Control Daily/Weekly Inspection Form.	HSE Manager
Identification of excessive sediment deposition (whether on or off site).	At a minimum weekly, and: Daily (during rainfall), and Following runoff-producing rainfall.	Erosion and Sediment Control Daily/Weekly Inspection Form.	HSE Manager
Identification of construction materials, litter or sediment placed, deposited, washed or blown from the site, including sediment deposition by vehicular movements.	Weekly.	Erosion and Sediment Control Weekly Inspection Form.	HSE Manager
Inspection of litter and waste receptors.			
Inspection of oil, fuel and chemical storage facilities.			
Inspection of all site discharge points.	At a minimum weekly, and: Daily during runoff-producing rainfall.	Erosion and Sediment Control Daily/Weekly Inspection Form.	HSE Manager
Inspection of all temporary flow diversion and drainage works.	Prior to anticipated runoff-producing rainfall events.	Erosion and Sediment Control Daily Inspection Form.	HSE Manager

Inspections

The IECA Manual requires that all erosion and sediment control measures be inspected as follows:

- Daily site inspections (during runoff-producing rainfall):
 - All drainage, erosion and sediment control measures (when work is occurring on site)
 - All instream erosion and sediment control measures (when work is occurring on site)
 - Occurrences of excessive sediment deposition (whether on or off site)
 - All site discharge points.
- Weekly site inspections:
 - All drainage, erosion and sediment control measures (when work is not occurring on site)

- All instream erosion and sediment control measures (when work is not occurring on site)
- Occurrences of excessive sediment deposition (whether on or off site, where visible from discharge points)
- Occurrences of construction materials, litter or sediment placed, deposited, washed or blown from the site, including deposition by vehicular movements
- Litter and waste receptors
- Oil, fuel and chemical storage facilities.
- Prior to anticipated runoff-producing rainfall (within 24 hours of rainfall occurring):
 - All drainage, erosion and sediment control measures
 - All temporary flow diversion and drainage works.
- Prior to rainfall event of sufficient intensity and duration to cause runoff (within 18 hours of rainfall occurring):
 - All drainage, erosion and sediment controls
 - All temporary flow diversion and drainage works
 - All instream erosion and sediment measures.
- Following runoff-producing rainfall (within 18 hours of rainfall event):
 - All drainage, erosion and sediment control measures
 - All instream erosion and sediment control measures
 - Occurrences of excessive sediment deposition (whether on or off site)
 - Occurrences of construction materials, litter or sediment placed, deposited, washed or blown from the site, including deposition by vehicular movements.

Water quality monitoring

If water quality monitoring is required during construction works, it shall be undertaken in accordance with Section 7.5 of the IECA Manual for the water quality objectives outlined in Section 2.6.1.

As mentioned in Section 2.6, surface water discharges from the project at five distinct locations. Water quality sampling and analysis should be undertaken at these locations while a rain event is occurring. As the majority of these discharge points are located within waterways, water quality monitoring should also be undertaken at undisturbed upstream locations, if accessible.

Where access tracks or other works are being completed within or adjacent to a waterway, water quality monitoring should be undertaken simultaneously upstream and downstream of this location to assess potential impact.

If the water quality objectives are not met, additional water quality monitoring may be required to assess the effectiveness of remediation erosion and sediment control measures.

5.1.4 Maintenance

Any erosion and sediment control failures or excess sediment build up identified during the site inspections is to be rectified as soon as practicable following identification.

Any sediment removed from devices should be disposed of in a lawful manner that does not cause ongoing soil erosion or environmental harm.

5.1.5 Reporting

It is recommended that site check sheets be filled out weekly, and monthly reports be completed by the Contractor. Monthly reports shall include water quality monitoring reports (if required), details of the performance of the site's monitoring and maintenance activities, non-compliances and corrective actions implemented.

