
Appendix 1



Our ref: OUT22/4641

12 December 2022

Gilmour Space Technologies
c/- Ms Sarah Jones
Senior Planner
Milford Planning
sjones@milfordplanning.com.au

Office of the
Coordinator-General

Dear Ms Jones

APC2022/007 – Change application for an SDA approval AP2021/007 in the Abbot Point State Development Area (SDA)

Thank you for your change application for an SDA approval AP2021/007 for a material change of use high impact industry (launch facility) in the Abbot Point SDA. The change relates to the installation of ancillary infrastructure in the form of a 24 metre communication tower.

In accordance with sections 84E and 84F of the *State Development and Public Works Organisation Act 1971*, the Coordinator-General has decided to approve your change application with conditions.

Please find enclosed the decision notice and conditions for your change application for an SDA approval, for your reference.

If you require any further information, please contact Mr Chandler Walker, A/Project Officer, Office of the Coordinator-General, at Chandler.Walker@coordinatorgeneral.qld.gov.au or on (07) 3214 9253 who will be pleased to assist.

Yours sincerely

David Stolz
Assistant Coordinator-General
Planning and Services
(as delegate of the Coordinator-General)

1 William Street
Brisbane Queensland 4000
PO Box 15517
City East Queensland 4002
Telephone 13 QGOV (13 74 68)
Website www.statedevelopment.qld.gov.au
ABN 29 230 178 530

Decision notice

Application details:

Application type	Change application for an SDA approval for a material change of use for a high impact industry (launch facility)
Reference #	APC2022/007
Proponent	Milford Planning Pty Ltd
Land subject of the change application for an SDA approval	Lots 8, 9 and 10 on SP295408
State development area	Abbot Point State Development Area
Decision date	12 December 2022
Approvals to which this decision relates	AP2021/007
Currency period	Refer to condition 3

Decision details:

In accordance with section 84E and 84F of the *State Development and Public Works Organisation Act 1971*, the Coordinator-General has decided to **approve with conditions** all of the above change application for an SDA approval for a high impact industry (launch facility)

The conditions attached to this SDA approval supersedes all previous conditions.



David Stolz
Assistant Coordinator-General
Planning and Services
(as delegate of the Coordinator-General)

SDA approval – conditions

Material change of use

Condition 1 – approved plans and documents		Timing
1.1	Carry out the approved development generally in accordance with the approved plans and documents as referenced in Table 1 (including any amendments marked in red), except insofar as modified by any of the conditions of this approval.	<i>To be maintained at all times.</i>

Table 1 – approved plans and documents

Title	Prepared By	Plan reference / Document ID	Issue / Rev	Date Approved
Bowen Orbital Space Port Access Road Layout Plan Launch Facility	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-006-01	E	09/02/2022
Bowen Orbital Spaceport Site Layout Design	Gilmour Space	BOS-PADS-LAY, Sheet 1 of 3	5	12/12/2022
	Gilmour Space	BOS-PADS-LAY, Sheet 2 of 3	5	12/12/2022
	Gilmour Space	BOS-PADS-VAB, Sheet 3 of 3	5	12/12/2022
Bowen Orbital Space Port Access Road Locality Plan and Drawing Index, as amended in red by the Department of Environment and Science	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-001-01	E	09/02/2022
Bowen Orbital Space Port Access Road Sediment and Erosion Control Typical Details	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-002-01	D	08/02/2022
Bowen Orbital Space Port Access Road Typical Notes and Details – Sheet 1 of 3	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-003-01	D	08/02/2022
Bowen Orbital Space Port Access Road Typical Notes and Details – Sheet 2 of 3	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-003-02	D	12/12/2022
Bowen Orbital Space Port Access Road Typical Notes and Details – Sheet 3 of 3	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-003-03	D	12/12/2022
Bowen Orbital Space Port Access Road Layout and Long section – Sheet 1 of 4	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-005-01	D	08/02/2022
Bowen Orbital Space Port Access Road	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-005-02	D	08/02/2022

Title	Prepared By	Plan reference / Document ID	Issue / Rev	Date Approved
Layout and Long section – Sheet 2 of 4				
Bowen Orbital Space Port Access Road Layout and Long section – Sheet 3 of 4	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-005-03	D	08/02/2022
Bowen Orbital Space Port Access Road Layout and Long section – Sheet 4 of 4	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-005-04	D	08/02/2022
Bowen Orbital Space Port Access Road Floodway Layout Plan	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-007-01	D	08/02/2022
Bowen Orbital Space Port Access Road Floodway Details Plan	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-007-02	D	08/02/2022
Bowen Orbital Space Port Access Road Cross Sections – Sheet 1 of 3	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-008-01	D	08/02/2022
Bowen Orbital Space Port Access Road Cross Sections – Sheet 2 of 3	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-008-02	D	08/02/2022
Bowen Orbital Space Port Access Road Cross Sections – Sheet 3 of 3	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-008-03	D	08/02/2022
Bowen Orbital Spaceport Water Deluge System Proposed Pad Layout	Gilmour Space	BOS-PADS-LAY	A	18/01/2022
Cover Page	i ³ Consulting Pty Ltd	S00	0	12/12/2022
Project Notes	i ³ Consulting Pty Ltd	S01	0	12/12/2022
General Arrangement and Elevation	i ³ Consulting Pty Ltd	S50	0	12/12/2022
Flooring Details	i ³ Consulting Pty Ltd	S100	0	12/12/2022

	i ³ Consulting Pty Ltd	S400	0	12/12/2022
	i ³ Consulting Pty Ltd	S401	0	12/12/2022
Approved Report				
STRUCTURAL COMPUTATION REPORT 22-055- 24 COMMUNICATION TOWER AT BOWEN ORBITAL SPACEPORT	i ³ Consulting Pty Ltd	Structural Computation Report	2/1	12/12/2022

Condition 2 – land tenure		Timing
2.1	Obtain appropriate tenure for the land the subject of the application as shown on the plans referenced in condition 1.	<i>Prior to commencement of site works.</i>

Condition 3 – limit of development approval		Timing
3.1	The approved use must cease to be carried out ten (10) years from the date of obtaining the Commonwealth Minister’s approval, in accordance with the <i>Space (Launches and Returns) Act 2018</i> , for a launch facility licence to operate a launch facility on the land, the subject of this approval.	<i>As indicated</i>

Condition 4 – limit of use		Timing
4.1	Only the three-stage ERIS small class orbital launch vehicle that comprises:	<i>At all times.</i>

	(a) a hybrid propulsion system for the first and second stages fuelled by a stabilised high concentration hydrogen peroxide in combination with an inert polymer solid fuel grain, and a (b) third stage that is fuelled by a traditional liquid oxygen and kerosene propulsion system, forms part of the approval.	
4.2	The maximum number of launch events in any calendar year shall not exceed twelve.	<i>At all times.</i>
4.3	The development is not approved for a 'return' activity as defined by the <i>Space (Launches and Returns) Act 2018</i> (Cth).	<i>At all times.</i>
4.4	Provide a copy of landowner's consent obtained to authorise the implementation and enforcement of an exclusion zone, required to satisfy the public safety provisions under the Flight Safety Code 2019, ten (10) business days prior to each launch event.	<i>As indicated.</i>
4.5	Provide a copy of each launch permit to the Coordinator-General, 10 business days before a launch event.	<i>As indicated.</i>
4.6	The construction and operation of the Launch Control Centre does not form part of this development approval.	<i>At all times.</i>

Condition 5 – launch scheduling		Timing
5.1	The operator of the development must consult with North Queensland Bulk Ports Corporation Pty Ltd regarding launch schedules and coordinate, as far as practicable, with port infrastructure operators.	<i>Forward schedule to be provided 12 months prior to launch dates, unless otherwise agreed to in writing by North Queensland Bulk Ports Corporation Pty Ltd .</i>
5.2	The operator of the development is required to work with the Aurizon Network to coordinate with its Critical Asset Availability Calendar, and Train Plans for the period relevant to each proposed launch date.	<i>Prior to finalisation of forward schedule identified in Condition 5.1.</i>

Condition 6 – dilapidation surveys		Timing
6.1	Prior to and following each permitted launch, RPEQ certified dilapidation survey is to be conducted of: (a) Abbot Point Road to be conducted from Nulla Bridge (north) to NQBP Security Gate (south), and (b) rail transport infrastructure and other rail infrastructure, as agreed to by the railway manager.	<i>As indicated.</i>
6.2	Should the comparison of the pre- and post-launch surveys identify that rectification works, if attributable to launch operations, are required to that part of Abbot Point Road identified under condition 6.1 or to rail transport infrastructure and other rail infrastructure: (a) the operator is required to undertake all necessary rectification works at the operator's expense, to ensure the road and/or rail transport infrastructure or other rail	<i>(a) Prior to the next permitted launch.</i>

	<p>infrastructure is reinstated post-launch to its pre-launch condition or better, to the satisfaction of NQBP, railway manager and</p> <p>(b) provide RPEQ certification to the Coordinator-General, North Queensland Bulk Ports for Abbot Point Road via approvals@nqbp.com.au, or the railway manager for rail transport infrastructure or other rail infrastructure confirming that the rectification works have been designed and constructed in accordance with part (a) of this condition.</p>	<p><i>(b) Within two (2) weeks of completion of all rectification works.</i></p>
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Condition 7 – Abbot Point Road – access		Timing
7.1	<p>The operator of the development is required to provide a plan, that covers the 12-week period prior to each launch. The plan must ensure access along Abbot Point road is not adversely impacted during that period, and that the safe and efficient operation of the Port of Abbot Point is maintained.</p> <p>The plan is required to be developed in consultation with NQBP and provided for review via Approvals@nqbp.com.au.</p>	<p><i>12 weeks prior to each launch.</i></p>
7.2	<p>The operator of the development must ensure that access for emergency service vehicles, along Abbot Point Road, is maintained, including during the periods of implementation of exclusion zones.</p>	<p><i>At all times.</i></p>

Condition 8 – notification		Timing
8.1	<p>Notify the Coordinator-General, in writing, of the date of commencement of construction.</p>	<p><i>Within 10 business days after commencement of construction.</i></p>
8.2	<p>Notify the Coordinator-General, in writing, of the date of commencement of use.</p>	<p><i>Within 10 business days after the commencement of use.</i></p>
8.3	<p>Notify the Coordinator-General, in writing, of the date of date of the inaugural launch.</p>	<p><i>Within 10 business days prior to launch.</i></p>
8.4	<p>Notify the Coordinator-General and Whitsunday Regional Council, in writing, of each permitted launch.</p>	<p><i>A minimum of 10 business days prior to the permitted launch.</i></p>
8.5	<p>Notify the Coordinator-General, in writing, of the transfer of the launch facility licence.</p>	<p><i>Within 5 business days of the Minister transferring the launch facility licence.</i></p>

Condition 9 – auditing		Timing
9.1	<p>Prepare and submit an audit report to the Coordinator-General. The audit report must be prepared by an independent suitably qualified</p>	<p><i>As indicated.</i></p>

	<p>person to determine whether the conditions of this approval have been complied with.</p> <p>Audit reports are required for both temporary and permanent infrastructure within 30 business days of the following:</p> <ul style="list-style-type: none"> (a) commencement of site works (b) commencement of the use (c) every three months from the commencement of use (d) rehabilitation. <p>An audit report will contain detail consistent with the information provided in Enclosure 1.</p>	
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Condition 10 – inspection		Timing
10.1	Permit the Coordinator-General, or any person authorised by the Coordinator-General, to inspect any aspect of the development.	<i>At all times.</i>
10.2	<p>Ensure records and documents required to be kept by a condition of this approval or as described in the Environmental Management Plan:</p> <ul style="list-style-type: none"> (a) are kept at the premises for a period of not less than 5 years, (b) can be made available for inspection by the Coordinator-General or a delegate of the Coordinator-General. <p><i>Note: Where practicable, at least forty-eight (48) hours' notice will be provided.</i></p>	<i>At all times.</i>

Condition 11 – detailed plans		Timing
11.1	<p>Submit to the Coordinator-General and Whitsunday Regional Council the detailed design plans certified by a Registered Professional Engineer of Queensland (RPEQ) that identify the following:</p> <ul style="list-style-type: none"> (a) the final location of all structures, pads, tank farms, hardstand and laydown areas as well as the on-site utilities of the development (b) the final location of drainage structures and waterway crossing(s) (c) the final location of access road, internal circulation and manoeuvring area and any maintenance tracks. 	<i>Prior to the commencement of construction.</i>
11.2	<p>Submit to the Coordinator-General and Whitsunday Regional Council final layout plans and building plans (to scale and dimensioned) for the development, including at a minimum:</p> <ul style="list-style-type: none"> (a) cross sections and elevations (b) setback distances (c) building heights (d) pavement treatment. 	<i>Prior to the commencement of construction.</i>

Condition 12 – environmental management plan		Timing
12.1	Prepare and submit to the Coordinator-General and Whitsunday Regional Council, a detailed project specific Environmental Management Plan (EMP) addressing both the construction and operational phases of the project.	<i>Prior to the commencement of construction.</i>

	<p>The EMP must be certified by an independent suitably qualified third-party confirming the adequacy of the EMP in accordance with current best practice. The EMP must include the following matters:</p> <ul style="list-style-type: none"> (a) air quality and dust management (refer to enclosure 2) (b) flora and fauna management (refer to enclosure 3) (c) soils, erosion and sediment control (refer to enclosure 4) (d) general and hazardous waste management (refer to enclosure 5) (e) surface water and groundwater management (f) stormwater management (refer to enclosure 6) (g) lighting management (refer to condition 30) (h) traffic management (refer to enclosure 7) (i) noise and vibration management (refer to enclosure 8) (j) cultural heritage management (k) safety and emergency management (refer to enclosure 9) (l) bushfire hazard assessment and management (refer to enclosure 10) (m) acid sulfate soils management (refer to condition 13 and enclosure 11) (n) site-based land management (refer to enclosure 12) (o) risk management (refer to condition 33) (p) decommissioning and rehabilitation management (refer to enclosure 13) (q) operational management strategy to limit the impacts on the outstanding values of the Great Barrier Reef Marine Park (r) a monitoring program to identify issues of non-compliance, actions for correcting any non-compliance and who is responsible for undertaking those actions (s) a timetable and process for review of the EMP to assess its effectiveness and to implement amendments as required. <p>The EMP(s), for the construction and operational phases, are to account for any impacts outside the Abbot Point State Development Area and the EMPs are to contain detail consistent with the information provided in enclosures 2 – 13.</p>	
12.2	Implement and undertake the development in accordance with the certified EMP(s) submitted under condition 12.1	<i>At all times.</i>
12.3	The EMP(s) must be current and available on-site, with staff being made aware of the location of the EMP and being appropriately informed of their relevant obligations under the EMP.	<i>At all times.</i>
12.4	If any part of the EMP(s) is inconsistent with the conditions of this approval, the conditions prevail.	<i>At all times.</i>

Condition 13 – acid sulfate soils		Timing
13.1	Acid sulfate soil sampling and testing should be undertaken prior to earthworks to determine the presence of acid sulfate soils.	<i>At all times</i>
13.2	In the event that the works cause disturbance or oxidisation of acid sulfate soil, the affected soil must be treated and thereafter managed (until the affected soil has been neutralised or contained) in accordance with the current Queensland Acid Sulfate Soil Technical Manual: Soil management guidelines, prepared by the Department of Science, Information Technology, Innovation and the Arts, 2014.	<i>Upon disturbance or oxidisation until the affected soil has been neutralised or contained.</i>

13.3	<p>Certification by an appropriately qualified person, confirming that the affected soil has been neutralised or contained, in accordance with condition 13.2 above is to be provided to palm@des.qld.gov.au or mailed to:</p> <p>Department of Environment and Science Permit and Licence Management Implementation and Support Unit GPO Box 2454 Brisbane Qld 4001</p> <p><i>Note: Appropriately qualified person means a person or persons who has professional qualifications, training, skills and experience relevant to soil chemistry or acid sulfate soil management and can give authoritative assessment, advice and analysis in relation to acid sulfate soil management using the relevant protocols, standards, methods or literature.</i></p>	<p><i>At the time the soils have been neutralised or contained.</i></p>
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Condition 14 – earthworks and construction timing		Timing
14.1	Earthworks and construction must only occur during April to October of the dry season.	As indicated

Condition 15 – clean fill		Timing
15.1	Only clean and uncontaminated fill is to be used on site.	At all times
15.2	A record of the clean fill’s originating site, in conjunction with a record of that site’s historical activities is to be retained.	At all times.
15.3	A copy of the record required by condition 15.2 must be provided to the Coordinator-General upon request.	Within 48 hours of the request being made.

Condition 16 – services and utilities		Timing
16.1	Obtain the necessary approvals for all required services and utilities (power, potable water, sewer, gas, wastewater, communications etc) for both construction and operation.	Prior to commencement of site works.
16.2	Provide and maintain to the relevant standards all services and utilities (power, potable water, sewer, gas, wastewater, communications etc) necessary to the development.	At all times.
16.3	Submit to the Coordinator-General and Whitsunday Regional Council approval for the on-site sewerage treatment facility.	Prior to commencement of use.
16.4	Prepare and submit to the Coordinator-General and Whitsunday Regional Council a construction and operational water supply strategy demonstrating how the development will be adequately serviced by a water supply. The water supply strategy must clearly identify any expectation of Whitsunday Regional Council to supply water.	Prior to the commencement site works.
16.5	Any required provision, relocation and/or alteration to any public service, utility or facility installation must be carried out at no cost to Whitsunday Regional Council or the Coordinator-General.	Prior to the commencement of use and to be maintained.