As the site has been identified as 'high risk' (see Section 3.4), the Contractor shall also engage an independent, appropriately qualified person (i.e. CPESC) to undertake regular erosion and sediment control audits to confirm compliance with best practice.

A register should be maintained for the duration of the project site works, and should be available for review during site inspections undertaken by a regulatory authority. Any environmentally relevant incidents which occur on the site should be recorded, and also be available for review during site inspections undertaken by regulatory authorities.

If erosion and sediment controls have been found to be deficient or failed in service, due to unforeseen circumstances, corrective action is to be undertaken immediately which may include modifications to the approved ESCP. Such modifications are to be approved by the Contractor.

5.2 Wet weather preparedness

In accordance with the IECA Manual, the project site shall be appropriately prepared for both likely and unlikely wet weather conditions. The Contractor shall consider developing a wet weather preparedness plan to establish appropriate erosion and sediment control measures and actions that may be implemented prior to a predicted wet weather event.

The following erosion and sediment control measures may be considered appropriate for inclusion within the wet weather preparedness plan:

- Inspect the condition of all erosion and sediment control devices on site to ensure that these measures are operationally effective prior to the rainfall event
- Establish temporary flow diversion up-slope of open, newly formed batters
- Stabilise all drainage pathways and exposed surfaces still subject to construction with temporary erosion and sediment control techniques (i.e. erosion control blankets, hydraulic blankets and mulching)
- Secure erosion control blankets with additional anchorage such as sandbags, rocks or timber stakes
- Ensure overflow weirs of any sediment basins or rock filter dams are structurally sound to withstand greater flow rates should the capacity of basins and dams be exceeded by the predicted weather event.

5.3 Non-conformance and corrective actions

Where an environmental non-conformance occurs regarding erosion and sediment control (loss of sediment from the site, accidental discharge of sediment into adjacent waterways, riparian zones or drainage lines), the Contractor shall immediately inform the Principal and the DES of the incident. The Contractor must also prepare a monthly report detailing any incidents of environmental nuisance and non-conformance for review by DES, if requested.

Table 5.2 Erosion, sediment control and water quality corrective actions

Incident	Corrective action
Soil erosion	Upslope flow is to be diverted around the erosive area.
	Soil may require testing to confirm if ameliorates need to be applied.
	Soil is to be stabilised with an appropriate cover material.
Sediment and drainage control failures	Inspection of the controls to determine appropriate rectification measures.
	Controls are to be repaired in accordance with manufacturer's specifications.
	Regularly monitoring controls to assess stability.
Build-up of sediment	Excess sediment is to be removed to ensure controls continue to operate effectively.

Incident	Corrective action
	Environmental officer to consider the placement of additional sediment controls upstream of the location of excess sediment deposition.
Off-site discharge of sediment-laden runoff	Environmental officer to assess the source of the sediment-laden runoff.
	Additional sediment controls may need to be installed or areas of exposed soil are to be stabilised.
	Water quality monitoring to be undertaken regularly to ensure sediment-laden runoff is not discharged off site.

The Contractor has a responsibility to report to DES all major environmental incidents that risk causing environmental harm under the *Environment Protection Act 1994*.

Where an environmental incident occurs, the following mitigation strategies shall be adopted as a minimum:

- All non-conformances and incidents are to be corrected as soon as possible and strategies implemented to reduce the likelihood of the incident reoccurring
- Containment of the sediment laden runoff, where possible
- The HSE Manager is to review the erosion and sediment control measures in place for effectiveness and check maintenance records
- An incident / accident report is to be completed for all non-conformances and incidents.

Where incidents have occurred, the Contractor shall ensure that all reasonable and practical control measures are implemented for future operations. This may include reviewing water quality monitoring data, where exceedances have been found, and implementing additional and/or alternative controls to achieve the required environmental outcomes.

6. Conclusion

This Report has been produced to demonstrate the management of erosion and sediment hazards and risks for the proposed project, and demonstrates compliance with relevant requirements within State Code 16 and State Code 23.

Further recommendations for erosion and sediment controls relevant to this project are:

- Undertake site investigations to confirm geotechnical and soil conditions (characterisation of dispersive and sodic soils) that will inform the site-specific ESCP
- Prepare a site-specific Erosion and Sediment Control Plan as part of the CEMP for the project, in accordance with the IECA guidelines and recommendations provided in this Report and any development permit conditions, prior to any disturbance occurring within the project.

7. References

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Department of Natural Resources, Mines and Energy 2018. *Queensland Globe*, State of Queensland.

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Queensland Nature Conservation Act 1992. Queensland Government.

Appendix A

Preliminary erosion hazard assessment

Table 1 Erosion Hazard Assessment

Table 1
Erosion Hazard Assessment

Controlling Factors	Point System	Fairview Resource Reserve Phase 2 - Average
Item 1 – Average slope of Disturbance Area		
not more than 3%	0	2
more than 3% but not more than 5%	1	
more than 5% but not more than 10%	2	
more than 10% but not more than 15%	4	
more than 15%	6	
Item 2 – Soil Classification Group		
GW, GP, GM, GC	0	3
GW, GP, OL, OH	1	
SM, SC, MH, CH	2	
ML, CL, or if imported fill* is used, or if soils are untested	3	
*Soils are crushed mudstone		
Item 3 – Emerson (Dispersion) Class Number		
Class 4, 6, 7, or 8	0	4
Class 5	2	
Class 3, (default value if soils are untested)	4	
Class 1 or 2	6	
Item 4 – Anticipated Duration of Soil Disturbance		
not more than 1 month	0	6
more than 1 month but not more than 4 months	2	
more than 4 months but not more than 6 months	4	
more than 6 months	6	
Item 5 – Area of Disturbance		
not more than 1000 m ²	0	4
more than 1000 m ² but not more than 5000 m ²	1	
more than 5000 m ² but not more than 1 ha	2	
more than 1 ha but not more than 4 ha	4	
more than 4 ha	6	
Item 6 – Waterway Disturbance		
No disturbance to a watercourse, open drain or channel	0	2
Involves disturbance to a constructed open drain or channel	1	
Involves disturbance to a natural watercourse	2	
Item 7 – Rehabilitation Method		
Percentage of area (relative to total disturbance) revegetated by seeding without light mulching (i.e. worst-case revegetation method)		0
not more than 1%	0	
more than 1% but not more than 5%	1	
more than 5% but not more than 10%	2	
more than 10%	4	
Item 8 – Receiving Waters		
Saline waters only	0	2
Freshwater body (e.g. creek or freshwater lake or river)	2	
Item 9 – Subsoil Exposure		
No subsoil exposure except of service trenches	0	2
Subsoils are likely to be exposed	2	
Item 10 – External Catchments		
No external catchment	0	1
External catchment diverted around the soil disturbance	1	
External catchment not diverted around the soil disturbance	2	
Item 11 – Road Construction		
No road construction	0	2
Involves road construction works	2	
Item 12 – pH of soils to be revegetated		
more than pH 5.5 but less than pH 8	0	1
other pH values, or if soils are untested	1	
TOTAL SCORE		29
High Risk Site.		

CONTROL

AUTHOR	REVIEWER	APPROVER
Megan Hillier	Peter Gibson	Andrew Tshaikiwsky
16/08/2021	16/08/2021	16/08/2021
<i>Megan Hillier*</i>	<i>Peter Gibson*</i>	<i>Andrew Tshaikiwsky*</i>

**This document has been verified by the IMS Coordinator and meets review and approval requirements*

RECORD OF CHANGES

REV.	DATE	DESCRIPTION
r01	16/08/2021	Initial release

- **Project overview methodology**

The MacIntyre Wind Farm Precinct is located approximately 40km west of the township of Warwick and 70km south west of Toowoomba, as shown in Figure 1. The region is predominantly rural land and used for stock grazing. The wind turbines and ancillary buildings will be located within the Southern Downs Regional and Goondiwindi Regional and the 64 km of overhead transmission line will be located across Goondiwindi and Toowoomba Regional Councils.