Condition 17 – ‘As constructed’ plans		Timing
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17.1	<p>Prepare and submit to the Coordinator-General, Whitsunday Regional Council and palm@des.qld.gov.au 'As constructed' plans certified by an RPEQ or other independent suitably qualified person.</p> <p>The plans must show all relevant elements of the development, including drainage structures and the access road.</p> <p>Plans must be submitted in electronic pdf and shape files.</p>	<p><i>Within two (2) weeks of the completion of works and prior to commencement of use.</i></p>
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Condition 18 – repair of damage		Timing
18.1	Repair any damage to infrastructure, services, property, assets, utilities, fencing, roads damaged during any works carried out in association with the construction or during the operation of the development.	<i>Prior to commencement of use and ongoing.</i>
18.2	Re-instate existing signage and pavement markings that have been removed during any works carried out in association with the development.	<i>Prior to commencement of use and ongoing.</i>
18.3	Where damage occurs from either the construction or the operation of the launch facility occurs, rectification must be undertaken at the developer's own cost, and be to the satisfaction of the Office of the Coordinator-General and the relevant service provider.	<i>At all times.</i>

Condition 19 – complaints and incidents		Timing
19.1	<p>Record all complaints received relating to the development in a register that includes, as a minimum:</p> <ul style="list-style-type: none"> (a) date and time when complaint was received (b) complainant's details including name and contact information (c) reasons for the complaint (d) investigations undertaken and conclusions formed (e) actions taken to resolve this complaint, including the time taken to implement these actions include a notation in the register as to the satisfaction (or dissatisfaction) of the complainant with the outcome. 	<i>At all times.</i>
19.2	Prepare and provide a response to the complainant within 48 hours of receipt of the complaint.	<i>As indicated.</i>
19.3	Keep an up-to-date copy of the complaints register and provide it to the Coordinator-General, when requested.	<i>Within 48 hours of the request being made.</i>
19.4	Keep an up-to-date incident register at the premises, including information about any explosions, launch failures, damage to property, fires at the premises, any release, spills or leakages, and the actions taken and timeframes to undertake those actions in response to the incident and any penalties incurred as a result of the incident.	<i>At all times.</i>
19.5	Provide an up-to-date copy of the incident register if requested by the Coordinator-General.	<i>Within 48 hours of the request being made.</i>

Condition 20 – site security	Timing
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20.1	Install and maintain the operation of a security gate at the point of the new access road.	<i>Prior to commencement of use and to be maintained at all times.</i>
20.2	Install security fencing around the perimeter of the vehicle assembly building, internal road and launch pad operations area so as to prevent public access to all operational areas of the development as illustrated in the plan entitled, Bowen Orbital Spaceport Site Layout, prepared by Gilmour Space, plan reference BOS-PADS-LAY, Sheet 1 of 3, revision 1, dated 08/03/2022.	<i>Prior to commencement of use and to be maintained at all times.</i>
20.3	Install adequate signage to warn the public of operations and safety hazards.	<i>Prior to commencement of use and to be maintained at all times.</i>

Condition 21 – site management		Timing
21.1	The construction and operation of the development must not adversely impact the effective and efficient operation of the Port of Abbot Point.	<i>At all times.</i>
21.2	The construction and operation of the development must not adversely impact access to, or along Abbot Point Road except during a launch, as managed by the plan required in condition 7.1.	<i>At all times.</i>
21.3	The construction and operation of the development must not result in damage to infrastructure, services, property, assets or utilities during the construction or operation of the development.	<i>At all times.</i>
21.4	If any damage results to infrastructure, services, property, assets or utilities during the construction or operation of the development, rectification must be undertaken at no cost to, and to the satisfaction of North Queensland Bulk Ports or the relevant service provider.	<i>At all times.</i>

Condition 22 – railway level crossing safety		Timing
22.1	A Traffic Management Plan, certified by a RPEQ, must be given to the Program Delivery and Operations Unit, Mackay Whitsunday Region (Mackay.Whitsunday.IDAS@tmr.qld.gov.au) within the Department of Transport and Main Roads.	<i>Prior to the commencement of construction.</i>
22.2	The Traffic Management Plan must ensure that there is no disruption to the safety and operational integrity of railway level crossings impacted on by development generated traffic, including but not limited to railway level crossings: ID: 5159 on the North Coast Line at Abbot Point Road and ID: 843 at Abbot Point Road on the Abbot Point Branch Railway. In particular, the maximum design vehicle for the construction and operation of the development must not exceed 19m in length. The Traffic Management Plan must detail at least the communication and safety controls to be implemented to manage short stacking.	<i>Prior to the commencement of construction and ongoing.</i>
22.3	The development must be undertaken in accordance with the Traffic Management Plan.	<i>At all times.</i>

Condition 23 – railway corridor safety and integrity – Rocket Management Plan		Timing
23.1	The development must ensure that there is no disruption to the safety and operational integrity of the railway corridor from rocket launching and similar and associated activities.	<i>At all times.</i>
23.2	<p>The operator of the development must provide a Rocket Launch Management Plan to the Program Delivery and Operations Unit, Mackay Whitsunday Region within the Department of Transport and Main Roads (Mackay.Whitsunday.IDAS@tmr.qld.gov.au), which addresses potential impacts on the safety and operational integrity of the railway corridor and the management and monitoring mechanisms to mitigate these impacts. The Rocket Launch Management Plan is to address, to the satisfaction of the Department of Transport and Main Roads, the following relevant considerations:</p> <ul style="list-style-type: none"> (a) Pre and post launch dilapidation surveys of rail transport infrastructure and other rail infrastructure (b) Flight paths, trajectories, exclusion zones, launch vehicles, frequency, timing and scheduling of launches and the like (c) Details on the pre, during and post procedures for rocket launches in relation to the railway corridor (d) Railway operational requirements and scheduled railway closures (e) The requirement for the operator of the development to engage a RPEQ to establish the baseline structural and ground movement and vibration readings on the railway corridor (f) The requirement to agree with the Department of Transport and Main Roads and the railway manager as to the level of acceptable movement and trigger levels and monitoring instrumentation (g) Protocols to be complied with when the movement and trigger levels are breached, including specific actions to be undertaken and who is responsible for each, the notification process, lines of communication, and stop work procedure (h) The requirement to provide the overall monitoring results to the Department of Transport and Main Roads and the railway manager (i) A risk assessment in accordance with <i>Attachment 1: Risk Assessment Guide of the Guide for Development in a Transport Environment: Rail</i> (j) Details of the mitigation measures, management measures and protocols to minimise any identified risks to the railway corridor, including but not limited to: <ul style="list-style-type: none"> (i) minimising or controlling the outbreak of fire (ii) controlling smoke and/or gas release and dispersion (iii) limiting the possibility of the railway corridor being blast damaged (iv) providing stability or contingency measures in the proposed development and its operations (v) providing safe emergency access and egress; and (k) ensuring effective containment and clean-up of hazards and incidents. (l) Emergency protocols and notification procedures to be complied with in any emergencies such as fire, explosion, catastrophic failure and the like 	<i>Prior to the commencement of use.</i>

	(m) The requirement for the developer to rectify any damage to rail transport infrastructure, other rail infrastructure or rail corridor land caused by the operation of the development.	
23.3	The operation of the development must be carried out in accordance with the Rocket Launch Management Plan required under condition 23.2.	<i>At all times.</i>
23.4	The minimum setback of the launch pad from the railway corridor must be generally in accordance with the Bowen Orbital Space Port Access Road Locality Plan and Drawing Index, as amended in red by the Department of Environment and Science, prepared by i3 Consulting Pty Ltd, plan reference GSLF-I3C-CV-DWG-001-01, revision E, dated 09/02/2022.	<i>Prior to the commencement of use and to be maintained at all times</i>

Condition 24 – stormwater and drainage		Timing
24.1	Drainage from the development works/building shall not adversely impact upon adjacent properties. No ponding, concentration or redirection of stormwater shall occur on adjoining land.	<i>At all times.</i>
24.2	Provide the discharge of stormwater drainage flows to a legal point of discharge.	<i>At all times.</i>
24.3	Drainage works shall be designed and constructed in accordance with the Queensland Urban Drainage Manual.	<i>Prior to the commencement of construction.</i>
24.4	Stormwater and flooding management of the development must ensure no worsening or actionable nuisance to adjoining land or the Newlands System/Abbot Point Branch railway corridor.	<i>At all times.</i>
24.5	Any works on the land must not: <ul style="list-style-type: none"> (a) create any new discharge points for stormwater runoff onto the Newlands System/Abbot Point Branch railway corridor (b) interfere with and/or cause damage to the existing stormwater drainage on the Newlands System/Abbot Point Branch railway corridor (c) surcharge any existing culvert or drain on the Newlands System/Abbot Point Branch railway corridor (d) reduce the quality of stormwater discharge onto the Newlands System/Abbot Point Branch railway corridor (e) impede or otherwise interfere with hydraulic conveyance or overland flow paths on the site (f) reduce the floodplain storage capacity of the site. 	<i>At all times.</i>
24.6	Untreated stormwater from the works must be diverted or bypassed around the wetland in the Wetland Protection Area.	<i>At all times.</i>

Condition 25 – air quality		Timing
25.1	An Ambient Air Quality Monitoring (AAQM) Program must be developed and implemented to specify how the ambient dust impacts of the project will be monitored. The AAQM Program as outlined in “ <i>Table 1 – Maximum ground level concentration limit and monitoring program</i> ” below must include, but not necessarily be limited to: <ul style="list-style-type: none"> (a) locations, frequencies and methods for monitoring of potential air contaminants for determining the actual impacts 	<i>Prior to the commencement of use.</i>

	<p>from the proposed activity on the receiving environment values</p> <p>(b) provision for the use of at least three air quality samplers (CO, CO₂ and NO₂) and one meteorological station capable of monitoring wind speed and direction, humidity, temperature and precipitation</p> <p>(c) air quality sampling must be conducted in accordance with the Queensland Air Quality Sampling Manual and applicable Australian Standards and</p> <p>(d) should an alternative sampling method be required; the proponent must seek approval from administering authority to exclude this requirement. In seeking such exclusion, the reasons for the exclusion shall be provided and be justified.</p> <p>Table 1: Maximum ground level concentration limit and monitoring program.</p> <table border="1"> <thead> <tr> <th>Contaminant</th> <th>Limit Type</th> <th>Air Quality Limit</th> <th>Monitoring frequency²</th> </tr> </thead> <tbody> <tr> <td>Carbon monoxide (CO)</td> <td>Maximum as one hour average</td> <td>31 mg/m³</td> <td rowspan="5">At least for 24-hour period covering the rocket launching event</td> </tr> <tr> <td>Carbon monoxide (CO)</td> <td>Maximum as 8- hour average</td> <td>11 mg/m³</td> </tr> <tr> <td>Carbon Dioxide (CO₂)</td> <td>Maximum as one hour average</td> <td>60 µg/m³</td> </tr> <tr> <td>Nitrogen Dioxide</td> <td>Maximum as one hour average</td> <td>250 µg/m³</td> </tr> <tr> <td>Meteorological¹</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> </tr> </tbody> </table> <p>¹ Wind speed and direction, humidity, temperature and precipitation using AS 3580.14 - 2011: Methods for sampling and analysis of ambient air – Part 14: Meteorological monitoring for ambient air quality monitoring applications.</p> <p>² mg/m³ means milligram per cubic metre at 0 degrees Celsius and an atmospheric pressure of 1.</p>	Contaminant	Limit Type	Air Quality Limit	Monitoring frequency ²	Carbon monoxide (CO)	Maximum as one hour average	31 mg/m ³	At least for 24-hour period covering the rocket launching event	Carbon monoxide (CO)	Maximum as 8- hour average	11 mg/m ³	Carbon Dioxide (CO ₂)	Maximum as one hour average	60 µg/m ³	Nitrogen Dioxide	Maximum as one hour average	250 µg/m ³	Meteorological ¹	-	-	
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25.2	The activities at the development must not exceed the air quality limits specified in “ <i>Table 1 – Maximum ground level concentration limit and monitoring program</i> ” to condition 25.1, at or beyond the boundaries of the development.	<i>At all times.</i>																				

Condition 26 – launch facility noise limits		Timing																						
26.1	<p>The operator of the development must ensure that noise generated by launch activities does not cause the criteria in “<i>Table 1 - Noise limits for launch activities</i>”, to be exceeded at a sensitive place or commercial premises.</p> <p>Table 1 – Noise limits for launch activities</p> <table border="1"> <thead> <tr> <th colspan="2">Sensitive Place</th> </tr> </thead> <tbody> <tr> <td>Noise level dB(A) measured as:</td> <td>All Launch activities</td> </tr> <tr> <td>L_{Amax}</td> <td>96</td> </tr> <tr> <td>SEL</td> <td>110</td> </tr> <tr> <td>Day Night Average Sound Level (DNL)</td> <td>70</td> </tr> <tr> <td>Vibration</td> <td>10mm/s</td> </tr> <tr> <th colspan="2">Commercial Place</th> </tr> <tr> <td>Noise level dB(A) measured as:</td> <td>All launch activities</td> </tr> <tr> <td>L_{Amax}</td> <td>115</td> </tr> <tr> <td>SEL</td> <td>115</td> </tr> <tr> <td>Day Night Average Sound Level (DNL)</td> <td>80</td> </tr> </tbody> </table>	Sensitive Place		Noise level dB(A) measured as:	All Launch activities	L _{Amax}	96	SEL	110	Day Night Average Sound Level (DNL)	70	Vibration	10mm/s	Commercial Place		Noise level dB(A) measured as:	All launch activities	L _{Amax}	115	SEL	115	Day Night Average Sound Level (DNL)	80	<i>For all launch activities.</i>
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	Vibration	15mm/s
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Condition 27 – matters of state environmental significance - waterways providing for fish passage		Timing
27.1	Development authorised under this approval is limited as follows: (a) the operational works to raise or construct a waterway barrier works that is a culvert crossing within un-named waterway, and marked on plans as causeway 1 and shown in Bowen Orbital Space Port – Access Road – Floodway Layout Plan, prepared by i3 consulting, plan reference GSLF-13C-CV-DWG-007-001, revision D, dated 08/02/2022, and (b) Bowen Orbital Space Port – Access Road – Floodway Details Plan, prepared by i3 consulting, plan reference GSLF-13C-CV-DWG-007-002, revision D, dated 08/02/2022.	<i>At all times.</i>
27.2	The maintenance of the culvert crossing must be undertaken generally in accordance with Chapter 7 - Maintenance Schedule of Bowen Orbital Spaceport (BOS) Development Erosion and Sediment Control Management Plan prepared by FYFE reference 43076-1-ENV-REP_1, revision 1, dated 24/08/2021.	<i>At all times.</i>
27.3	Provide written notice to notifications@daf.qld.gov.au, when the development authorised under this approval: (a) will start, and (b) when it has been completed. These notices must state this permit number AP2021/007.	<i>Within 15 business days of the completion of the fisheries development works and prior to the commencement use.</i>
27.4	This fisheries development (as defined by the <i>Fisheries Act 1994</i>) constitutes a place that is required to be open for inspection by an inspector at all times, pursuant to section 145 of the <i>Fisheries Act 1994</i> .	<i>At all times.</i>
27.5	In-stream works are to be completed as quickly as possible, but must be avoided during times of elevated flows, namely - 63% AEP or greater flows.	<i>As indicated.</i>
27.6	Spoil is not disposed of on tidal lands or within waterways and spoil must be managed to prevent acid soil development.	<i>At all times.</i>
27.7	Land profiles that are temporarily disturbed by the development works (other than those within the permanent development footprint, as shown on Bowen Orbital Space Port – Access Road – Floodway Layout Plan, prepared by i3 consulting, dated 08/02/2022, plan reference GSLF-13C-CV-DWG-007-001 and revision D), must be promptly restored to pre-work profiles as shown on the same plan.	<i>Upon completion of the works and prior to commencement of use.</i>

Condition 28 – wetland buffer		Timing
28.1	Provide a 50-metre wide buffer for the purpose of protecting the adjacent wetlands shown as the '50m buffer zone' on Locality Plan and Drawing Index as amended in red by the Department of Environment and Science, prepared by i3 Consulting Pty Ltd, plan	<i>Prior to commencement of use and to be</i>

	reference GSLF-I3C-CV-DWG-001-01, revision E, dated 09/02/2022.	<i>maintained at all times.</i>
28.2	Provide buffer elements in the location shown as the '50m buffer zone' on Locality Plan and Drawing Index as amended in red by the Department of Environment and Science, prepared by i3 Consulting Pty Ltd, plan reference GSLF-I3C-CV-DWG-001-01 revision E, dated 09/02/2022, designed to achieve the purposes set out in the Queensland Wetland Buffer Planning Guidelines 2011.	<i>Prior to commencement of use.</i>
28.3	Written evidence from a suitably qualified person that (a) and (b) have been fulfilled is to be provided palm@des.qld.gov.au or mailed to: Department of Environment and Science Permit and Licence Management GPO Box 2454 Brisbane Qld 4001 Note: <i>Suitably qualified person means a person or persons who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.</i>	<i>Prior to commencement of use.</i>

Condition 29 – environmental nuisance or harm		Timing
29.1	The construction and operation of the development must not cause environmental nuisance or harm at a nuisance sensitive place unless specifically authorised by a condition of this approval or where alternative lawful arrangements are in place. Nuisance sensitive places include, but not limited to, the: (a) Caley Valley Wetlands (b) Coral Sea Marine Park (c) Eastern Beach (d) Euri Creek residential dwellings (e) Great Barrier Reef Marine Park and World Heritage Area (f) Saltwater Creek.	<i>At all times</i>

Condition 30 – lighting		Timing
30.1	Ensure outdoor lighting installed within the development (excluding the telecommunications tower) minimises light spill in the adjacent properties and sensitive places in accordance with AS4282:1997 Control of obtrusive effects of outdoor lighting. Sensitive places include, but are not limited to, the: (a) Caley Valley Wetlands (b) Eastern beach (c) Great Barrier Reef Marine Park and World Heritage Area.	<i>To be maintained</i>
30.2	Ensure lighting is not installed on the telecommunications tower to avoid light impacts on sensitive places identified in condition 30.1 and vessel navigation.	<i>At all times</i>

Condition 31 – waste management		Timing
31.1	Reuse, recycle or lawfully dispose of all waste (other than treated wastewater released to land) generated by the development.	<i>At all times.</i>

31.2	Solid waste is to be stored on site in vermin-proof facilities until it is transferred to a licensed refuse facility.	<i>At all times.</i>
31.3	Prepare and implement a refuse management strategy which outlines the method and frequency of refuse collection for the	<i>Prior to commencement</i>

	development.	<i>of use and ongoing.</i>
31.4	All vehicles involved in the excavation and/or building or operational waste and are departing the property with waste materials, spoil or loose matter must have their loads fully covered before entering the public roadway.	<i>At all times.</i>

Condition 32 – hazardous materials / dangerous goods		Timing
32.1	All flammable and combustible liquids (including hazardous waste materials) must be contained within an on-site containment system, controlled in a manner that prevents environmental harm and must be maintained in accordance with the current edition of <i>AS1940—Storage and Handling of Flammable and Combustible Liquids</i> and in accordance with any other relevant Australian Standard.	<i>At all times.</i>
32.2	All containers must be secured to prevent movement during a flood event.	<i>At all times.</i>
32.3	All hazardous and dangerous goods must be transported, receipted, stored, used, handled and disposed of in accordance with the Hazardous and Dangerous Goods Management Plan (HDGMP).	<i>At all times.</i>
32.4	Development involving dangerous goods must not adversely impact on the safety or operation of the railway corridor.	<i>At all times.</i>

Condition 33 – chemical and fuel storage		Timing
33.1	<p>Prepare and implement a Risk Management Plan (RMP) to specify how the risk will be managed from the storage of hazardous chemicals and catastrophic failure of rocket launch. The RMP must include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> (a) identification of potential effects of accidental release of hazardous chemicals (b) identification of potential causes that will lead to the incident identified for each accident (c) documentation of appropriate steps that must be taken to prevent accidental spills as well as the control measures that can be implemented to reduce the risk to an acceptable residual risk level (d) identification of chemical spills that may occur over the marine environment and how this impact will be mitigated (e) description of emergency response procedures should an accident occur, emergency response program includes emergency health care and procedures for informing the public and response agencies (e.g., the fire department) should an accident occur, and (f) development of prevention program that must include safety precautions and maintenance, monitoring, and employee training. 	<i>Prior to the commencement of launch activities.</i>
33.2	<p>Any facilities on the site involving the storage of chemicals and/or fuel are sited and constructed to ensure contaminants do not enter surface and/or ground waters. Such facilities, including the vehicle assembly building, are to be:</p> <ul style="list-style-type: none"> (a) located above the 1% AEP flood event (b) undercover in a building or similar structure 	<i>At all times.</i>

	(c) in or on a dedicated impervious secondary containment store or device that permits full recovery of spills (d) in a manner that prevents the movement of packages/containers from their place of storage during a flood event (e) in accordance with AS1940-2004: The storage and handling of flammable and combustible liquids and/or AS1692: Steel tanks for flammable and combustible liquids.	
33.3	Chemical and fuel storage is conducted in accordance with relevant Australian legislation, standards and codes.	<i>At all times.</i>
33.4	No spent or empty or fuel storage containers are to be burned or otherwise disposed of on the site.	<i>At all times.</i>

Condition 34 – fire fighting		Timing
34.1	The development must be provided with an adequate and accessible supply of water for firefighting purposes in accordance with AS2419.1-2005.	<i>Prior to commencement of use and to be maintained at all times.</i>
34.2	Provide adequate and safe access for firefighting/other emergency vehicles and for safe evacuation.	<i>At all times.</i>

Condition 35 – land contamination		Timing
35.1	Contaminants must not: (a) be buried on site (b) be in contact with the soil at the site (c) directly or indirectly seep or penetrate into the soil or groundwater at the site.	<i>At all times.</i>
35.2	Contamination of land arising from the operation of the rail maintenance and provisioning facility shall be lawfully remediated by the operator, at the operator's cost.	<i>At all times.</i>

Condition 36 – vehicle parking and manoeuvring		Timing
36.1	A minimum of 48 car parking spaces shall be provided.	<i>At all times.</i>
36.2	All parking is to occur on site.	<i>At all times.</i>
36.3	The design, layout, signage, line marking, lighting, physical controls, internal roadways, on-site circulation and manoeuvring areas for vehicles on site shall be in accordance with AS2890.1: 2004 Parking facilities: Part 1 and AS2890.2:2002: Part 2.	<i>Prior to commencement of works and to be maintained.</i>
36.4	Provide disabled car parking in accordance with AS2890.6.	<i>Prior to commencement of the use and to be maintained.</i>
36.5	The car parking area is to be line marked.	<i>Prior to commencement of the use and to be maintained.</i>
36.6	Ensure all vehicle movements to and from the property are conducted in forward gear.	<i>At all times.</i>

36.7	Completed works are certified by an RPEQ as having been constructed in accordance with good engineering practice to the relevant standard reasonable for commercial purposes.	<i>Prior to commencement of the use.</i>
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Condition 37 – temporary uses		Timing
37.1	All temporary uses are to remain no longer than twelve months from the completion of construction, unless otherwise agreed to in writing by the Coordinator-General.	<i>As indicated</i>
37.2	Remove all temporary works once the temporary use has ceased and rehabilitate the site/s to their original condition, or as otherwise agreed to with the landowner, in accordance with the EMP outlined in condition 12.1.	<i>Within twelve months from the completion of construction.</i>

Condition 38 – rehabilitation plan		Timing
38.1	Should the use cease for a period of more than twelve months, the subject land must be decommissioned and rehabilitated in accordance with the detailed rehabilitation plan required by condition 12.1	<i>As indicated</i>
38.2	Provide a notice to the Coordinator-General stating the rehabilitation of land has been completed in accordance with the rehabilitation plan together with photographic evidence of decommissioning activities and rehabilitation outcomes.	Within six (6) months of completion of all decommissioning activities.