Figure 1 – Project Location



The Project will include the construction and operation of a two independent wind farms within the MacIntyre Wind Farm Precinct as follows:

the **Karara Wind Farm**, comprising 18 Nordex N163 5.7MW wind turbines with a hub height of 148 meters with a total power generation name plate capacity of 102.6MW; and

the **MacIntyre Wind Farm**, comprising 162 Nordex N163 5.7MW wind turbines with a hub height of 148 meters and a total power generation name plate capacity of 923.4MW.

- **Program of works / staging details (as per Ausco camp program)**
- **Dust suppression re-use details, which include things such as**
 - **m2 of areas to be sprayed for dust suppression**
 - **km of road to be sprayed for dust suppression**
 - **Number and size of trucks to be engaged**
 - **Timeline and staging of works specifically related to dust suppression**

(we will utilise the above to work out application rates, which will be a critical part of the ERA63 assessment)

The project has various construction operations and dust suppression obligations to meet the requirements of the project earthworks specification, and management of the project site.

The quantities of water required have been derived by utilising a combination of the 30% design development earthworks quantities and the construction program histogram quantities. (Int Delivery Program -17 Feb 2022 Access – 10/4 Roster dated 30-Oct-21)

As detailed in Table 2 below, water demand has not been obtained by using the OMC %. Consultation with the internal ACA team concluded that a lower water percentage value should be adopted due to OMC not being required to achieve the design compaction . The lower water percentage allows the project to optimise the available on-site water sources and reduce the overall demand.

The dust suppression demand has been derived utilising the pavement areas, either in production or completed. The following calculations have been used. Note variations in dust suppression demand per month following construction completion is caused by a change in working days per month.

Dust Suppression

Work Area		Completed Area	
	0.6 L/m2/pass/day		0.6 L/m2/pass/day
	3 # passes/day		1 # passes/day
	1.8 L/m2/day		0.6 L/m2/day

Table 1 – Dust Suppression Quantities

A summary of construction water quantities for each activity is shown in the table below. Total Construction water demand is estimated to be 624,000kl.

MIWF Water Required	
General Fill (Estimated 50% General Fill/50% Rockfill)	
General Fill (m3)	1,332,365.00
Density	2.01
General Fill (t)	2,682,050.75
Insitu MC %	6%
OMC %	12%
Added Water %	2%
Total Water (kl)	53,641.01
Rockfill (Estimated 50% General Fill/50% Rockfill)	
Rock Fill (m3)	1,332,365.00
Density (t/m3)	2.10
Rock Fill (t)	2,797,966.50

Insitu MC %	3%
OMC%	6%
Added Water %	1%
Total Water (kl)	27,979.67
Gravel Pavement	
Gravel Pavement (m3)	545,416.00
Density (t/m3)	2.20
Gravel Pavement (t)	1,199,915.20
Insitu MC %	3%
OMC %	11%
Added Water %	3%
Total Water (kl)	35,997.46
Cable Trenches	
Cable Trenches Fill (m3)	150,976.95
Density (t/m3)	2.01
Cable Trenches Fill (t)	303,765.61
Insitu MC %	6%
OMC %	12%
Added Water %	4%
Total Water (kl)	12,150.62
Dust Suppression	
Total Water (kl)	494,287.83
Total Water Added (kl)	624,056.59

Table 2 – Total Quantity-Construction Water in kl

The monthly water demands have been quantified using the monthly program production rates.

A summary of construction water demand for each month/activity is shown in Table 3 and figures below.

	1-Feb-22	1-Mar-22	1-Apr-22	1-May-22	1-Jun-22	1-Jul-22	1-Aug-22	1-Sep-22	1-Oct-22	1-Nov-22	1-Dec-22
General Fill	0.08	3.90	6.05	5.35	4.96	4.46	5.11	4.84	4.54	3.35	2.67
Rock Fill	0.04	2.03	3.16	2.79	2.59	2.33	2.67	2.53	2.37	1.75	1.39
Gravel Pavement	-	0.44	0.61	1.21	3.08	2.78	3.14	3.22	2.59	2.01	2.63
Cable Trenches	-	-	-	0.97	1.08	0.95	1.25	0.98	0.10	1.17	0.56
Crushing/Quarry Operations	-	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
Dust Suppression	-	0.69	1.03	2.24	5.76	7.16	9.18	9.99	10.12	11.56	11.04
Total	0.12	8.37	12.15	13.87	18.77	18.97	22.65	22.87	21.01	21.15	19.59
	1-Jan-23	1-Feb-23	1-Mar-23	1-Apr-23	1-May-23	1-Jun-23	1-Jul-23	1-Aug-23	1-Sep-23	1-Oct-23	1-Nov-23
General Fill	2.80	3.24	2.29	-	-	-	-	-	-	-	-

Rock Fill	1.46	1.69	1.19	-	-	-	-	-	-	-	-
Gravel Pavement	2.21	2.31	3.03	2.29	2.59	1.87	-	-	-	-	-
Cable Trenches	0.48	1.07	1.17	1.10	1.20	0.05	-	-	-	-	-
Crushing/Quarry Operations	1.30	1.30	1.30	1.30	1.30	1.30	-	-	-	-	-
Dust Suppression	11.60	14.03	17.68	16.43	19.68	18.98	16.38	18.84	18.02	17.20	18.02
Total	19.85	23.64	26.67	21.12	24.76	22.20	16.38	18.84	18.02	17.20	18.02
	1-Dec-23	1-Jan-24	1-Feb-24	1-Mar-24	1-Apr-24	1-May-24	1-Jun-24	1-Jul-24	1-Aug-24	1-Sep-24	1-Oct-24
General Fill	-	-	-	-	-	-	-	-	-	-	-
Rock Fill	-	-	-	-	-	-	-	-	-	-	-
Gravel Pavement	-	-	-	-	-	-	-	-	-	-	-
Cable Trenches	-	-	-	-	-	-	-	-	-	-	-
Crushing/Quarry Operations	-	-	-	-	-	-	-	-	-	-	-
Dust Suppression	13.92	15.56	17.20	16.38	17.20	17.20	17.20	17.20	17.20	17.20	17.20
Total	13.92	15.56	17.20	16.38	17.20	17.20	17.20	17.20	17.20	17.20	17.20

Table 3 – Monthly water demand in (ML)