Condition 39 – maritime safety		Timing
39.1	The operator of the development must notify the Regional Harbour Master, (Townsville Region), Maritime Safety Queensland of the sea areas affected by the flight path and range safety exclusion zones required each launch event, that will cross over any portion of: (a) the Abbot Point Pilotage Area (b) State waters extending into the two-way route for Abbot Point (c) Australian waters comprising of a section of the Great Barrier Reef inner route extending to the edge of the Reef Vessel Traffic Services area.	<i>As indicated.</i>
39.2	The request for the Maritime Exclusion Zones, notified under condition 39.1 of this condition, must be made 60 days prior to each launch, unless otherwise agreed to in writing by the Regional Harbour Master, Marine Operations (Townsville Region).	<i>As indicated.</i>
39.3	The request for the Maritime Exclusion Zones, required under condition 39.1 of this condition, must include: (a) coordinates for items 39.1(a), 39.1(b) and 39.1(c), (b) date, time and duration of the exclusion zone(s) (c) a Marine Traffic Management Plan, prepared in consultation with maritime authorities (Maritime Safety Queensland, Australian Maritime Safety Authority, Queensland Water Police), detailing strategies and measures to be implemented to ensure, but not be limited to: (i) the hazard area is clear of marine traffic (ii) waterway users are aware of the exclusion zone (iii) exclusion zone monitoring (iv) exclusion zone compliance by mariners.	<i>At all times.</i>

	<i>Note: Depending on the area to be monitored, the operator of the development should commence monitoring maritime exclusion zones at T-4 hours or earlier, noting speed of watercrafts in the area may require considerable time to clear the hazard area.</i>	
39.4	Prepare and provide written evidence to the Regional Harbour Master (Townsville Region), Maritime Safety Queensland, Department of Transport and Main Roads, 60 Ross Street, Townsville Qld 4810 GPO Box 1921, Townsville Qld 4810, P: (07) 4421 8100, F: (07) 4721 2028, E: RHMTownsville@msq.qld.gov.au, 60 days prior to launch unless agreed to in writing by the Regional Harbour Master (Townsville Region), detailing: (a) the management measures to be implemented to ensure maritime users are notified of each launch event, and (b) the required maritime exclusion zone, to enable publishing of the same in the government gazette.	<i>As indicated.</i>
39.5	The operator of the development must notify Regional Harbour Master, (Townsville Region), of (a) any debris, obstruction or hazard to safe vessel navigation resulting from a failure of a launch - immediately; and (b) remove and dispose of the debris, obstruction or hazard of at the operator's cost within a timeframe agreed with the relevant authority. <i>Note: Relevant authorities include Maritime Safety Queensland, Australian Maritime Safety Authority, Great Barrier Reef Marine Park Authority.</i>	<i>(a) Immediately. (b) As agreed with the relevant authority.</i>

Condition 40 – land management plan		Timing
40.1	Landscape all disturbed areas during construction, through the planting of native trees, bushes and scrubs, to allow the root network to stabilise the underlying soils.	<i>Prior to commencement of use.</i>
40.2	Maintain landscaping and replace any failed or failing trees or shrubs.	<i>At all times.</i>
40.3	Implement the pest management plan prepared in accordance with condition 12.1 of this condition document.	<i>At all times.</i>

SDA self-assessable development authorised by this SDA approval

The following operational work is authorised by this SDA approval as SDA self-assessable development. SDA self-assessable development must comply with the conditions stipulated below and with Schedule 3 of the Abbot Point Basin SDA Development Scheme.

For operational work not authorised by this SDA approval, the proponent must obtain the relevant approvals or authorisations as per the relevant authorising process.

Operational work condition 41 – excavation or filling that materially affects premises or their use		Timing
41.1	Submit to the Coordinator-General detailed earthworks plans prepared by an RPEQ and certified by a suitably qualified independent third party, generally in accordance with AS3798 –	<i>Prior to commencement of site works.</i>

	<p>1996 Guidelines on Earthworks for Commercial and Residential Developments. The plans shall:</p> <ul style="list-style-type: none"> (a) include a geotechnical soils assessment of the site (b) include an assessment that confirms that all cut/fill batters, retaining structures and embankments associated with the development achieve a minimum long-term factor of safety (FoS) of 1.5 and a short term (during construction) FoS of 1.3, unless otherwise certified by an RPEQ (c) include details of any associated retaining structures which are to be designed in accordance with AS4678 – 2002 Earth Retaining Structures (d) be consistent with the Erosion and Sediment Control plans required by condition 12.1 and enclosure 4 of this approval. (e) where appropriate, provide full details of areas where dispersive soils will be disturbed, treatment of dispersive soils and their rehabilitation (f) provide full details of any areas where surplus soils are to be stockpiled (g) include an appropriate monitoring program for the period the site works are being undertaken, identify actions for correcting any failings in management and who is responsible for undertaking those actions. 	
41.2	Carry out the earthworks generally in accordance with the certified plans required under condition 41.1.	<i>Prior to the commencement of use.</i>
41.3	Submit to the Coordinator-General certification by an RPEQ that all earthworks have been carried out generally in accordance with the certified plans required under condition 41.1 and any unsuitable material encountered has been treated or replaced with suitable material.	<i>Prior to the commencement of use.</i>

Operational work condition 42 – undertaking work, in, on, over or under premises that materially affects premises or their use		Timing
42.1	Limit works to the area(s) shown on the plans specified in Table 1 to condition 1 of this approval.	<i>At all times</i>

Operational work condition 43 – performing work in wetland protection area		Timing
43.1	Limit all works performed in a wetland area to the location shown on plan titled Bowen Orbital Space Port Access Road Locality Plan and Drawing Index, as amended in red by the Department of Environment and Science, prepared by i3 Consulting Pty Ltd, plan reference GSLF-I3C-CV-DWG-001-01, revision E, dated 09/02/2022 and detailed in Table 1 to condition 1 of this approval.	<i>At all times</i>
43.2	<p>Prepare and implement a wetland protection management plan (by a suitably qualified person in accordance with current best practise) that:</p> <ul style="list-style-type: none"> (a) is consistent with the plan showing the proposed work in the wetland protection area (b) identifies all impacts associated with the identified operations 	<i>Prior to commencement of site works.</i>

	(c) contains management actions that address the impacts associated with performing work in a wetland protection area in accordance with current best practices, and (d) contains an appropriate monitoring program, identifies actions for correcting any failings in management and who is responsible for undertaking those actions.	
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Advice

Currency period

This SDA approval is valid until the end of the currency period, four years after the date of approval, unless the approval states a different period. For the SDA approval to remain valid the proponent must have, before the end of the currency period:

- substantially started the development; or
- made an application to the Coordinator-General to extend the currency period.

Other approvals

This approval relates solely to the material change of use for a high impact industry (launch facility) in the Abbot Point State Development Area. All other approvals and/or permits required under local, state and/or commonwealth legislation must be obtained prior to the commencement of the use.

If a development does not comply with the conditions of this material change of use approval, a new SDA application may be required to be lodged with the Coordinator-General in accordance with the Abbot SDA Development Scheme.

Department of Agriculture and Fisheries

If an exclusion area for the launch period or longer is required, this may affect commercial fishing operations in the vicinity. For guidance on identifying potential impacts to commercial fishing operations, contact the fisheries managers (fisheriesmanagers@daf.qld.gov.au) with details of any proposed marine exclusions and the timing and geographic areas of exclusion. Advice should also be sought on how to negotiate a suitable fisheries adjustment package with the impacted commercial fishers where applicable.

Department of Transport and Main Roads

Works on a railway

Pursuant to section 255 of the *Transport Infrastructure Act 1994*, the railway manager's written approval is required to carry out works in or on a railway corridor or otherwise interfere with the railway or its operations.

Prior to the commencement of works, the applicant should contact the railway manager (Aurizon) regarding the following:

- (a) the requirement for relevant approvals/agreements from Aurizon such as a licence to enter or wayleave agreement, to address any procedures required pre, post and during the rocket launching. Please refer to the following weblink for more information:

<https://www.aurizon.com.au/what-we-deliver/network/accessing-the-rail-corridor>

- (b) the conditioned requirement for a Traffic Management Plan and to notify of changes to vehicular traffic over railway level crossings: ID: 5159 on the North Coast Line at Abbot Point Road and ID: 843 at Abbot Point Road on the Abbot Point Branch Railway.

This development approval does not constitute an approval under section 255 of the *Transport Infrastructure Act 1994* and that such approvals need to be separately obtained from the relevant railway manager.

The applicant should contact the Aurizon at CorridorEnquiries@aurizon.com.au in relation to this matter.

Emergencies

The facility operator should establish emergency procedures with the railway manager (Aurizon) and include them within the required contacts for landowners' consent for Lot 1 on RP748626 and in the Rocket Launch Management Plan.

Early notification of any situation will be required so that operations can be managed. The Emergency Response Plan (ERP) for the facility should include protocols for contacting Train Control so that appropriate emergency actions can be put in place. Aurizon should be contacted immediately via the metropolitan control centre for Queensland Rail on telephone number 1800 079 303 in relation to any dangerous goods or rocket launch events impacting on the railway corridor.

Cultural heritage – duty of care

Where items of archaeological importance are identified during construction of the project, the proponent must comply with its duty of care under the *Aboriginal Cultural Heritage Act 2003* and the Department of Environment and Heritage Protection 2014 guideline: archaeological investigations. All work must cease, and the relevant State agency must be notified. Work can resume only after State agency clearance is obtained.

Office of Industrial Relations | Major Hazardous Facilities Unit (OIR|MHFU)

This high impact industry (launch facility) development, commonly referred to as the Bowen Orbital Spaceport, is now required to notify hazardous chemicals as per:

<https://www.worksafe.qld.gov.au/safety-and-prevention/incidents-and-notifications/hazardous-chemical-notifications>.

Queensland Fire and Emergency Services

The contact for consultation on both the Bushfire Management Plan (with Rural Fire Service) and the Safety and Management Plan (Fire and Rescue Service) for this development is:

Office of The Assistant Commissioner, Northern Region (NR)
Queensland Fire and Emergency Service
PO Box 5845, Townsville, Qld, 4810 E: NR.AC@qfes.qld.gov.au

Resources Health and Safety Queensland (RSHQ)

Any future development involving materials and processes administered by the *Explosives Act 1999* and Explosives Regulation 2017 are notified to the Explosives Inspectorate for consideration, comment and review. This includes the use of solid rocket motors, black powder or other authorised primary and initiating explosives.

Enclosure 1 – audit report

To demonstrate compliance with **condition 9** of this development approval, the following information will be required in an audit report:

- (a) details of the development approval, including the SDA approval number, the date of approval and a summary of the audit reporting requirements. This should include a schedule of the dates by which audit reporting is to be provided to the Coordinator-General.
- (b) details of the independent, suitably qualified person(s) (see Schedule 1 in the Abbot Point SDA Development Scheme) (the auditor) responsible for preparing the audit report, including the auditor(s):
 - (i) name, position, company and contact details
 - (ii) qualifications and experience
 - (iii) proof that the auditor is an independent third party unaffiliated with the proponent.
- (c) details of any external suitably qualified person(s) used to supplement reports/plans outside of the auditor's expertise.
- (d) an audit evaluation matrix including but not limited to:
 - (i) each condition of the SDA approval, and the status of the condition at the end of the relevant audit period
 - (ii) where a condition is current or complete, (to be activated, activated, complete), whether compliance has been achieved (compliant, non-compliant or not applicable), how compliance has been achieved (description of works, tasks or actions undertaken) and how the evaluation of the audit has been undertaken
 - (iii) a full description of the relevant standards, practices etc. against which works have been assessed together with evidence (reports, site photographs, certification documentation) to support the evaluation of the works against the compliance standards
 - (iv) the title, date, location and holder of any documentation referred to in the compliance evaluation matrix but not provided with the audit to allow the Coordinator-General to call upon these documents as required
 - (v) details of any non-compliances identified by any party during the current audit period and a methodology specifying how compliance has been/will be achieved and by when it will be achieved, and
 - (vi) details of previous audit reports (if relevant) with an update on any non-compliance, corrective actions and revised practices (as relevant) undertaken and the current status of any corrective actions.
- (e) additional evidence to support the compliance evaluation, including the date and locations of any site inspection/s conducted during the preparation of the audit report and details of any employees of the proponent interviewed for the audit.
- (f) the auditor's declaration whereby the auditor:
 - (i) certifies the conditions contained in the SDA approval have been satisfactorily complied with, subject to any qualifications which the author has outlined in the audit report
 - (ii) certifies that to the best of the auditor's knowledge, all information provided in the audit report is true, correct and complete, and
 - (iii) acknowledges it is an offence under section 157O of the *State Development and Public Works Organisation Act 1971*, to give the Coordinator-General a document containing information the auditor knows is false or misleading in any material particular.
- (g) any further attachments the auditor considers relevant to the audit report.

An audit report guideline has been prepared to provide guidance to proponents and auditors in compiling audit reports. The guideline is available on the Department of State Development, Manufacturing, Infrastructure and Planning website at:

<https://www.statedevelopment.qld.gov.au/coordinator-general/state-development-areas/development-schemes-applications-and-requests> or by contacting the SDA Division on 1800 001 048 or via sdainfo@coordinatorgeneral.qld.gov.au.

Enclosure 2 – air quality and dust management plan

To demonstrate compliance with **condition 12.1** and **condition 25** of this development approval, prepare a site-based air quality and dust management plan (by a suitably qualified person) that addresses, but is not necessarily limited to, the following matters:

- (a) An *'Ambient Air Quality Monitoring Program'*
- (b) mitigation and measures proposed to prevent spray drift, odour, noise, dust, smoke, or ash emission on nuisance sensitive places
- (c) mitigation and measures proposed to ensure dust deposition attributable to project activities, when measured at a nuisance sensitive place must not exceed 120 milligrams per square metre per day, averaged over 1 month
- (d) mitigation and measures proposed to ensure other indicators that a measured at any nuisance sensitive place must not exceed the air quality objectives specified in Schedule 1 of the *Environmental Protection (Air) Policy 2019*
- (e) site clearance and soil stockpiles must be maintained using all reasonable and practicable measures using water sprays or alternative dust suppression and/or mitigation measures
- (f) ensure all access roadways, material storage areas and vehicle entry points have appropriate dust mitigation
- (g) restrict vehicle movements to specifically defined areas and adhere to onsite speed limits
- (h) ambient dust monitoring program that includes parameters such as dust deposition (insoluble matter) and suspended particulate concentrations of PM10 and PM2.5.
- (i) undertake visual monitoring for fugitive dust during construction and implement appropriate controls to contain fugitive dust
- (j) ensure that all plant and equipment are maintained and operated in accordance with Australian Design Rules and manufacturers specifications.

Enclosure 3 - flora and fauna management plan

To demonstrate compliance with **condition 12.1** of this development approval, prepare a site-based flora and fauna management plan (by a suitably qualified person) that addresses, at a minimum, the following matters:

- (a) the location, extent, condition and significance of native terrestrial and marine fauna populations, including individual endangered, threatened (or near threatened) and vulnerable species and communities in the surrounding area, including on land, wetlands (Caley Valley Wetland), waterways and the marine environment
- (b) inclusion of a monitoring and recording program for populations of endangered, threatened (or near threatened) and vulnerable species of state significance, inclusive of a count of the relevant species, prior to the commencement of the use (a launch event) and monitored on regular annual intervals, during both dry and wet seasons, for the duration of the approval period
- (c) detail the ability of populations or individuals to recover
- (d) the mitigation and management measures required to protect threatened species, including among other things:
 - (i) actions and procedures to be followed during the pre-construction, construction, operational and (if appropriate) rehabilitation phases of the project
 - (ii) a program of monitoring, reporting and review to facilitate adaptive management of the actions and measures, should it be required
 - (iii) the developments compliance with all relevant provisions of the *Nature Conservation Act 1992 (Qld)*.
- (e) provision for the relocation of fauna prior to each launch event
- (f) measures to prevent bird strike
- (g) measures to prevent fauna being harmed from noise and heat exposure must be implemented during operational activities and immediately before a launch event
- (h) monitoring and management of flora and fauna pest species, including prevention of pest animals accessing putrescible waste at facilities.

Enclosure 4 – soils, erosion and sediment control plan

To demonstrate compliance with **condition 12.1** of this development approval, prepare and implement a site-specific soils, erosion and sediment control plan (by a suitably qualified person) in accordance with Best Practice Erosion and Sediment Control (BPESC) guidelines for Australia (International Erosion Control Association) that addresses the following:

- (a) erosion and sediment control plans (minimum A3 size to scale) for the use, with the following attributes:
 - (i) property boundaries
 - (ii) general soil types on block
 - (iii) contours – existing and final
 - (iv) location of existing improvements and final building and infrastructure
 - (v) location of stormwater discharge points
 - (vi) location of all final impervious areas
 - (vii) location and description of existing vegetation
 - (viii) location of all drainage lines, creeks, wetlands, tidal waters and other water bodies potentially affected by the development
 - (ix) catchment area boundaries
 - (x) limits of clearing
 - (xi) location of vegetation buffer strip
 - (xii) location of entry/exit
 - (xiii) location of stockpile areas
 - (xiv) location of roads, stormwater drainage areas, underground services
 - (xv) location of temporary drainage control measures
 - (xvi) location of proposed sediment control measures
 - (xvii) permanent site stabilisation measures.
- (b) an erosion and sediment control plan report that addresses the following information:
 - (i) description of development and staging
 - (ii) description of adjoining land
 - (iii) description of soil materials to be exposed or disturbed
 - (iv) description and location of existing vegetation
 - (v) location and assessment of any critical areas
 - (vi) measures to prevent the release of sediment to all drainage lines, creeks, wetlands, tidal waters and other water bodies potentially affected by the development
 - (vii) confirmation of sodic (clay) soils capture and containment. It is noted that stormwater containing sodic sediment can have detrimental impact upon adjacent wetland areas.
- (c) an erosion prevention and sediment control strategy that addresses the following information:
 - (i) details of timing of erosion works and project staging
 - (ii) site access controls and treatment
 - (iii) diversion of runoff around work sites
 - (iv) location and design of temporary and permanent erosion and sediment control structures. This should include calculations to support the sizing of sediment detention basins, catch drains and catch dams etc.
 - (v) descriptions of onsite dust control measures
 - (vi) proposed vegetated buffer strips
 - (vii) revegetation program including stream bank rehabilitation near permanent roads and temporary crossings
 - (viii) final landscaping proposals
 - (ix) maintenance program
 - (x) monitoring program
 - (xi) corrective action strategies and procedures and who is responsible.
- (d) a risk assessment analysis of conducting earthworks during the wet season (unless written confirmation that no earthworks will take place within the wet season)
- (e) prepare an acid sulphate soils management plan for any earthworks in areas below 5m AHD or areas of probable acid sulphate soils.