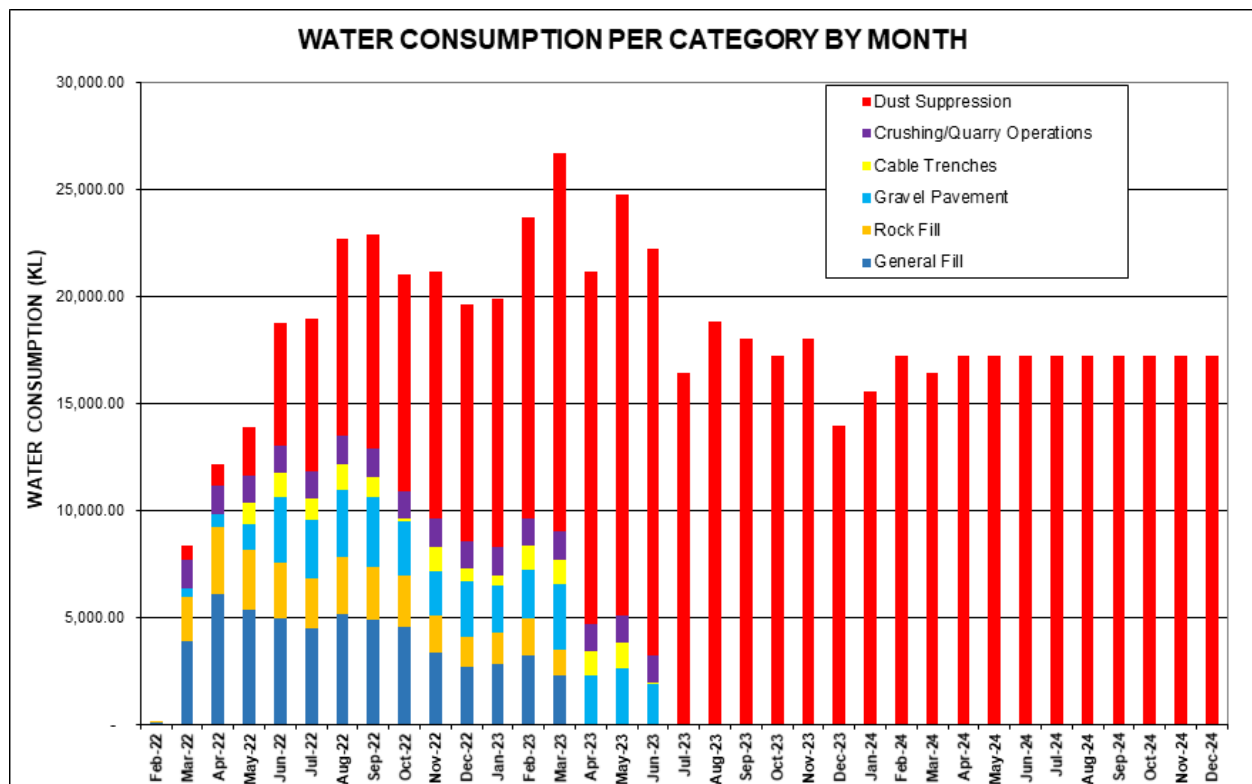


Figure 1 – Construction Water per Category by month

- **Site map and relevant drawings**

The MIWF project Camp is located approximately 8.4km south along Carbean Rd from the Cunningham Hwy/Carbean Rd Intersection. The site is located on private property within the Goondiwindi Regional Council Local Government area. Figure 2 below, details the location of the MIWF Camp.