Enclosure 5 – general and hazardous waste management plan

To demonstrate compliance with **condition 12.1** of this development approval, prepare a general and hazardous waste management plan (by a suitably qualified person) based on the following criteria:

- (a) reuse, recycle or lawfully dispose of all waste (other than treated wastewater released to land) generated by the development
- (b) prepare a refuse management strategy which outlines the method and frequency of refuse collection
- (c) hazardous materials (including hazardous waste materials) must be contained within an onsite containment system and controlled in a manner that prevents environmental harm and must be maintained in accordance with the current edition of AS1940 – Storage and Handling of Flammable and Combustible Liquids
- (d) ensure pest animals are prevented from accessing putrescible waste around the development.

Enclosure 6 – stormwater management plan

To demonstrate compliance with **condition 12.1** of this development approval, prepare a site-based stormwater management plan (by a suitably qualified person) that addresses the following:

- (a) topsoil stripping phase
- (b) development phase
- (c) post-development and rehabilitation phase
- (d) confirmation of measures to be put in place during high rainfall events (minimum Cyclone Category 3) that will require pump out
- (e) the release criteria for controlled runoff events or pumped discharges from the construction site
- (f) prevention of ponding or other significant effect on other properties, watercourses, creeks or lakes to ensure stormwater does not adversely affect the values of the receiving environment
- (g) the location and number of stormwater monitoring points
- (h) confirmation of the number and location of meteorological monitoring stations and flow gauging stations on key watercourses that would affect flooding in proximity to the site
- (i) confirmation of destination of water collected in the sediment basin where proposed and monitoring measures to be established to ensure any overflows are addressed
- (j) confirmation of measures to be implemented to prevent sediment and pollutants from entering the waterways and groundwater supply
- (k) monitoring of stormwater management devices
- (l) final stormwater discharge from the detention basin/s, if used, must not cause ponding of stormwater on adjacent site/s and any significant on adjacent water courses/creeks/lakes
- (m) contaminants must not be directly or indirectly released to waters
- (n) be prepared having regard to Module 18.2 – Stormwater and Drainage Impacts on State Transport Infrastructure State Code of the State Development Assessment Provisions (available at <https://dsdmipprd.blob.core.windows.net/general/sdap-1-10-module-18.pdf>).
- (o) demonstrate that the management of stormwater (quantity and quality) post development can achieve a no worsening impact (on the pre-development condition) for all flood and stormwater events that exist prior to development and up to a 1% Annual Exceedance Probability (AEP) (equivalent to 1/100 year Average Recurrence Interval (ARI)). Stormwater management for the proposed development must ensure no worsening to the railway, including rail transport infrastructure, caused by peak discharges, flood levels, frequency/duration of flooding, flow velocities, water quality, sedimentation and scour effects
- (p) incorporate appropriate hydraulic and hydrological analysis demonstrating:
 - (i) design flood peak discharges for the site and surrounding area which exist prior to the development for all flood and stormwater events up to a 1% Annual Exceedance Probability (AEP) (equivalent to 1/100-year Average Recurrence Interval (ARI)). This should include at least the following flood and stormwater events: 50%, 20%, 10%, 5%, 2% and 1% AEP (equivalent to 2, 5, 10, 20, 50 and 100-year ARI events)
 - (ii) design flood peak discharges for the site after the development has occurred for all flood and stormwater events up to a 1% Annual Exceedance Probability (AEP) (equivalent to 1/100-year Average Recurrence Interval (ARI)). This should include at least the following flood and stormwater events: 50%, 20%, 10%, 5%, 2% and 1% AEP (equivalent to 2, 5, 10, 20, 50 and 100-year ARI events).
- (q) ensure the following are addressed, where applicable:
 - (i) all relevant legal points of discharge for the development site are identified.
 - (ii) overland flow paths are identified, and hydraulic conveyance is maintained on the site as part of the proposed development
 - (iii) flood storage capacity is maintained on the site as part of the proposed development
 - (iv) the adverse impacts from sheet flow on the railway are prevented
 - (v) the proposed development does not cause a concentration of stormwater (including floodwater) flows discharging on the railway during construction or thereafter

- (vi) retaining structures, filling/excavation, landscaping, construction activities or any other works to the land have been designed to include provision for drainage so as not to adversely impact on the railway
 - (vii) the proposed development does not impede or interfere with any drainage, stormwater or floodwater flows from the railway
 - (viii) stormwater or floodwater flows have been designed to maintain the structural integrity of the rail transport infrastructure
 - (ix) existing stormwater drainage infrastructure on the railway is not interfered with or damaged by the proposed development such as through concentrated flows, surcharging, scour or deposition
 - (x) the quality of stormwater discharging onto the railway is not reduced through erosion and sedimentation.
- (r) include details of the mitigation measures proposed to address any potential stormwater impacts (including flooding impacts) of the proposed development. The design flood peak discharges should be shown for the mitigated case to demonstrate there is no worsening impact on the railway.

Enclosure 7 – traffic management plan

To demonstrate compliance with **condition 12.1** of this development approval, prepare a traffic management plan (TMP) (by a suitably qualified person) that addresses all aspects of access to and from the development.

The TMP must ensure that there is no disruption to the safety and operational integrity of railway level crossings impacted on by development generated traffic, including but not limited to railway level crossings: ID: 5159 on the North Coast Line at Abbot Point Road and ID: 843 at Abbot Point Road on the Abbot Point Branch Railway.

In particular, the maximum design vehicle for the construction and operation of the development must not exceed 19m in length. The Traffic Management Plan must detail at least the communication and safety controls to be implemented to manage short stacking.

This TMP, certified by a RPEQ, must be given to the Program Delivery and Operations Unit, Mackay Whitsunday Region (Mackay.Whitsunday.IDAS@tmr.qld.gov.au) within the Department of Transport and Main Roads.

Enclosure 8 – noise and vibration management plan

To demonstrate compliance with **condition 12.1** and **condition 26** of this development approval, a noise and vibration management plan (prepared by a suitably qualified person) must be implemented at the site of the development and must include the following as a minimum:

- (a) identification of all potential sensitive and commercial locations which may be affected by noise and vibration impacts from launch activities and quantify the cumulative noise impact at those commercial locations that accounts for launch activities occurring simultaneously (that is the existing noise levels at the commercial location plus the noise impact of a launch event)
- (b) identification of all major sources of noise and vibration emissions that may occur as result of the operation of the launch facility
- (c) description of the procedures to manage the noise and vibration emissions from the sources identified
- (d) collection and recording of noise and vibration data to compile empirical data for each launch event for the duration of the approval period
- (e) identifying adverse meteorological conditions likely to produce elevated levels of noise and vibration at a sensitive or commercial place due to launch activities
- (f) protocols to minimise the potential for noise and vibration emissions, and
- (g) description of procedures to be undertaken if any exceedance is detected.

Enclosure 9 – safety and emergency/disaster management plan

To demonstrate compliance with **condition 12.1** of this development approval, the operator of the development must prepare and operate a safety and emergency/disaster management plan in consultation with the state and regional emergency service providers, to ensure the safety and well-being of all occupants of the facility. The plan must be for both the construction and operational phases of the project and must provide details of the following:

- (a) a hazard analysis and risk assessment undertaken in accordance with AS/NZ ISO31000:2018 Risk Management Principles and Guidelines and the Whitsunday Regional Council Local Disaster Management Plan
- (b) potential natural and manmade hazards and emergency events
- (c) strategies for the protection of life and property in a disaster/emergency event
- (d) workforce numbers (including general breakdown of site access arrangements during both construction and operation)
- (e) response procedures to incidents/events including injuries, medical evacuations, road accidents, spills, fire, floods, launch vehicle explosions, and cyclones
- (f) evacuation plans and procedures, including evacuation routes and assembly areas for both the construction and operational phases of the development
- (g) demonstration that resources required for the implementation of the plan will be provided independent of resources allocated to towns in the Whitsunday region
- (h) demonstration of long-time resilience in distressed conditions in the event an evacuation cannot be achieved, including details of access to food, water, and medical supplies
- (i) training for staff who will be tasked with emergency management activities.
- (j) safety management plans and emergency response procedures prepared in consultation with the state and regional emergency service providers and provide an adequate level of training to staff who will be tasked with emergency management activities.

Enclosure 10 – bushfire hazard assessment and management plan

To demonstrate compliance with **condition 12.1** of this development approval, prepare a bushfire hazard assessment and management plan. The bushfire hazard assessment and management plan must be prepared in accordance with all relevant state and federal guidelines, policies and regulations, certified by a suitably qualified person and prepared in consultation with all landholders, Queensland Fire and Emergency Services and the Local Disaster Management Groups for Whitsunday Regional Council.

The bushfire hazard assessment and management plan must provide a bushfire hazard assessment as well as mitigation strategies to achieve the development outcomes in Part E of the State Planning Policy July 2017 – Natural Hazards, Risk and Resilience including:

- (a) identification and quantification of fire risk
- (b) strategies for the prevention and minimisation of fire hazard including details of the proposed ongoing management of fuel loads across the subject site and the management of the asset protection zone around on-site infrastructure.
- (c) strategies for the protection of life and property in the event of a bushfire
- (d) details on how the above will be implemented, including sourcing of required materials and services independent of the allocation of such materials and services to towns within the Whitsunday region.

The QFES document *Bushfire Resilient Communities: Technical Reference Guide for the State Planning Policy State Interest 'Natural Hazards, Risk and Resilience - Bushfire'*, (QFES 2019) provides specific advice on:

- (a) The process for undertaking a bushfire hazard assessment (Chapter 5)
- (b) The process for calculating asset protection zones (Chapter 7), and
- (c) The process for preparing a bushfire management, vegetation management or landscape maintenance plans (Chapter 8).

The bushfire hazard assessment and management plan shall be provided to the Queensland Fire and Emergency Services Sustainable Development Unit for review prior to commencement of use and is to be referred to:

Sustainable Development Unit
L2 85 Hudson Road Albion
sdu@qfes.qld.gov.au

Enclosure 11 – acid sulfate soils management plan

To demonstrate compliance with **condition 12.1** and **condition 13** of this development approval, prepare an acid sulfate soils management plan (by a suitably qualified person) in accordance with the current *Queensland Acid Sulfate Soils Technical Manual: Soil management guidelines*, prepared by the Department of Science, Information Technology, Innovation and the Arts, 2014.

Enclosure 12 – site-based land management plan

To demonstrate compliance within **condition 21.1** of this development approval:

- (a) Prepare a site-based land management plan that includes a site-based pest management plan in accordance with the Department of Agriculture and Fisheries '*Pest Management Planning*' guidance material that includes, but is not limited to, the following:
 - (i) a pre-works inspection of the property to locate, map and identify existing pest flora and fauna species.
 - (ii) training of site personnel in the identification of local pest species likely to occur at the site.
 - (iii) no vehicles enter the wetland protection area 50m buffer zone
- (b) Implement the procedures/requirements contained in the site-based pest management plan, prepared in accordance with (a).

Note: The applicable guidance material is available at <http://www.daf.qld.gov.au/business-priorities/biosecurity/invasive-plants-animals/pest-management-planning>

Enclosure 13 – decommissioning and rehabilitation management plan

To demonstrate compliance with **condition 21.1** of this development approval, prepare a detailed site-specific decommissioning and rehabilitation management plan (by a suitably qualified person). The plan is to include:

- (a) details of how the area will be rehabilitated, including the removal of all temporary and permanent infrastructure and facilities
- (b) details of self-sustaining species (groundcover and vegetation) to be planted within six months of site decommissioning, including proposed numbers and location
- (c) a monitoring programme, including timeframes to ensure the revegetation species will survive (including during the dry period)
- (d) details of measures to be implemented to prevent weed control and erosion of the site
- (e) identification of the proposed topography of this site after rehabilitation.

After decommissioning or abandonment for any reason, all significant disturbed land caused by the carrying out of the activity(ies) must be rehabilitated to meet the following final acceptance criteria:

- (a) any contaminated land (e.g., contaminated soils) is remediated and rehabilitated
- (b) for land that is not being cultivated by the landholder:
 - i. groundcover, that is not a declared pest species, is established and self-sustaining
 - ii. vegetation of similar species richness and species diversity to preselected analogue sites is established and self-sustaining.
- (c) for land that is to be cultivated by the landholder, cover crop is revegetated, unless the landholder will be preparing the site for cropping within three months of activities being completed.



LEGEND

- EXISTING SURFACE CONTOURS (250mm)
- DESIGN CONTOURS - 250mm (FSL)
- 160.00 CONTOUR LABELS (FSL)
- 160.000 SPOT HEIGHTS (FINISHED SURFACE)

PAD SETOUT

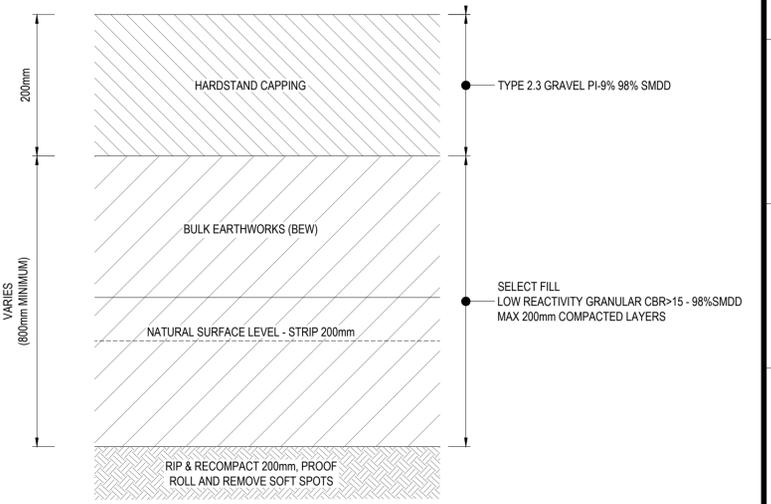
(GDA2020 / ZONE 55)

POINT	EASTING	NORTHING
1	616311.644	7792736.966
2	616384.973	7792752.895
3	616387.663	7792740.790
4	616517.574	7792769.011
5	616513.307	7792788.653
6	616556.322	7792797.998
7	616556.193	7792752.557
8	616558.544	7792740.662
9	616322.003	7792689.278
10	616388.773	7792735.403
11	616479.262	7792755.061
12	616484.336	7792731.705
13	616393.847	7792712.048

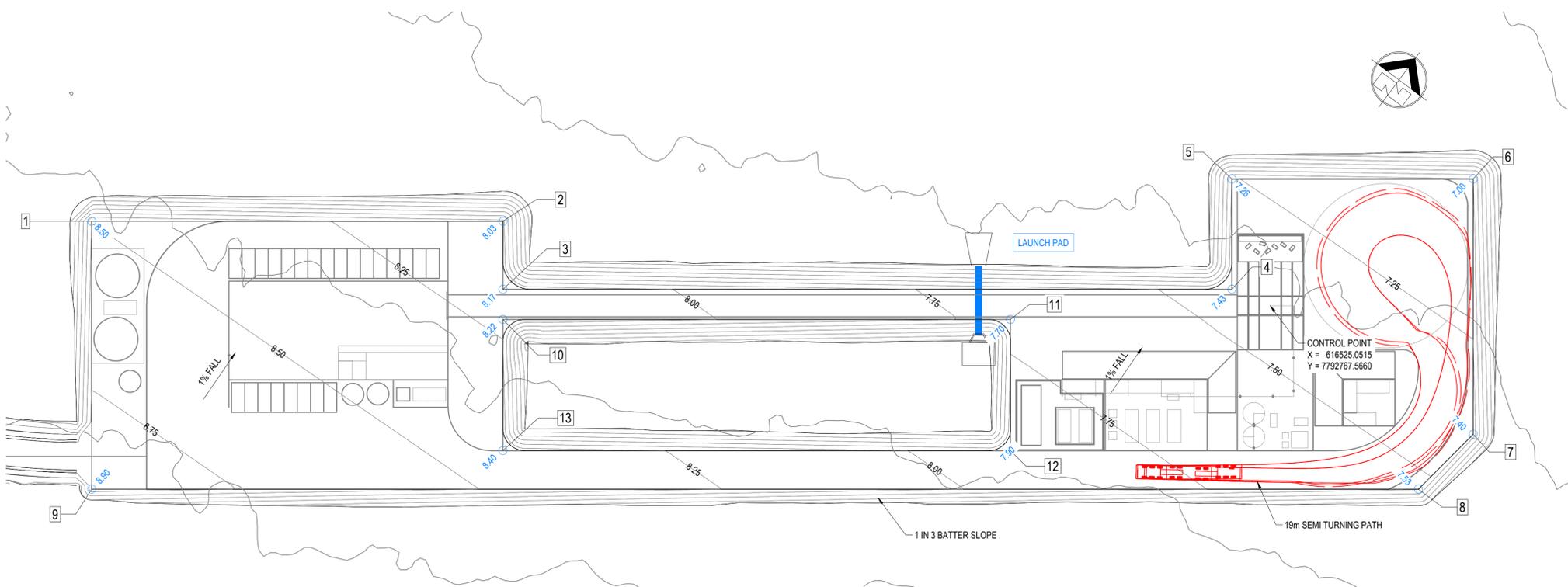
- NOTES:
- SURFACE IS TO BE GRADED LINEARLY BETWEEN FINISHED SURFACE POINTS.
 - TOLERANCES REFER CONTRACT DOCUMENTATION.
 - INTERNAL INFRASTRUCTURE LAYOUT IS BASED ON THE DESIGN AVAILABLE ON THE DATE OF DRAWING REVISION

- PAD SURFACE (FSL)
- PAVEMENT BASECOURSE
- BULK EARTHWORKS (BEW)
- SELECT FILL
- EXISTING SURFACE (ESL)

LAYER REFERENCE SECTION

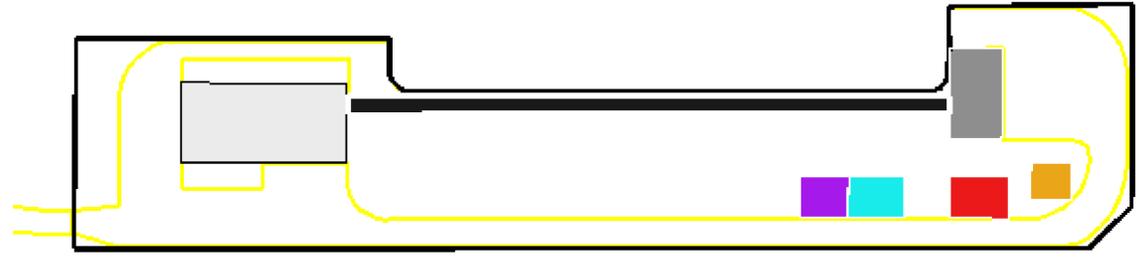


TYPICAL PAD PAVEMENT DETAIL



LAYOUT PLAN - LAUNCH FACILITY

SCALE 1:500



- VEHICLE ASSEMBLY BUILDING
- OXIDISER PAD
- CRYONGENIC PAD
- FUEL AND WATER PAD
- GASSES PAD
- LAUNCH PAD
- LAUNCH VEHICLE LANE

No	DESCRIPTION	DATE
E	FOR APPROVAL	09.02.2022
D	FOR APPROVAL	08.02.2022
C	FOR APPROVAL	02.02.2022
B	FOR APPROVAL	19.01.2022
A	FOR REVIEW	23.11.2021

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Engineers Certification:
 Travis Smith MIE Aust. CPEng.
 NPER Civil
 RPEQ 16400
 CPESC 9500

Signature: *T. Smith*
 Date: 09.02.2022

PROJECT
BOWEN LAUNCH FACILITY

DRAWING TITLE
BOWEN ORBITAL SPACE PORT ACCESS ROAD

LAYOUT PLAN - LAUNCH FACILITY

DRAWN	T.J.S.	CHECKED	T.J.S.	APPROVED	T.J.S.
DRAWING STATUS		FOR APPROVAL			
SCALE	SIZE	COPYRIGHT ©I3 CONSULTING PTY. LTD. ANY UNAUTHORISED USE, DUPLICATION, DISTRIBUTION OR ALTERATION IS STRICTLY PROHIBITED.			
NTS	A1	DRAWING CODE			REV
GSLF-I3C-CV-DWG-006-01					E

PLANS AND DOCUMENTS
referred to in the
SDA APPROVAL

SDA approval: AP2021/007



REVISIONS			
REVISION	REVISION DESCRIPTION	DATE	APPROVED
A	ISSUED FOR DETAIL DESIGN	19/01/22	LDJ



COMPACTED HARDSTAND AREA
SUITABLE FOR VEHICLE ACCESS AND
TEMPORARY WORKS OR TEMPORARY MATERIALS
STORAGE DURING CAMPAIGN PREPARATION
AND OPERATIONS

LAUNCH PAD BUND + SUMP CAPACITY: 28 m³
(TOTAL VEHICLE LIQUIDS: ~ 20 m³)
(TOTAL WATER DELUGE: ~6 m³)

LP SUMP VOLUME: 20 m³
LP BUND WALL HEIGHT: 150mm
LP BUND VOLUME: 8 m³

EXHAUST BREAK BLOCKS
(1m L x 0.5m H x 0.5m W) TO DISPERSE
EXHAUST ENTRAINED WATER INTO BUND

WATER DELUGE DIVERTER FLOW
LINES OF CONTAINMENT

WATER DELUGE NOMINAL OUTPUT:
6m³ per OPERATION

NOTE. CONDENSING WATER VAPOUR (STEAM) MAY
FALL OUTSIDE OF WATER BUND, BUT WITHIN THE BOS
COMPOUND AREA. ANY CONDENSING WATER VAPOUR
WILL BE PURE H₂O AND IS TREATED AS IF RAIN WATER,
AND NO COLLECTION OF THIS WATER IS REQUIRED.