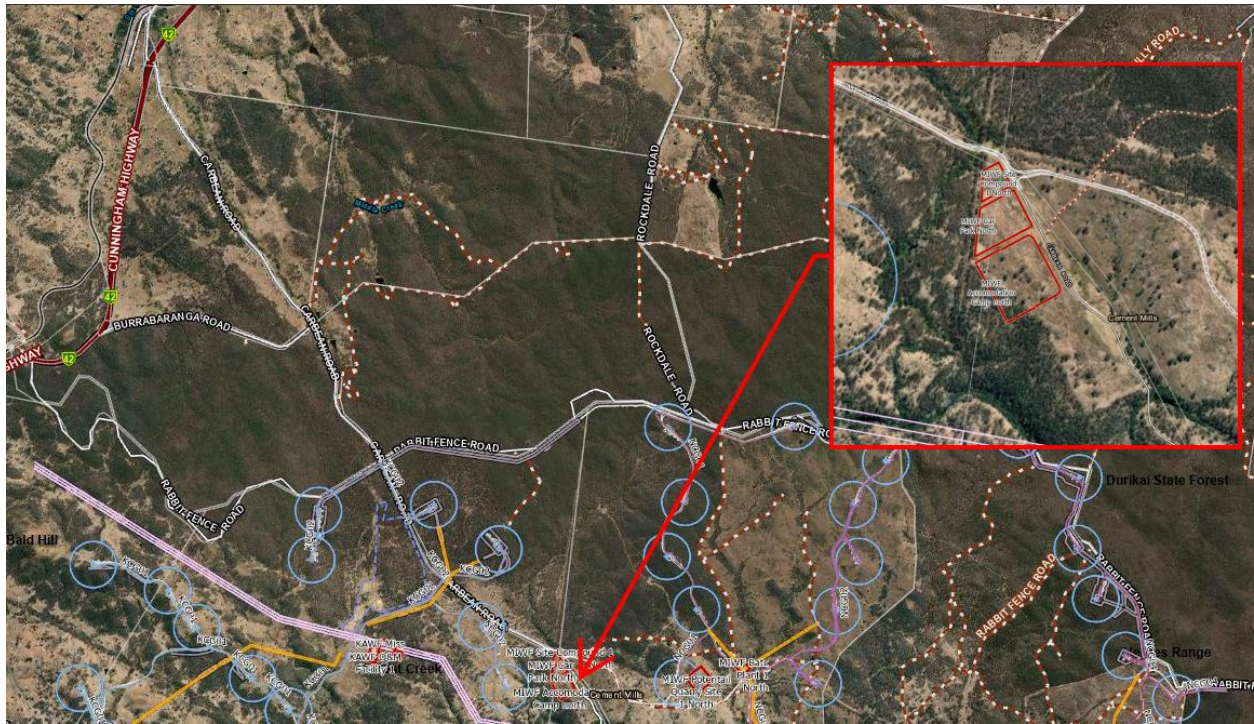


Figure 2 Location of the Works

- **Acciona environmental lead, who will be able to answer further specific questions we may have, and will be able to review and sign off the ERA63 application details prior to us submitting**



Mark Chilton

Manager Environment & Sustainability

ACCIONA Construction Australia

0414 240 131

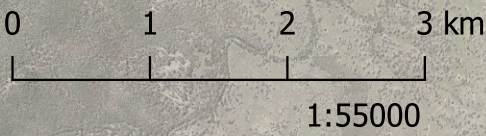
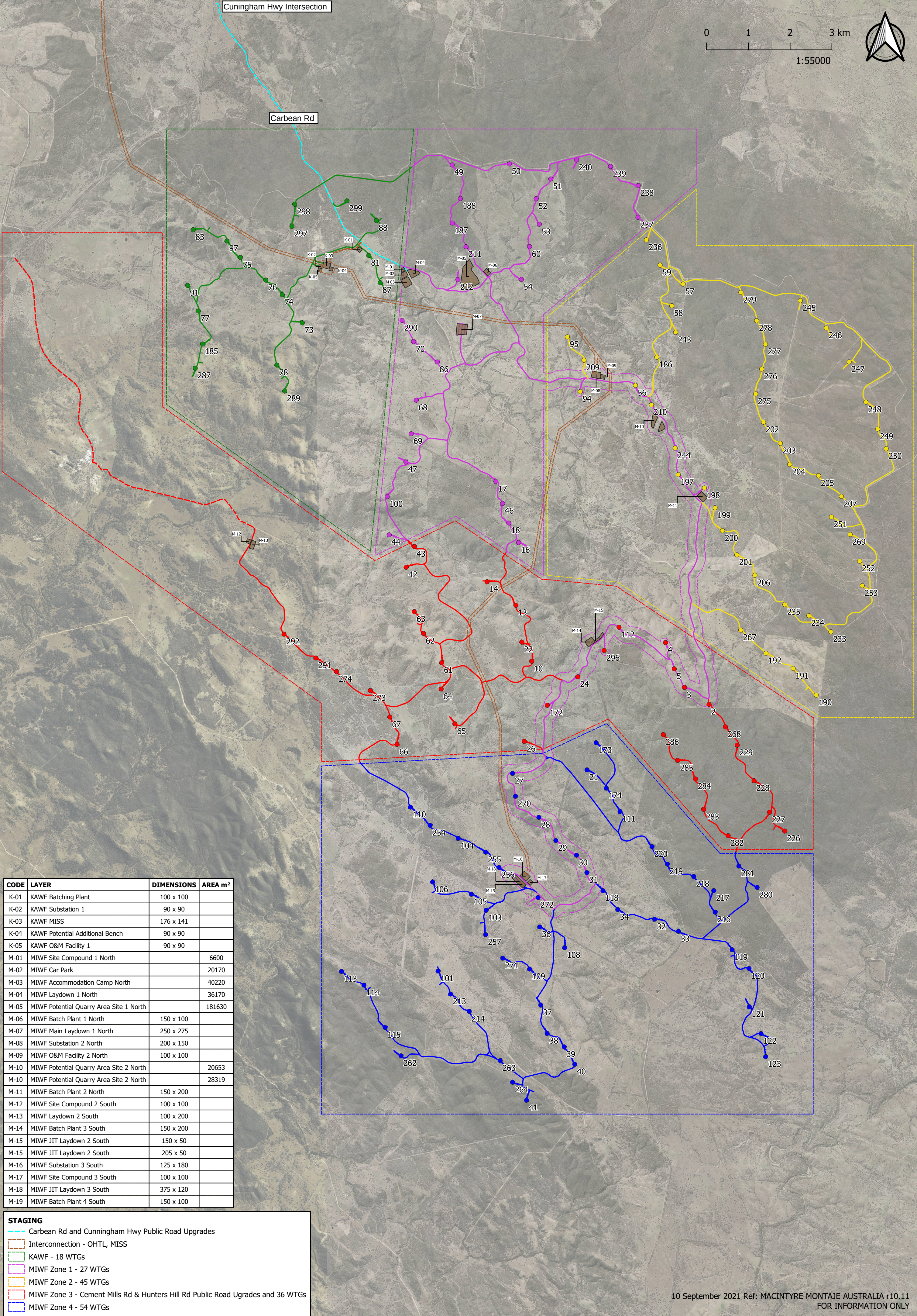
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Cunningham Hwy Intersection