NOTES.

- SUMP AND BUND MANAGEMENT PROCEDURES TO BE DEVELOPED FOR PRE-LAUNCH CLEANING AND PREP ACTIVITIES.
- HAZARDOUS AND DANGEROUS GOODS MANAGEMENT PLAN AND EMERGENCY RESPONSE PLAN FOR ANY RECOVERY AND SPILL MANAGEMENT ACTIVITIES.

CONCRETE PAVED ROAD BETWEEN VEHICLE
ASSEMBLY BUILDING AND THE LAUNCH PAD

LAUNCH PAD CENTRE
19° 57' 28.00" S
148° 06' 46.00" E

EARTHEN BATTER AND
CONTAINMENT WALL
BUILDUP 1V:2H

FLUIDS PIPING ALIGNMENT

DELUGE WATER STORAGE x 2
20m³ (20 kL) TANK.
TYPICAL DOMESTIC RAINWATER
COLLECTION POLY TANK

FLUIDS PIPING ALIGNMENT

EARTHEN BATTER AND
CONTAINMENT WALL
BUILDUP 1V:2H

BOUNDED AREA IS THE 'COMPOUND' AREA FOR
REFILLABLE GAS STORAGE COMPLIANT TO AS2030

BOUNDED AREA IS 'COMPOUND' AREA FOR HYDROGEN
PEROXIDE STORAGE COMPLIANT TO AS 4326

BOUNDED AREA IS THE 'COMPOUND' AREA FOR
CRYOGENIC LIQUID STORAGE COMPLIANT TO AS1894

BOUNDED AREA IS THE 'COMPOUND' AREA FOR WATER
STORAGE, AND FLAMMABLE AND COMBUSTIBLE STORAGE
COMPLIANT TO AS1940



UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS ANGULAR ± 0.05° LINEAR NO DECIMAL ± 0.20 LINEAR ONE DECIMAL ± 0.10 LINEAR TWO DECIMAL ± 0.05		FIRST ANGLE PROJECTION	
SURFACE FINISH ✓ RAS2		DRAWN	LUIKE JACOBS
DO NOT SCALE DRAWING BREAK ALL SHARP EDGES AND REMOVE BURRS		DATE	2022-01-18
		APPROVED	
		APPROV DATE	

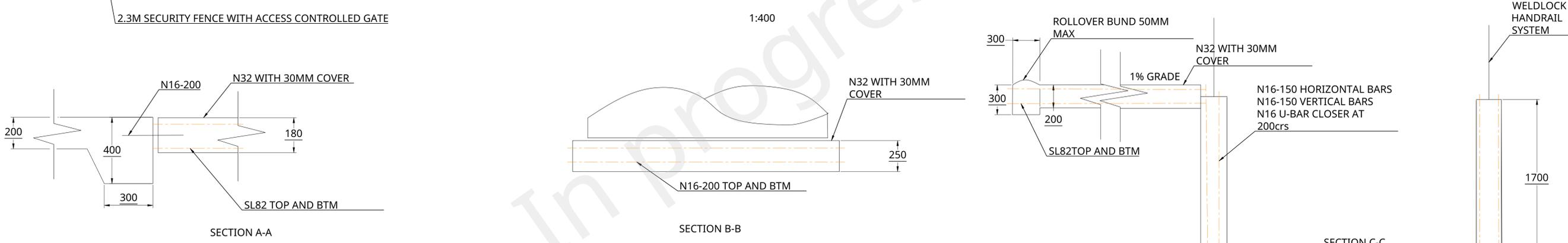
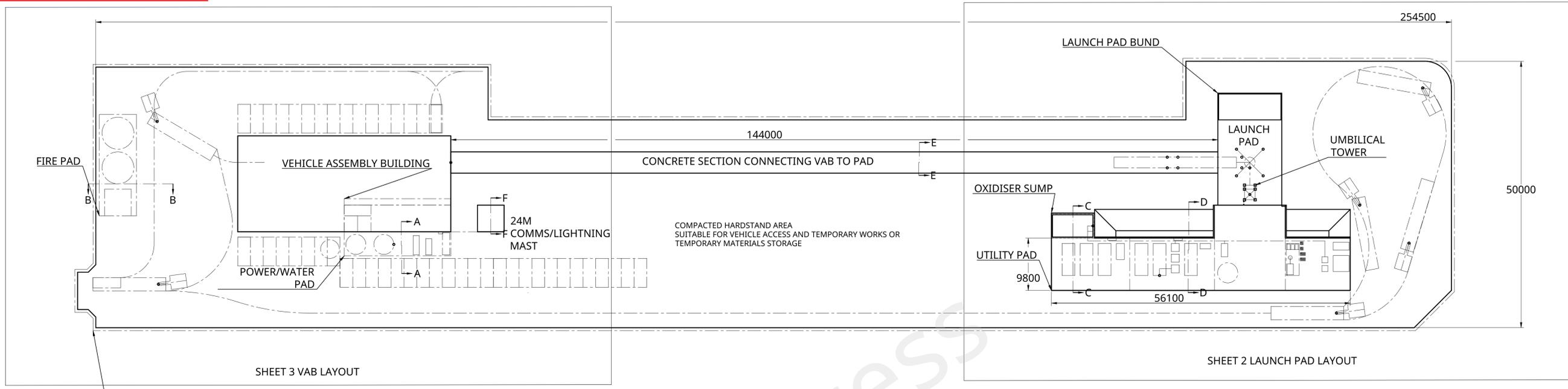
GILMOUR SPACE		TITLE	
		BOWEN ORBITAL SPACEPORT WATER DELUGE SYSTEM PROPOSED PAD LAYOUT	
SHEET	A1	DWG NO.	BOS-PADS-LAY
SCALE	1:100	SHEET	1 of 1

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TO USE OR DISCLOSE OF THE SAID INFORMATION TO UNAUTHORIZED PARTIES, DIRECTLY OR
INDIRECTLY, IRRESPECTIVE OF THE ACCEPTANCE OR REJECTION OF THE PRESENTATION OR AT ANY TIME
BEFORE, DURING OR AFTER AN AGREEMENT HAS BEEN REACHED, WITHOUT PRIOR WRITTEN CONSENT.

PLANS AND DOCUMENTS
referred to in the
SDA APPROVAL



SDA approval: APC2022/007



SLAB CROSS SECTIONS

NOTES.
1. ENCIRCLING GRAVEL ROADWAYS CLEARANCE SUFFICIENT TO FIREBREAK ALL PROPOSED INFRASTRUCTURE.

	UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS	THIRD ANGLE PROJECTION	
	LINEAR NO DECIMAL ±0.20 LINEAR ONE DECIMAL ±0.10 LINEAR TWO DECIMAL ±0.05 SURFACE FINISH ✓ RAS2	DRAWN: ADAM WILLIAMS DATE: 2022-09-07	
DO NOT SCALE DRAWING		APPROVED	BOWEN ORBITAL SPACEPORT LAYOUT DESIGN
BREAK ALL SHARP EDGES AND REMOVE BURRS		APPROV DATE	
THIS DOCUMENT IS COMMERCIAL-IN-CONFIDENCE. THE RECIPIENT OF THIS DOCUMENT AGREES TO HOLD ALL INFORMATION PRESENTED WITH AS CONFIDENTIAL AND AGREE NOT TO USE OR DISCLOSE, OR ALLOW TO USE OR DISCLOSE OF THE SAID INFORMATION TO UNAUTHORIZED PARTIES, DIRECTLY OR INDIRECTLY, IRRESPECTIVE OF THE ACCEPTANCE OR REJECTION OF THE PRESENTATION OR AT ANY TIME BEFORE, DURING OR AFTER AN AGREEMENT HAS BEEN REACHED, WITHOUT PRIOR WRITTEN CONSENT.		SITE: A1 SCALE: 1:400 SHEET: 1 of 3	DWG NO.: BOS PADS LAY REV: 5

12 11 10 9 8 7 6 5 4 3 2 1

NOTE:
NO AS/NZZS 60079 HAZARDOUS AREAS.
HOWEVER, PRACTICAL CONSIDERATIONS TO
BE CONSIDERED FOR KEROSENE STORAGE.

PLANS AND DOCUMENTS
referred to in the
SDA APPROVAL

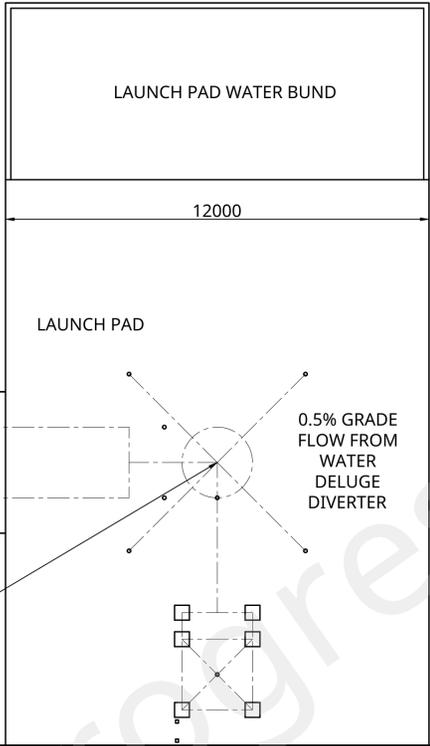


SDA approval: APC2022/007

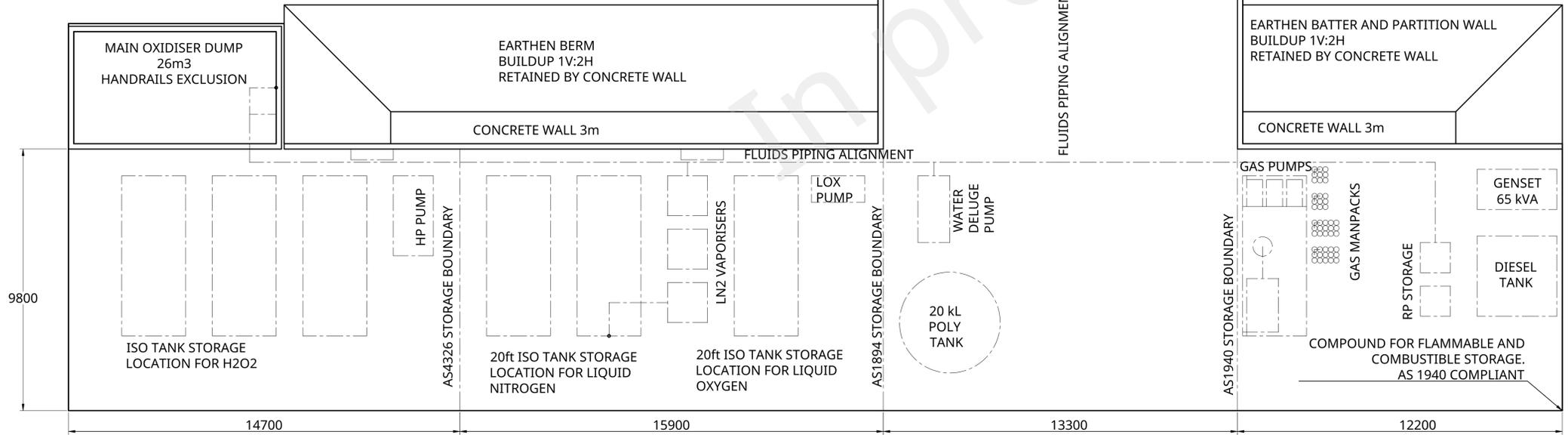
SECURITY FENCE
2.3M

COMPACTED HARDSTAND AREA
SUITABLE FOR VEHICLE ACCESS AND TEMPORARY WORKS OR TEMPORARY MATERIALS
STORAGE

CONCRETE PAVED ROAD BETWEEN VEHICLE
ASSEMBLY BUILDING AND THE LAUNCH PAD



19m SEMI TURNING PATH



9800

14700

15900

13300

12200

3:1 BATTER TRANSITION FROM ROADBASE
HARDSTAND TO SWALE



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GILMOUR SPACE		REV. 5
SHEET A1	DWG NO. BOS PADS LAY	
SCALE 1:100	DO NOT SCALE DRAWING	SHEET 2 of 3

12 11 10 9 8 7 6 5 4 3 2 1

12

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PLANS AND DOCUMENTS referred to in the SDA APPROVAL



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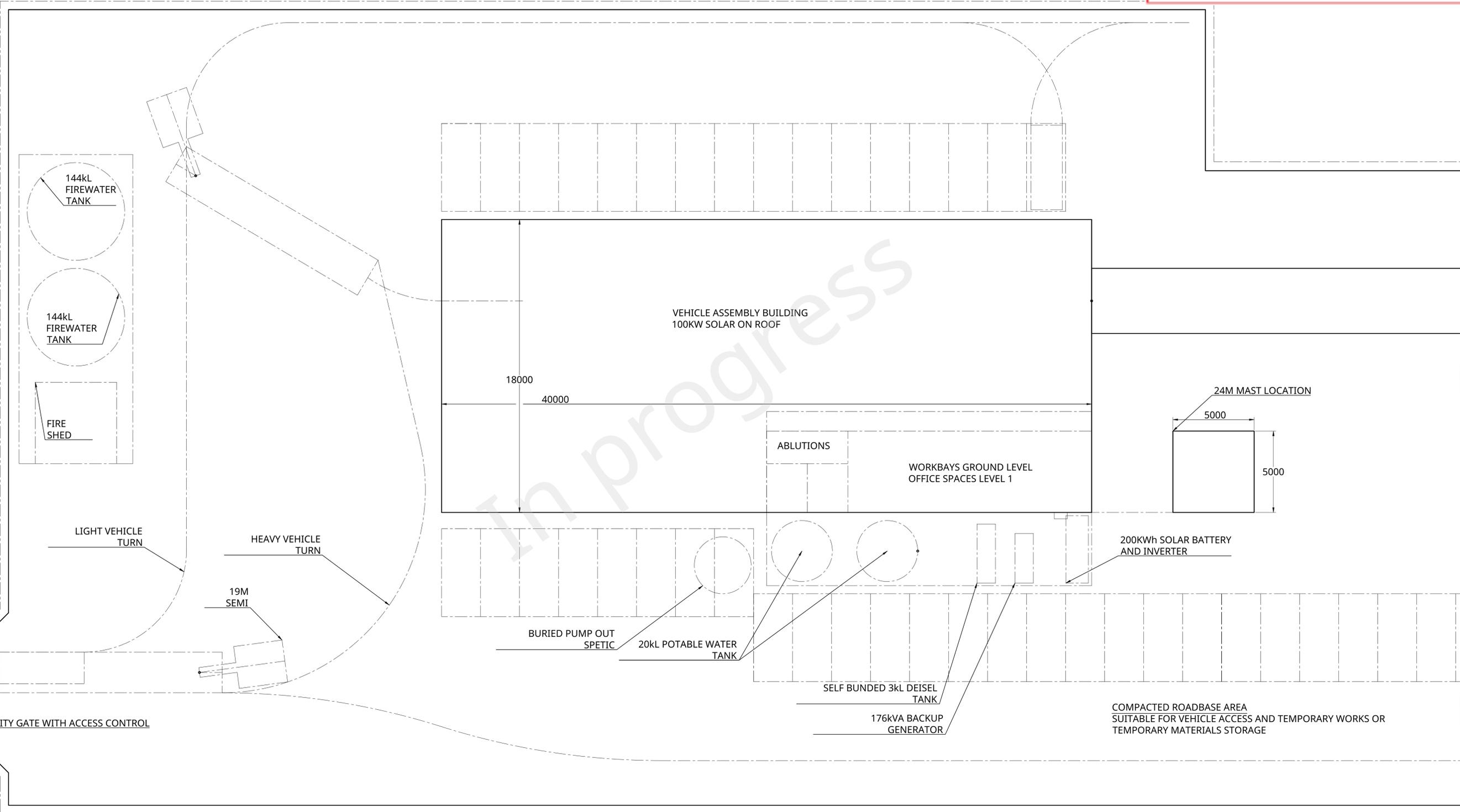
C

B

B

A

A



144kL FIREWATER TANK

144kL FIREWATER TANK

FIRE SHED

VEHICLE ASSEMBLY BUILDING
100KW SOLAR ON ROOF

18000

40000

ABLUTIONS

WORKBAYS GROUND LEVEL
OFFICE SPACES LEVEL 1

24M MAST LOCATION

5000

5000

LIGHT VEHICLE TURN

HEAVY VEHICLE TURN

19M SEMI

200KWh SOLAR BATTERY AND INVERTER

BURIED PUMP OUT SPETIC

20kL POTABLE WATER TANK

SELF BUNDED 3kL DEISEL TANK

176kVA BACKUP GENERATOR

COMPACTED ROADBASE AREA
SUITABLE FOR VEHICLE ACCESS AND TEMPORARY WORKS OR
TEMPORARY MATERIALS STORAGE

SECURITY GATE WITH ACCESS CONTROL

3:1 BATTER TRANSITION FROM ROADBASE
HARDSTAND TO SWALE

SECURITY FENCE
2.3M



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GILMOUR SPACE	
SITE: A1	DWG NO: BOS PADS LAY
SCALE: 1:120	DO NOT SCALE DRAWING
SHEET: 3 of 3	REV: 5

12

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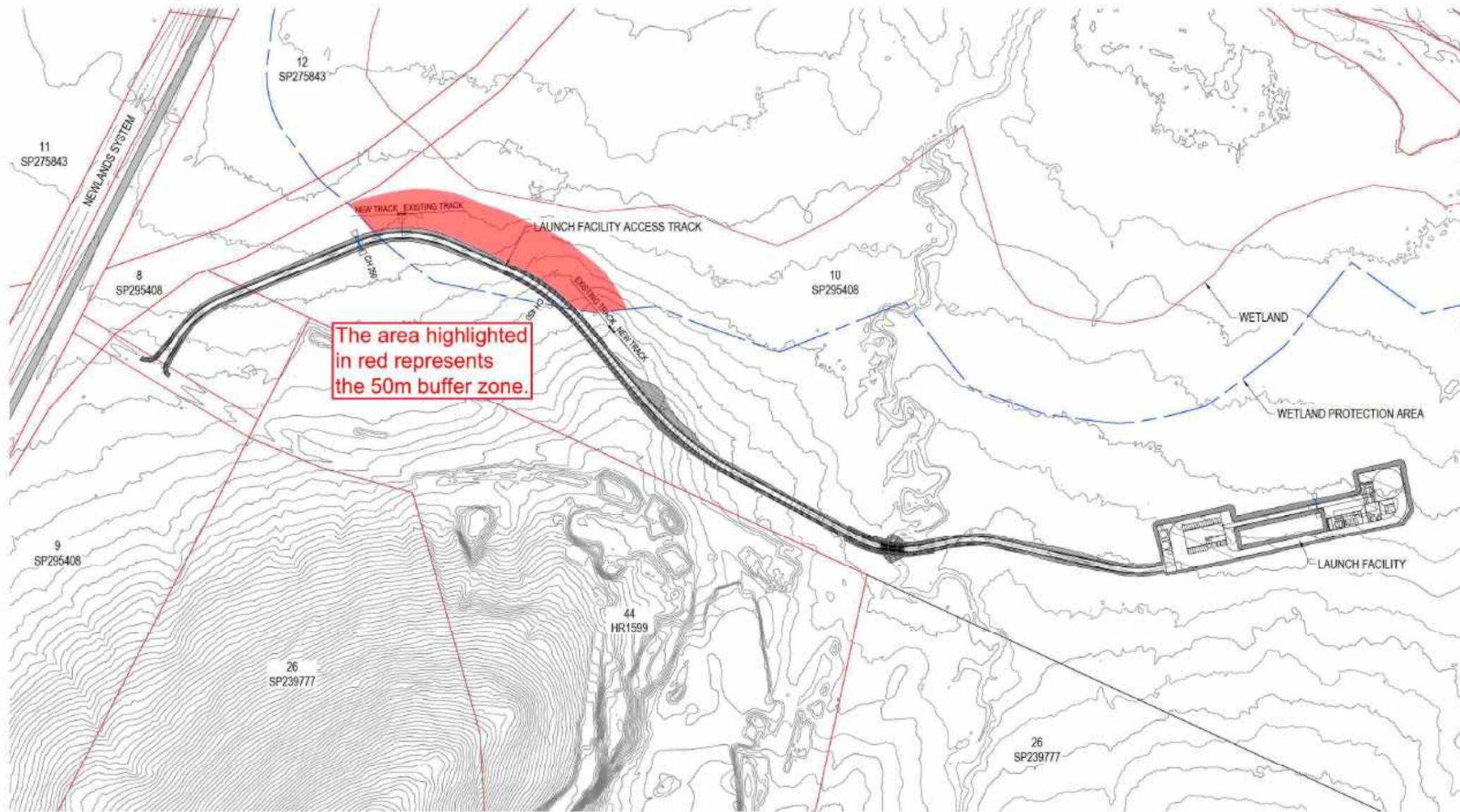
2

1

BOWEN ORBITAL SPACE PORT

BULK EARTHWORKS, ACCESS ROAD AND STORMWATER

Amended by the Department of Environment and Science to show approximate location of 50m buffer zone.
Date: 18/03/2022



The area highlighted in red represents the 50m buffer zone.

ACCESS ROAD - DRAWING INDEX

GSLF-I3C-CV-DWG-001-01	LOCALITY PLAN AND DRAWING INDEX
TYPICAL NOTES AND DETAILS	
GSLF-I3C-CV-DWG-002-01	SEDIMENT AND EROSION CONTROL TYPICAL DETAILS
GSLF-I3C-CV-DWG-003-01	TYPICAL NOTES AND DETAILS - SHEET 1 OF 3
GSLF-I3C-CV-DWG-003-02	TYPICAL NOTES AND DETAILS - SHEET 2 OF 3
GSLF-I3C-CV-DWG-003-03	TYPICAL NOTES AND DETAILS - SHEET 3 OF 3
STORMWATER CATCHMENT PLAN	
GSLF-I3C-CV-DWG-004-01	CATCHMENT PLAN - SHEET 1 OF 1
GSLF-I3C-CV-DWG-004-02	CULVERT UPGRADE SCHEDULE
LAYOUT AND LONGSECTION	
GSLF-I3C-CV-DWG-005-01	LAYOUT AND LONGSECTION - SHEET 1 OF 4
GSLF-I3C-CV-DWG-005-02	LAYOUT AND LONGSECTION - SHEET 2 OF 4
GSLF-I3C-CV-DWG-005-03	LAYOUT AND LONGSECTION - SHEET 3 OF 4
GSLF-I3C-CV-DWG-005-04	LAYOUT AND LONGSECTION - SHEET 4 OF 4
LAUNCH FACILITY	
GSLF-I3C-CV-DWG-006-01	LAYOUT PLAN - LAUNCH FACILITY
CROSS SECTIONS	
GSLF-I3C-CV-DWG-008-01	CROSS SECTIONS - SHEET 1 OF 3
GSLF-I3C-CV-DWG-008-02	CROSS SECTIONS - SHEET 2 OF 3
GSLF-I3C-CV-DWG-008-03	CROSS SECTIONS - SHEET 3 OF 3

LOCALITY PLAN
SCALE 1:2,500

PLANS AND DOCUMENTS referred to in the SDA APPROVAL

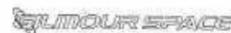


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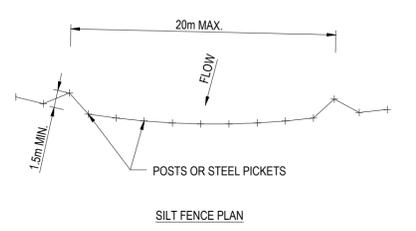
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Engineers Certification:
Travis Smith MIE Aust. CPEng.
NPER Civil
RPEQ 16400
CPESC 9500
Signature: *T. Smith*
Date: 09.02.2022

PROJECT
BOWEN ORBITAL SPACE PORT
DRAWING TITLE
**BOWEN ORBITAL SPACE PORT
ACCESS ROAD
LOCALITY PLAN AND DRAWING INDEX**

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ENSURE POST HOLES AND TRENCH ARE PROPERLY BACKFILLED AND COMPACTED

PLANS AND DOCUMENTS referred to in the **SDA APPROVAL**

SDA approval: **AP2021/007**

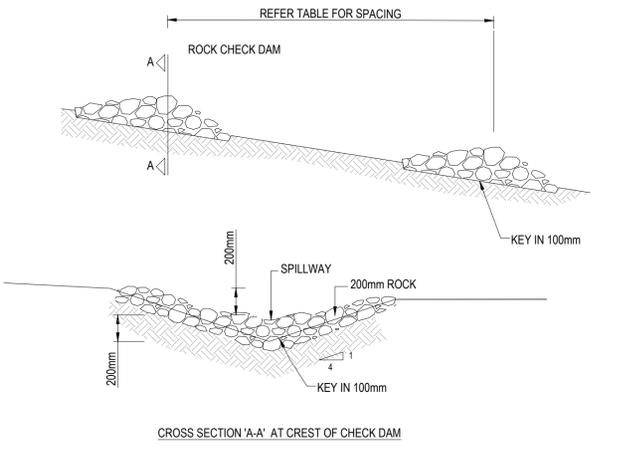
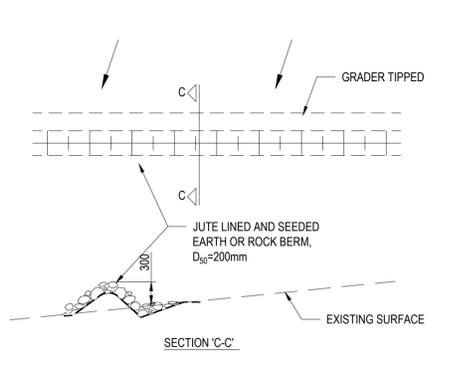
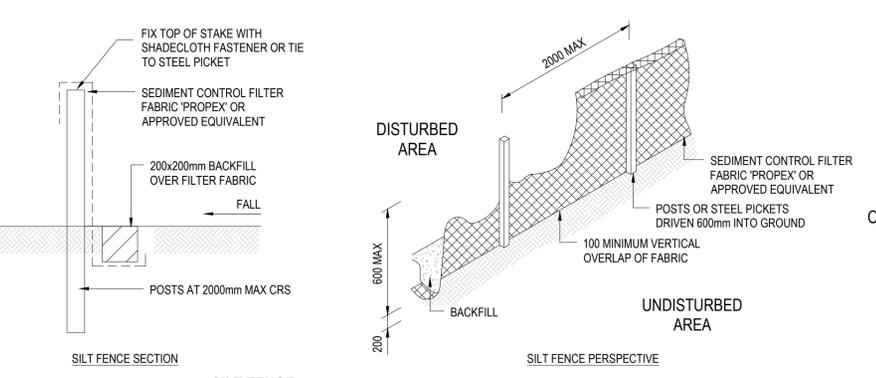
GRADE < 2.5%	2.5% < GRADE < 5%	5% < GRADE < 7%	7% < GRADE < 10%	GRADE > 10%
TOP SOILED & GRASSED	TOP SOILED & GRASSED WITH ROCK CHECK DAMS AT 20m CENTRES	TOP SOILED & GRASSED WITH ROCK CHECK DAMS AT 10m CENTRES	TOP SOILED & GRASSED WITH ROCK CHECK DAMS AT 5m CENTRES	ROCK LINED WITH COMPACTED D50=100mm CRUSHED ROCK (150mm THICK)

OPERATION & MAINTENANCE NOTES

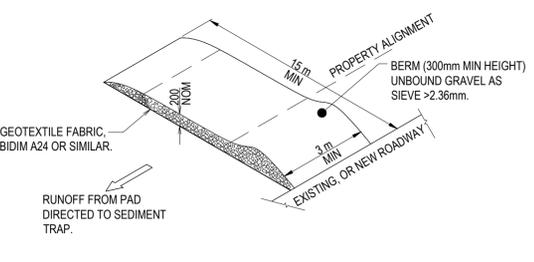
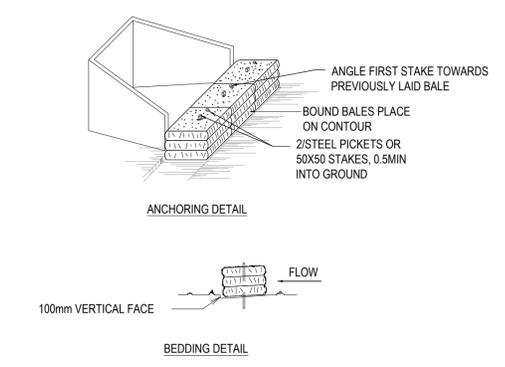
ALL ESC MEASURES MUST BE INSPECTED:
 - AT LEAST DAILY (WHEN WORK IS OCCURRING ON SITE) OR WEEKLY (WHEN WORK IS NOT OCCURRING ON SITE);
 - WITHIN 24 HOURS OF EXPECTED RAIN; AND
 - WITHIN 18 HOURS OF A RAINFALL EVENT (ie AN EVENT OF SUFFICIENT INTENSITY AND DURATION TO MOBILISE SEDIMENT ON SITE).

ESC MEASURE	MAINTENANCE TRIGGER	TIMEFRAME FOR COMPLETION OF MAINTENANCE
OTHER ESC MEASURES	THE CAPACITY OF ESC MEASURES FALLS BELOW 30%.	WITHIN 7 DAYS OF THE INSPECTION.

PRIOR TO LONG PERIOD OF SHUT DOWN ALL ESC MEASURES TO BE INSPECTED AND CLEANED.

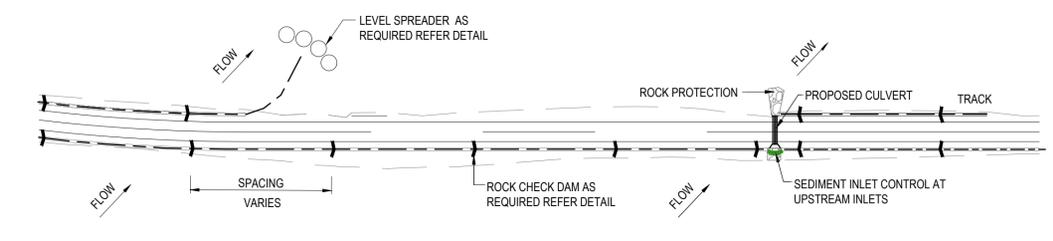


SILT ENTRAPMENT OPTIONS



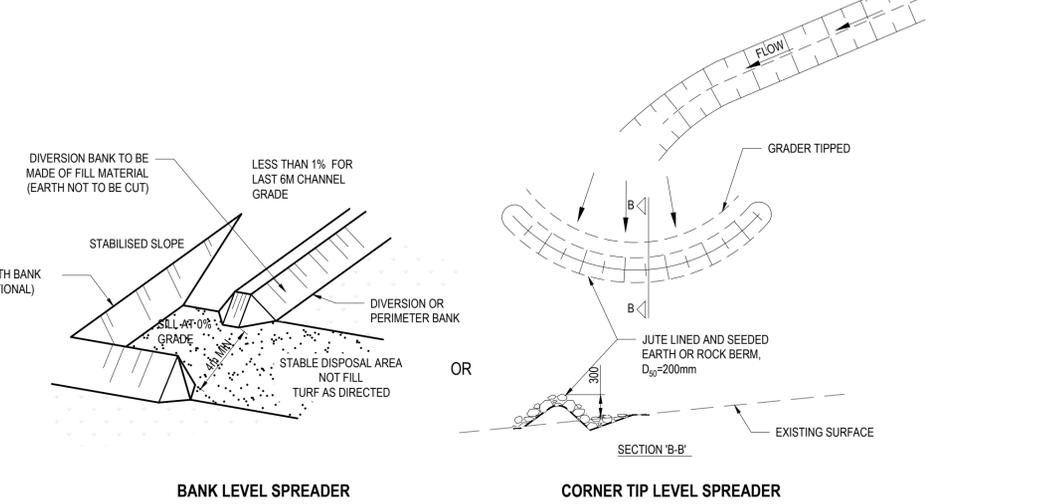
INLET CONTROL DETAIL

SHAKEDOWN DETAIL



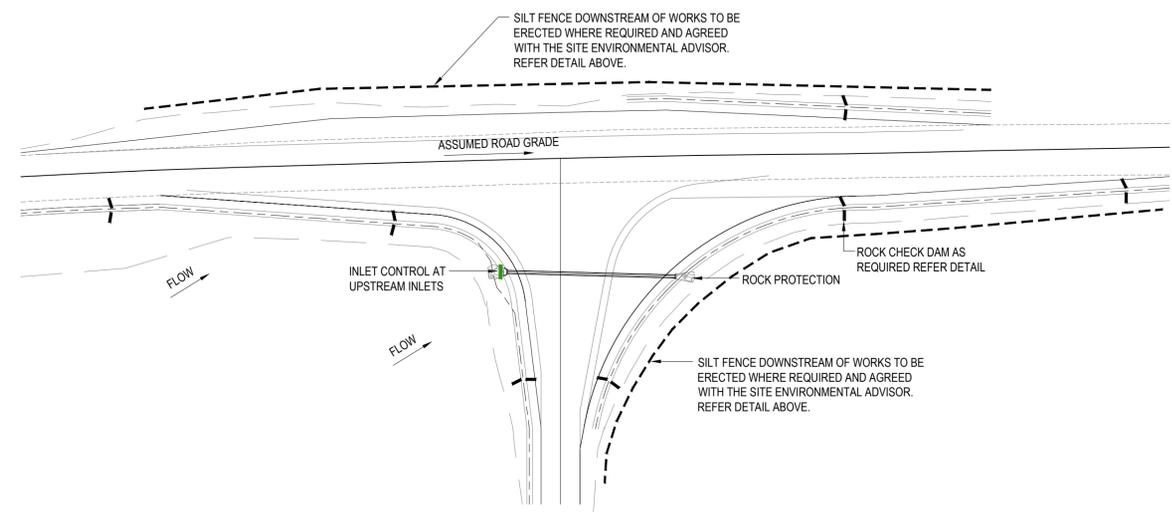
TYPICAL ROAD/ CULVERT SEDIMENT AND EROSION CONTROL PLAN

SCALE 1:1000



LEVEL SPREADER OPTIONS

CORNER TIP LEVEL SPREADER



TYPICAL INTERSECTION SEDIMENT AND EROSION CONTROL PLAN

SCALE 1:500

TABLE DRAINS, CATCH DRAINS AND DIVERSION DRAINS SHALL BE STABILISED WITH APPROPRIATE COVER APPROVED BY SUPERINTENDENT AND SUPPLEMENTED WITH ROCK WEIRS AS DETAILED.

SOIL AND STOCKPILE MANAGEMENT

- STOCKPILES SHALL BE APPROPRIATELY PROTECTED FROM THE WIND, RAIN, CONCENTRATED SURFACE FLOW AND EXCESSIVE UP-SLOPE STORMWATER SURFACE FLOWS.
- STOCKPILES SHALL BE LOCATED UPSTREAM OF AN APPROPRIATE SEDIMENT CONTROL SYSTEM. IF THE MATERIALS ARE LIKELY TO BE STOCKPILED FOR LONGER THAN 28 DAYS THEY SHALL BE PROTECTED BY PROVIDING AN APPROPRIATE COVER APPROVED BY SUPERINTENDENT WITHIN 10 DAYS.

No	DESCRIPTION	DATE
D	FOR APPROVAL	08.02.2022
C	FOR APPROVAL	02.02.2022
B	FOR APPROVAL	19.01.2022
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REVISION HISTORY

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 mail@i3consult.com.au
 ACN 106 675 156

Engineers Certification:
 Travis Smith MIE Aust. CPEng.
 NPER Civil
 RPEQ 16400
 CPESC 9500

Signature: *T. Smith*
 Date: 08.02.2022

PROJECT
BOWEN ORBITAL SPACE PORT

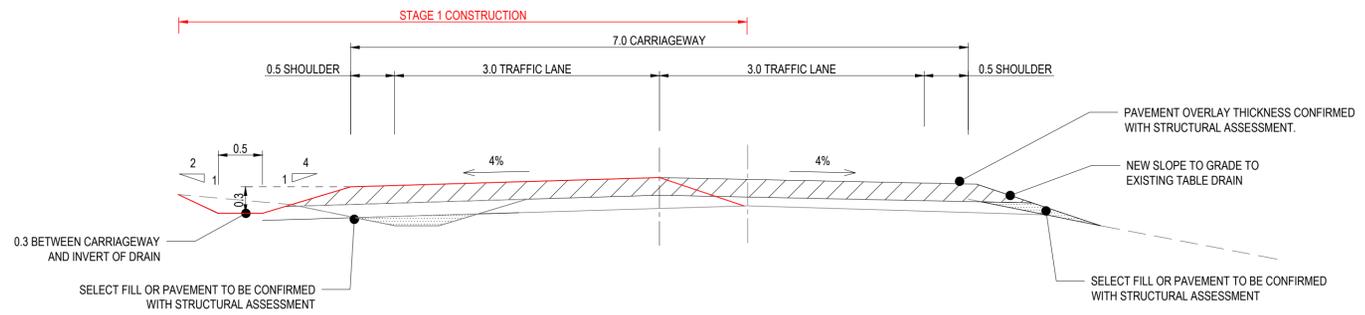
DRAWING TITLE
BOWEN ORBITAL SPACE PORT ACCESS ROAD
SEDIMENT AND EROSION CONTROL TYPICAL DETAILS

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PLANS AND DOCUMENTS
referred to in the
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- BEDDING LEGEND**
-  EVENLY GRADED BED, 20mm NOMINAL SIZE CLASS 2 FCR OR OTHER APPROVED BEDDING
 -  CLASS 3 FCR, 30mm NOMINAL SIZE OR OTHER APPROVED MATERIAL

- GENERAL NOTES**
1. ALL DIMENSIONS WITH DECIMALS ARE IN METRES, ALL THOSE WITHOUT ARE IN MILLIMETRES
 2. BACKFILL SHALL BE COMPACTED TO 98% STANDARD MDD COMPACTED AT ± 3% OMC. PAVEMENT LAYERS SHALL BE AS PER TYPICAL ACCESS TRACK DRAWING ###

TYPICAL CROSS SECTION 1 - GRAVEL SECTION
SCALE NTS

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ACN 106 675 156



Engineers Certification:
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RPEQ 16400
CPESC 9500