Carbean Rd



CODE	LAYER	DIMENSIONS	AREA m²
K-01	KAWF Batching Plant	100 x 100	
K-02	KAWF Substation 1	90 x 90	
K-03	KAWF MISS	176 x 141	
K-04	KAWF Potential Additional Bench	90 x 90	
K-05	KAWF O&M Facility 1	90 x 90	
M-01	MIWF Site Compound 1 North		6600
M-02	MIWF Car Park		20170
M-03	MIWF Accommodation Camp North		40220
M-04	MIWF Laydown 1 North		36170
M-05	MIWF Potential Quarry Area Site 1 North		181630
M-06	MIWF Batch Plant 1 North	150 x 100	
M-07	MIWF Main Laydown 1 North	250 x 275	
M-08	MIWF Substation 2 North	200 x 150	
M-09	MIWF O&M Facility 2 North	100 x 100	
M-10	MIWF Potential Quarry Area Site 2 North		20653
M-10	MIWF Potential Quarry Area Site 2 North		28319
M-11	MIWF Batch Plant 2 North	150 x 200	
M-12	MIWF Site Compound 2 South	100 x 100	
M-13	MIWF Laydown 2 South	100 x 200	
M-14	MIWF Batch Plant 3 South	150 x 200	
M-15	MIWF JIT Laydown 2 South	150 x 50	
M-15	MIWF JIT Laydown 2 South	205 x 50	
M-16	MIWF Substation 3 South	125 x 180	
M-17	MIWF Site Compound 3 South	100 x 100	
M-18	MIWF JIT Laydown 3 South	375 x 120	
M-19	MIWF Batch Plant 4 South	150 x 100	

STAGING

- Carbean Rd and Cunningham Hwy Public Road Upgrades
- Interconnection - OHTL, MISS
- KAWF - 18 WTGs
- MIWF Zone 1 - 27 WTGs
- MIWF Zone 2 - 45 WTGs
- MIWF Zone 3 - Cement Mills Rd & Hunters Hill Rd Public Road Ugrades and 36 WTGs
- MIWF Zone 4 - 54 WTGs