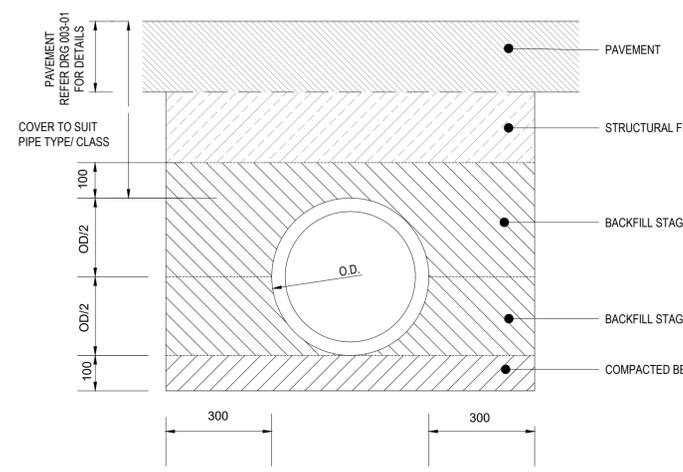
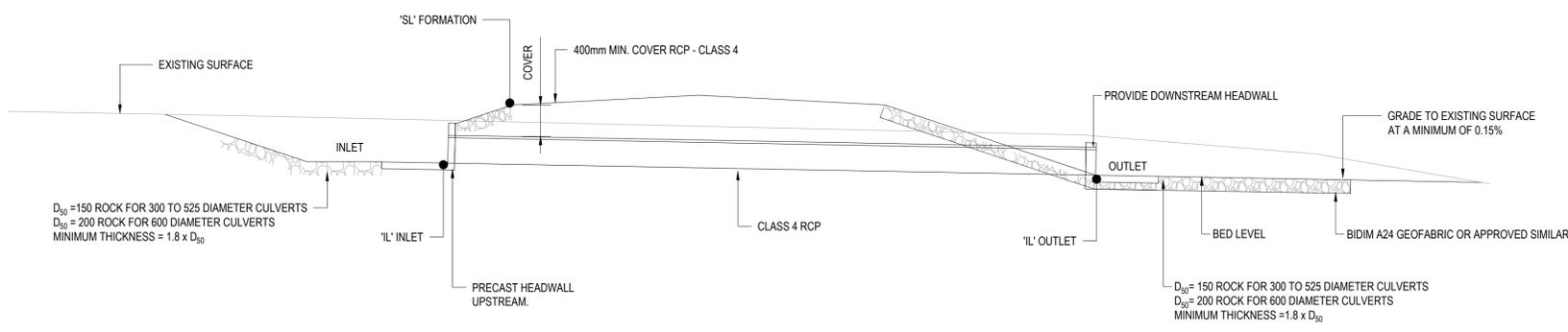
Signature: 
Date: 08.02.2022

PROJECT
BOWEN ORBITAL SPACE PORT

DRAWING TITLE
**BOWEN ORBITAL SPACE PORT
ACCESS ROAD**

TYPICAL NOTES AND DETAILS - SHEET 1 OF 3

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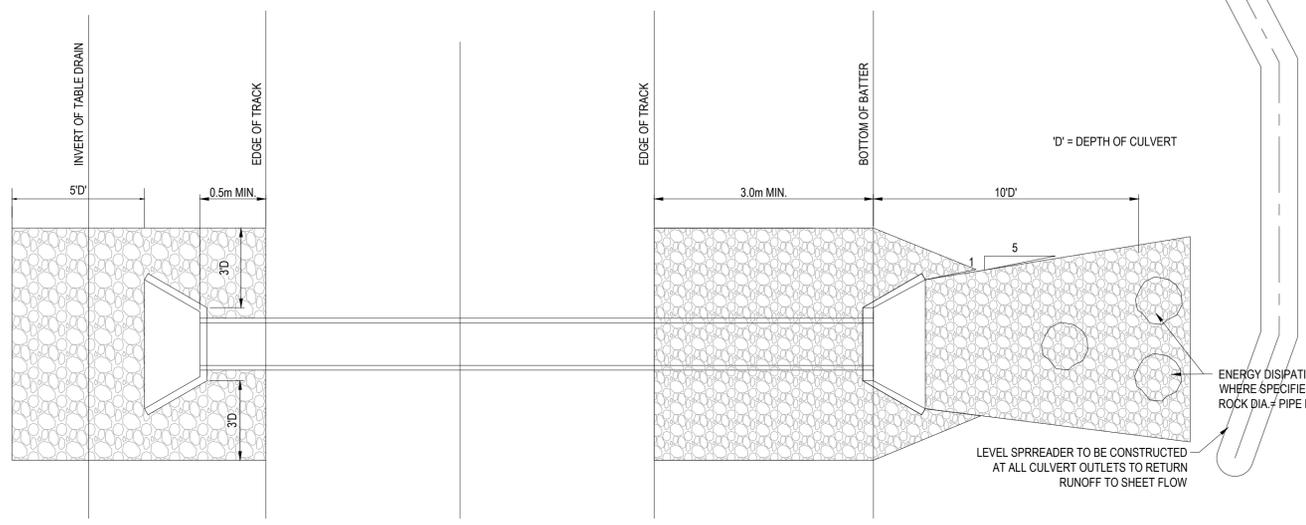


BEDDING LEGEND

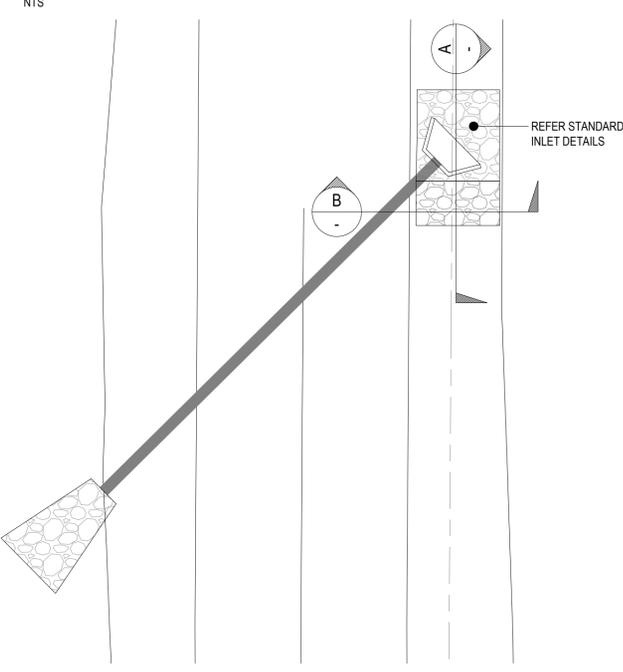
	EVENLY GRADED BED, 20mm NOMINAL SIZE CLASS 2 FCR OR OTHER APPROVED BEDDING
	CLASS 3 FCR, 30mm NOMINAL SIZE OR OTHER APPROVED MATERIAL

- DRAINAGE NOTES**
1. THE USE OF FIBRE REINFORCED CONCRETE CULVERTS IS NOT APPROVED.
 2. RCP-CLASS 4 PIPES WITH LESS THAN 400mm COVER MUST BE CONCRETE ENCASED.

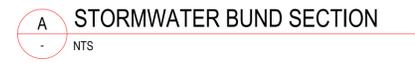
- GENERAL NOTES**
1. ALL DIMENSIONS WITH DECIMALS ARE IN METRES, ALL THOSE WITHOUT ARE IN MILLIMETRES
 2. BACKFILL SHALL BE COMPACTED TO 98% STANDARD MDD COMPACTED AT ± 3% OMC. PAVEMENT LAYERS SHALL BE AS PER TYPICAL ROAD DETAILS.



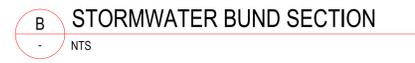
STORMWATER RCP CULVERT DETAIL - 0.4m TO 2.0m COVER



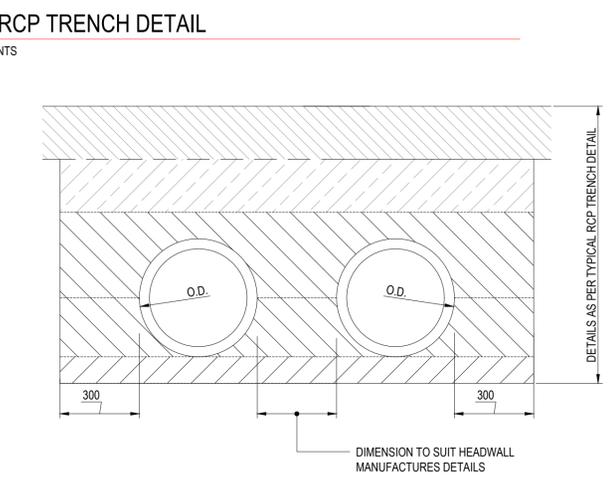
STORMWATER BUND DETAIL



STORMWATER BUND SECTION A



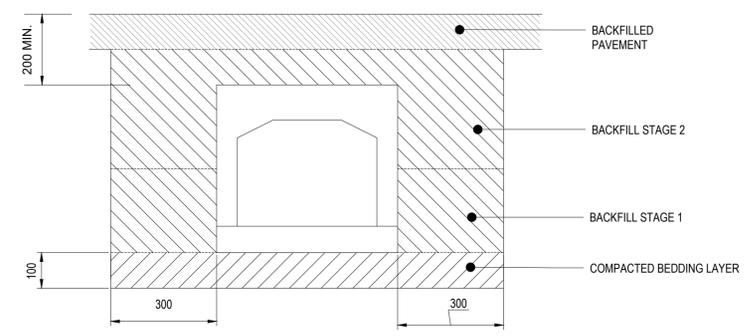
STORMWATER BUND SECTION B



MULTI BARREL - RCP DETAIL

TRENCH DIMENSIONS

PIPE SIZE	'X' MINIMUM
300 DIA	0.15m
375 DIA	0.175m
450 DIA	0.2m



RCBC TRENCH DETAIL

NOTE: IF BOTTOM OF PAVEMENT IS ABOVE 100mm ABOVE THE TOP OF CULVERT, INCLUDE BACKFILL STAGE 3.

PLANS AND DOCUMENTS referred to in the SDA APPROVAL

SDA approval: AP2021/007

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 ACN 106 675 156

GILMOUR SPACE

Engineers Certification:
 Travis Smith MIE Aust. CPEng.
 NPER Civil
 RPEQ 16400
 CPESC 9500

Signature:

Date: 08.02.2022

PROJECT
BOWEN ORBITAL SPACE PORT

DRAWING TITLE
BOWEN ORBITAL SPACE PORT ACCESS ROAD

TYPICAL NOTES AND DETAILS - SHEET 2 OF 3

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GENERAL NOTES

- THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL OTHER CONSULTANTS DRAWINGS AND SPECIFICATIONS. THE PROJECT SPECIFICATION SHALL TAKE PRECEDENCE OVER THESE GENERAL NOTES.
- BEFORE PROCEEDING WITH THE WORK ANY DISCREPANCIES IN THE CONTRACT DOCUMENTS SHALL BE REFERRED FOR DECISION TO THE DESIGN ENGINEER.
- ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE CURRENT EDITIONS INCLUDING AMENDMENTS OF THE RELEVANT GLADSTONE REGIONAL COUNCIL STANDARDS, TMR STANDARDS, QLD CODES OF PRACTICE.
- PROVIDE AS-CONSTRUCTED SURVEY FOR ALL WORKS.

EROSION & SEDIMENT CONTROL NOTES

- REFER TO SITE ENTRY INTERSECTION UPGRADE TYPICAL EROSION AND SEDIMENT CONTROL DRAWING GSLF-I3C-CV-DWG-002-01

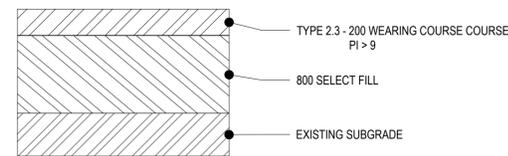
PAVEMENT NOTES

- ALL PAVEMENTS ARE BASED ON A SOUND AND TRAFFICABLE SUBGRADE.
- WET AND/ OR SOFT AREAS FAILING THE SUBGRADE PROOF ROLL TEST MAY REQUIRE SOME FORM OF SUBGRADE IMPROVEMENT.
- THE DESIGN ENGINEER SHALL BE CONSULTED TO ASSESS OPTIONS SUCH AS:
 - LIME STABILISATION
 - GEOTEXTILE STRENGTHENING
 - COARSE ROCKFILL STRENGTHENING
 - SUBGRADE REPLACEMENT
 - OR A COMBINATION OF ALL THESE OPTIONS.

STORMWATER NOTES AND DETAILS

- REFER TO GSLF-I3C-CV-DWG-003-02 FOR TYPICAL STORMWATER NOTES AND DETAILS
- REFER TO GSLF-I3C-CV-DWG-007-SERIES AND 008 SERIES FOR CAUSEWAY SPECIFIC NOTES. CAUSEWAY SPECIFIC NOTES TAKE PRECEDENCE OVER GENERAL NOTES FOR THOSE ITEMS.

TYPICAL PAVEMENT SECTION - UNSEALED

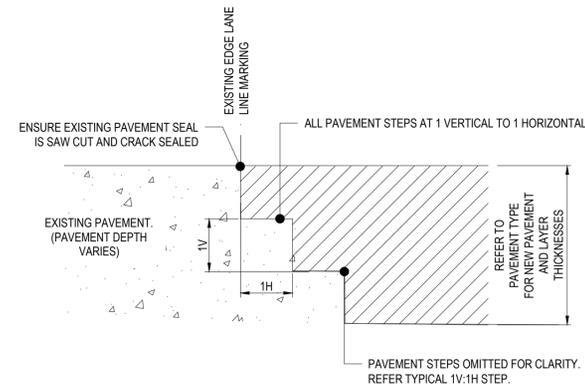


ROAD WORKS NOTES

- GENERAL:
 - EACH PAVEMENT COURSE SHALL NOT BE COMMENCED UNTIL THE PREVIOUS COURSE (I.E. SUBGRADE, SUB-BASE, BASE OR EXISTING PAVEMENT) HAS BEEN INSPECTED AND APPROVED WITH RESPECT TO COMPACTION, FINISHED LEVELS AND TEXTURE OF FINISH.
 - COMPACTION TESTS OF EACH LAYER ARE REQUIRED, AND THE ENGINEER SHALL ENSURE THAT ALL TESTS MEET SPECIFICATION BEFORE PROCEEDING TO THE NEXT LAYER.
 - SUBGRADE AFFECTED BY RAINFALL AFTER FINAL TRIMMING SHALL NOT BE ACCEPTED UNTIL APPROPRIATE DRYING OUT, TESTING AND PROOF-ROLLING TREATMENT HAS BEEN EFFECTED.
 - UNBOUND PAVEMENT COURSE MATERIAL SHALL BE KEPT AT OPTIMUM MOISTURE CONTENT AT ALL TIMES.
 - MINIMUM COMPACTED LAYER THICKNESS SHALL BE 100 mm, WITH THE MAXIMUM COMPACTED THICKNESS NOT EXCEEDING 200 mm.
- COMPACTION TESTING:
 - DETERMINATION OF THE COMPACTION PERFORMANCE OF THE EARTHWORKS, SUBGRADE AND PAVEMENT GRAVEL MATERIALS (I.E. LABORATORY REFERENCE DENSITY, FIELD DENSITY, OPTIMUM MOISTURE CONTENT, FIELD MOISTURE CONTENT) SHALL BE CARRIED OUT IN ACCORDANCE WITH AS 1289 METHODS OF TESTING SOILS FOR ENGINEERING PURPOSES, IN PARTICULAR THE E SERIES TESTS. THE FREQUENCY OF TESTING SHALL BE AS SPECIFIED IN THE DTMR GUIDELINES.
 - A LOT LAYOUT PLAN SHOWING THE LOCATION OF THE TESTS SHALL BE SUBMITTED TO THE ENGINEER WITH THE TEST RESULTS.
 - ALL TESTS ARE TO BE DISTRIBUTED REASONABLY EVENLY THROUGH THE FULL DEPTH AND AREA OF PAVEMENT.
 - FAILURE OF MATERIAL QUALITY TESTS WILL REQUIRE REMOVAL OF THE MATERIAL OR FURTHER IN SITU TESTING.
 - FAILURE OF COMPACTION TESTS WILL REQUIRE:
 - RETESTING AT THE SAME DEPTH AND LOCATION IF THE FAILURE IS MINOR (E.G. LOCALISED SINGLE FAILURE BY 1%-3%)
 - REMOVAL OR REWORKING OF MATERIAL IF THE FAILURE IS SIGNIFICANT OR WIDESPREAD.

BULK EARTHWORKS NOTES

- WORKS SHALL BE EXECUTED BY THE CONTRACTOR IN ACCORDANCE WITH AS3798 - 2007, "GUIDELINES FOR COMMERCIAL AND RESIDENTIAL DEVELOPMENTS" AND SHALL BE SUPERVISED BY AND APPROVED GEOTECHNICAL TESTING AUTHORITY, (GTA) AS DEFINED IN THE CODE TO A LEVEL 2 STANDARD.
- FOLLOWING INITIAL MOBILISATION AND PRIOR TO STRIPPING OF THE SITE, THE CONTRACTOR SHALL IMMEDIATELY UNDERTAKE THE EROSION AND SEDIMENT RUNOFF PREVENTION MEASURES.
- FOLLOWING THE STRIPPING OF THE UPPER ORGANIC SOIL, THE SITE SHALL BE PROOF ROLLED TO IDENTIFY ANY SOFT SPOTS OR FURTHER SIGNS OF UNSUITABLE MATERIAL. ANY SUCH AREAS SHALL BE RECTIFIED PRIOR TO COMMENCEMENT OF FILLING OPERATIONS.
- FILLING SHALL BE COMPLETED IN ACCORDANCE WITH THE FOLLOWING REQUIREMENTS
 - WORKS TO BE IN ACCORDANCE WITH AS3798-2007
 - DEGREE OF COMPACTION TO BE AS FOLLOWS
 - SUBGRADE COURSES LESS THAN 300mm BELOW DESIGN SURFACE LEVEL 98% SMDD.
 - SUBGRADE COURSES 300mm OR MORE BELOW DESIGN SURFACE LEVEL 95% SMDD.
 - SUBBASE COURSES 98% SMDD
 - BASE COURSES 98% SMDD
 - MATERIAL MOISTURE CONTENT TO BE IN THE RANGE OF ±3% OF OPTIMAL MOISTURE CONTENT (OMC)
 - THE EXPENSE OF TESTING IS ON THE CONTRACTOR
- IT IS THE CONTRACTORS RESPONSIBILITY TO PROTECT THE SITE AND SURROUNDING AREAS FROM DAMAGE RESULTING FROM STORMWATER RUNOFF. TEMPORARY DIVERSION DRAINS AND OR OTHER DRAINAGE CONTROL DEVICES ARE TO BE IMPLEMENTED BY THE CONTRACTOR DURING CONSTRUCTION TO MINIMISE THE EFFECTS OF WEATHER. NO EXTENSIONS OF TIME WILL BE GRANTED SHOULD DAMAGE TO THE WORKS AND SURROUNDING AREAS RESULT FROM THE CONTRACTORS NEGLIGENCE IN NOT PROVIDING ADEQUATE PROTECTION.
- EXCESS SPOIL MATERIAL GENERATED DURING CONSTRUCTION SHALL BE REMOVED FROM THE SITE BY THE CONTRACTOR.



PAVEMENT STEP DETAIL

NTS

LEGEND

- BOUNDARY
- EXISTING EDGE OF BITUMEN
- EXISTING EDGE OF TRACK
- EXISTING CULVERT
- NEW CULVERT
- EXISTING TREE
- EXISTING TREE TO BE REMOVED
- EXISTING TELSTRA
- EXISTING OVERHEAD POWERLINE
- EXISTING GAS MAIN
- EXISTING FENCE
- NEW STOCKPROOF FENCE
- DESIGN ROAD
- EXISTING CULVERT NOTATION
- NEW CULVERT NOTATION
- MATCH LINE
- TABLE DRAIN OUTLET
- EXISTING CONTOURS (0.25m INTERVAL)
- DESIGN CONTOURS (0.05m INTERVAL)
- BOREHOLE LOCATION AND IDENTIFIER
- SIGNPOST
- CONCRETE CAUSEWAY
- RIP RAP
- RIP RAP (LARGER ROCK - REFER DETAILS)

ROAD LAYOUT NOTES

- ALL LINE MARKING, SIGNS, GUIDE POSTS, RRPMS INSTALLATION SHALL BE IN ACCORDANCE WITH AS1742.2. (GUIDE POST SPACING SHOWN BELOW FOR REFERENCE).
- ALL PAVEMENT MARKINGS SHALL BE WHITE AND RETRO-REFLECTIVE.
- RRPMS HAVE NOT BEEN SHOWN ON PLAN FOR CLARITY PURPOSES. RRPMS SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 5.6.5.2 OF AS1742.2.
- CHEVRON ALIGNMENT MARKER SETOUT CURVES AS PER AS1742.2 FIGURE 4.8
- CHEVRON ALIGNMENT MARKER SPACING AS PER AS1742.2 TABLE 4.3 (SHOWN BELOW FOR REFERENCE)
- CURVE WIDENING TO BE DONE IN ACCORDANCE WITH AUSTRROADS GUIDE TO ROAD DESIGN PART 3 (AGRDP3); SECTION 7.9 - PAVEMENT WIDENING ON HORIZONTAL CURVES, SPECIFICALLY TABLE 7.13 (SHOWN BELOW FOR REFERENCE). THE DESIGN VEHICLE IS A 19m PRIME MOVER AND SEMI TRAILER.

CURVE RADIUS (m)	OUTSIDE OF CURVE (m)	INSIDE OF CURVE (m)
LESS THAN 100	6	12
100-199	10	20
200-299	15	30
300-399	20	40
400-599	30	60
ON STRAIGHTS AND RADIUS 2000	300	300

CURVE RADIUS (m)	CAM SPACING (m) *	
	85th PERCENTILE APPROACH SPEED LESS THAN 85 km/h	85 km/h AND GREATER
<50	10	6
50-99	12	8
100-149	18	12
150-199	24	16
200-249	30	20
250-300	36	24
>300	40	26

* THE SPACINGS IN THE TABLE ARE SUBJECT TO A TOLERANCE OF ± 10%

TABLE 7.13 AGRDP3 EXTRACT

CURVE RADIUS (m)	WIDENING PER LANE (m)
<100	REFER AGRDP3
100-119	0.7
120-139	0.6
140-159	0.5
160-199	0.4
200-299	0.3
>=300	0

PLANS AND DOCUMENTS referred to in the SDA APPROVAL

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 NPER Civil
 RPEQ 16400
 CPESC 9500

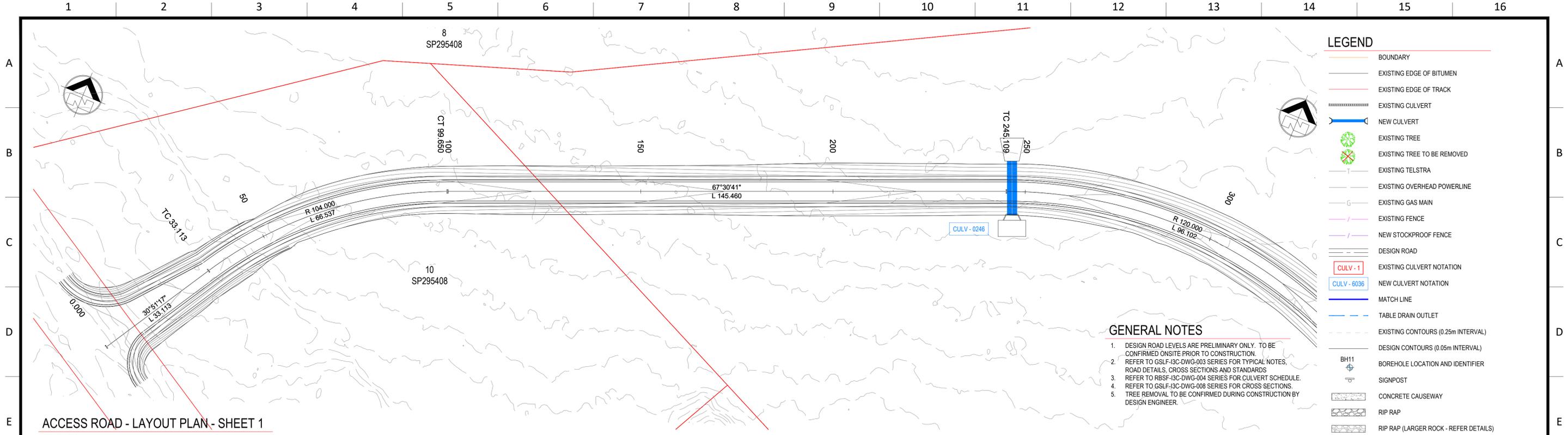
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 Date: 08.02.2022

PROJECT
BOWEN ORBITAL SPACE PORT

DRAWING TITLE
BOWEN ORBITAL SPACE PORT ACCESS ROAD

TYPICAL NOTES AND DETAILS - SHEET 3 OF 3

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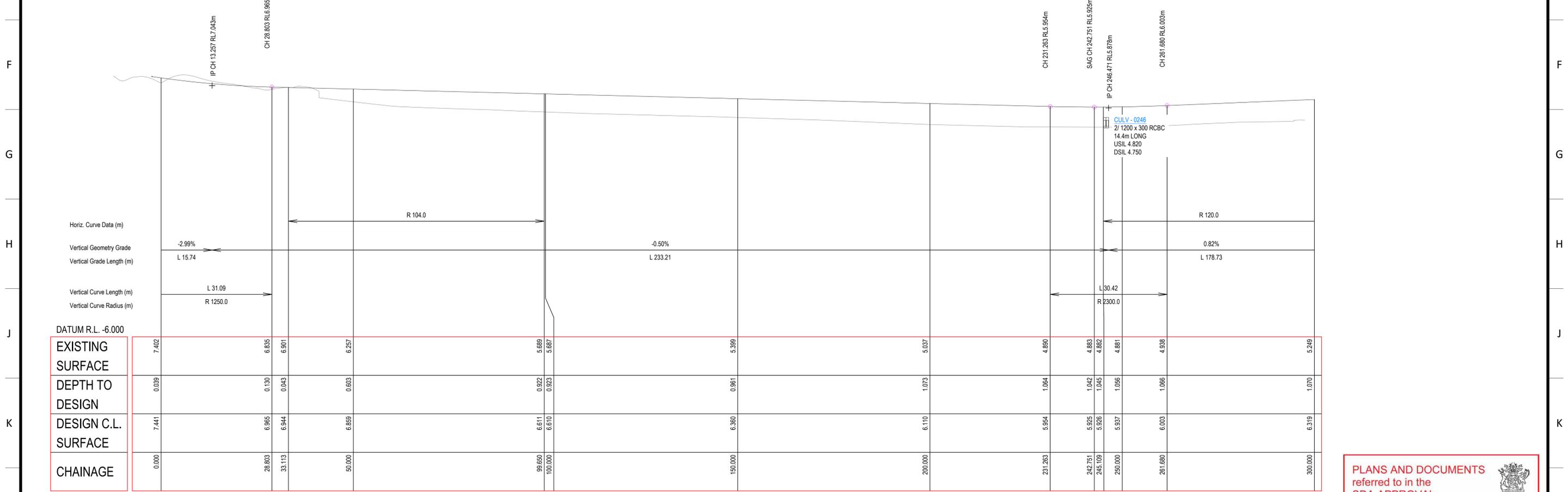


LEGEND

- BOUNDARY
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- EXISTING EDGE OF TRACK
- EXISTING CULVERT
- NEW CULVERT
- EXISTING TREE
- EXISTING TREE TO BE REMOVED
- EXISTING TELSTRA
- EXISTING OVERHEAD POWERLINE
- EXISTING GAS MAIN
- EXISTING FENCE
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- DESIGN ROAD
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- NEW CULVERT NOTATION
- MATCH LINE
- TABLE DRAIN OUTLET
- EXISTING CONTOURS (0.25m INTERVAL)
- DESIGN CONTOURS (0.05m INTERVAL)
- BH11 BOREHOLE LOCATION AND IDENTIFIER
- SIGNPOST
- CONCRETE CAUSEWAY
- RIP RAP
- RIP RAP (LARGER ROCK - REFER DETAILS)

- GENERAL NOTES**
- DESIGN ROAD LEVELS ARE PRELIMINARY ONLY. TO BE CONFIRMED ONSITE PRIOR TO CONSTRUCTION.
 - REFER TO GSLF-I3C-DWG-003 SERIES FOR TYPICAL NOTES, ROAD DETAILS, CROSS SECTIONS AND STANDARDS
 - REFER TO RBSF-I3C-DWG-004 SERIES FOR CULVERT SCHEDULE.
 - REFER TO GSLF-I3C-DWG-008 SERIES FOR CROSS SECTIONS.
 - TREE REMOVAL TO BE CONFIRMED DURING CONSTRUCTION BY DESIGN ENGINEER.

ACCESS ROAD - LAYOUT PLAN - SHEET 1
SCALE 1:500



DATUM R.L. -6.000

EXISTING SURFACE	7.402	6.835	6.901	6.257	5.689	5.687	5.399	5.037	4.890	4.883	4.882	4.881	4.938	5.249
DEPTH TO DESIGN	0.039	0.130	0.043	0.803	0.922	0.923	0.961	1.073	1.064	1.042	1.045	1.056	1.066	1.070
DESIGN C.L. SURFACE	7.441	6.965	6.944	6.869	6.611	6.610	6.390	6.110	5.954	5.925	5.926	5.937	6.003	6.319
CHAINAGE	0.000	28.803	33.113	50.000	99.650	100.000	150.000	200.000	231.263	242.751	245.109	250.000	261.680	300.000

ACCESS ROAD - LONGSECTION - SHEET 1
HORIZ. SCALE 1:1000
VERT. SCALE 1:100

PLANS AND DOCUMENTS referred to in the SDA APPROVAL

SDA approval: AP2021/007

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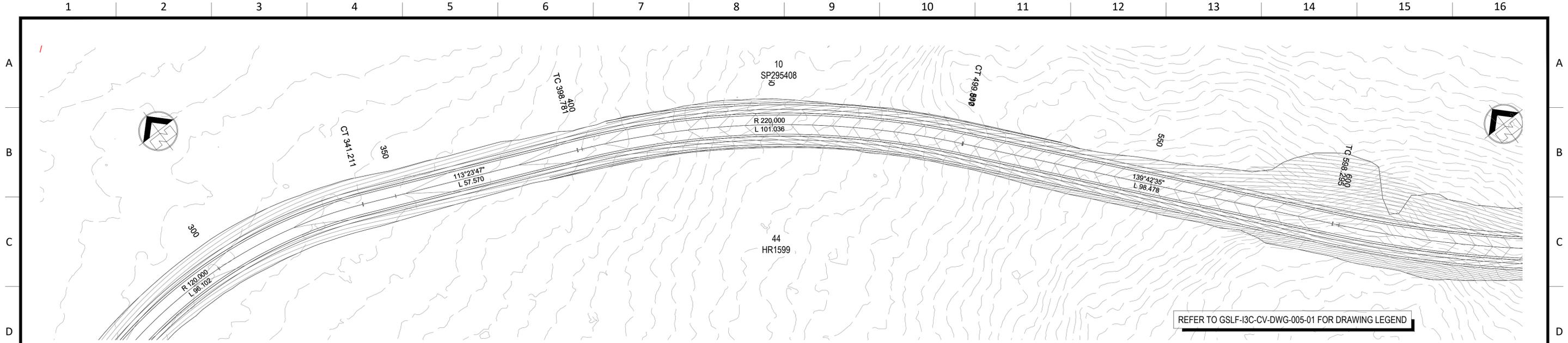
Engineers Certification:
Travis Smith MIE Aust. CPEng.
NPER Civil
RPEQ 16400
CPESC 9500

Signature: *T. Smith*
Date: 08.02.2022

PROJECT
BOWEN ORBITAL SPACE PORT

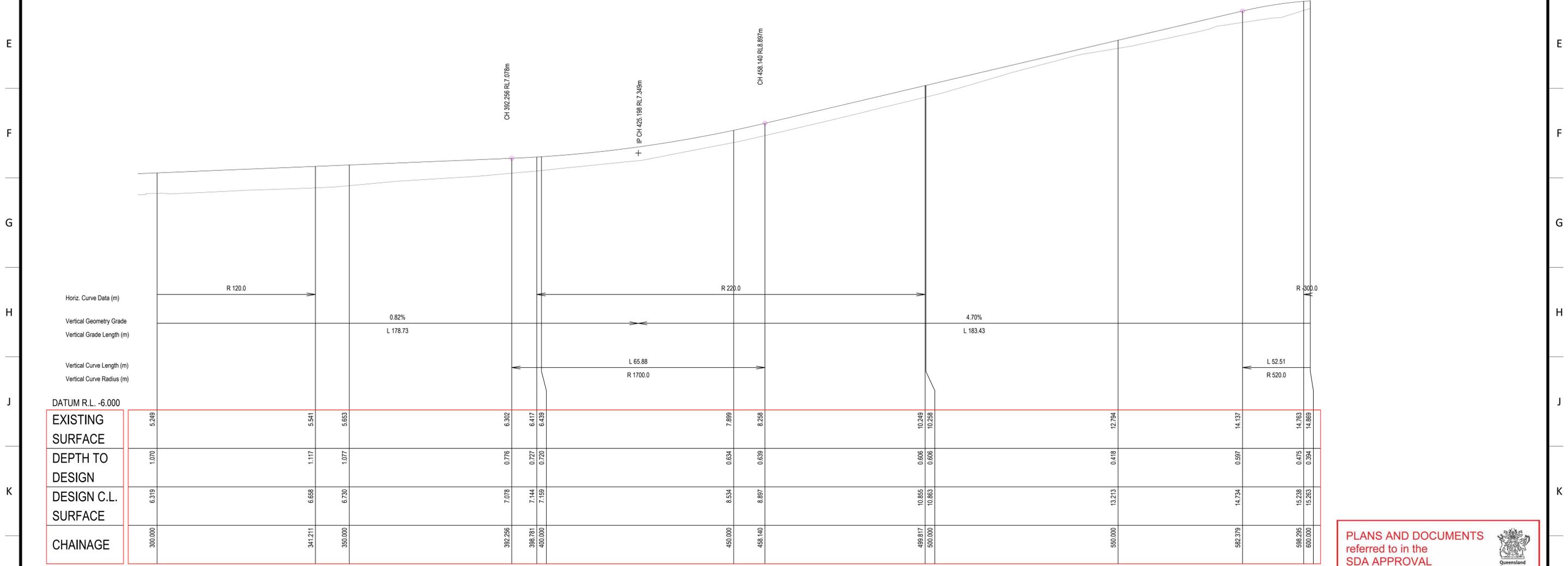
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ACCESS ROAD
LAYOUT AND LONGSECTION - SHEET 1 OF 4

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ACCESS ROAD - LAYOUT PLAN - SHEET 2

SCALE 1:500



ACCESS ROAD - LONGSECTION - SHEET 2

HORIZ SCALE 1:1000
VERT. SCALE 1:250

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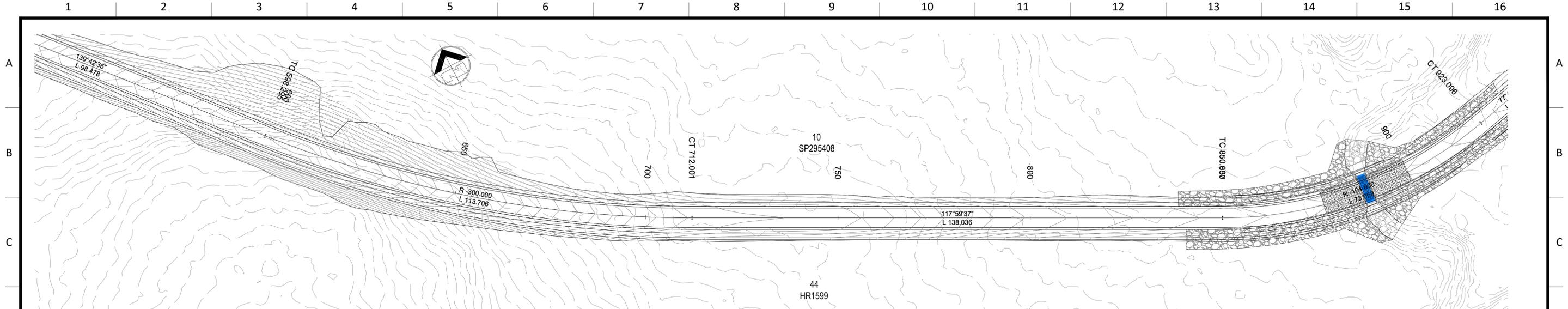
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Travis Smith MIE Aust. CPEng.
NPER Civil
RPEQ 16400
CPESC 9500

Signature: *T. Smith*
Date: 08.02.2022

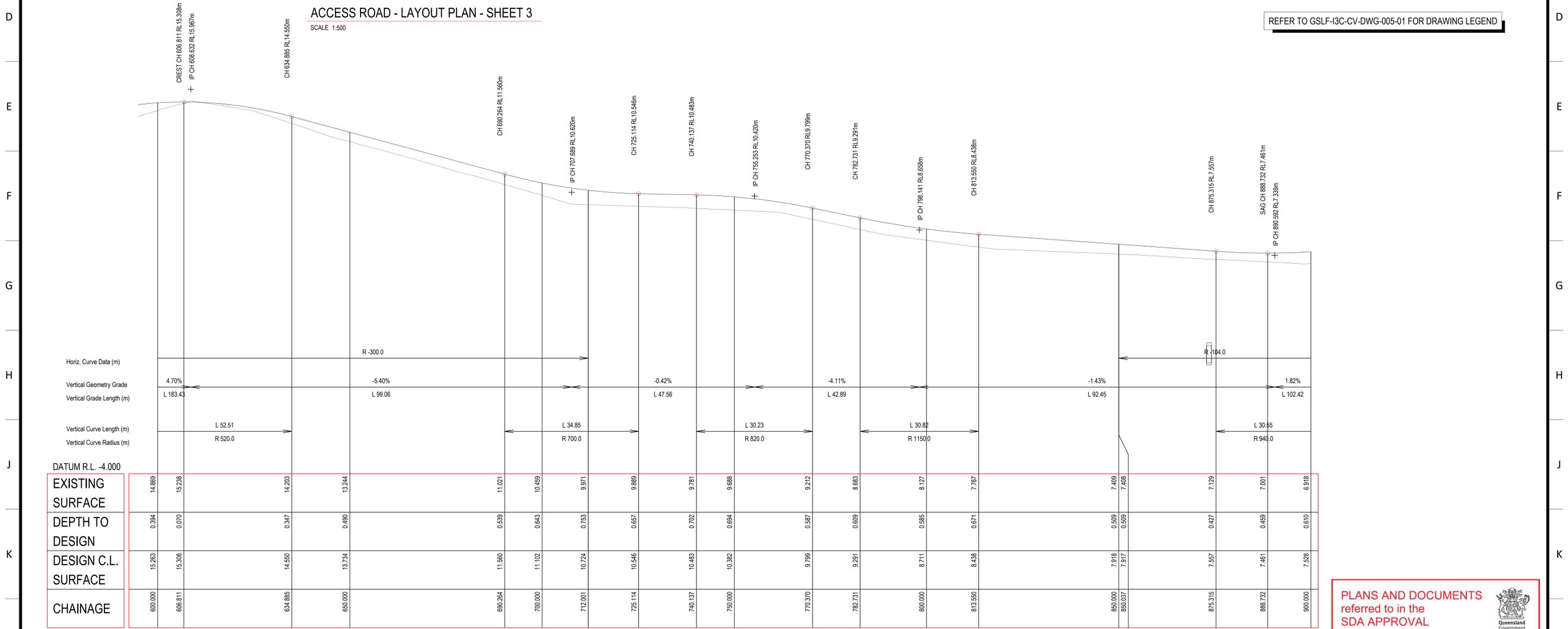
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BOWEN ORBITAL SPACE PORT

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**BOWEN ORBITAL SPACE PORT
ACCESS ROAD
LAYOUT AND LONGSECTION - SHEET 2 OF 4**

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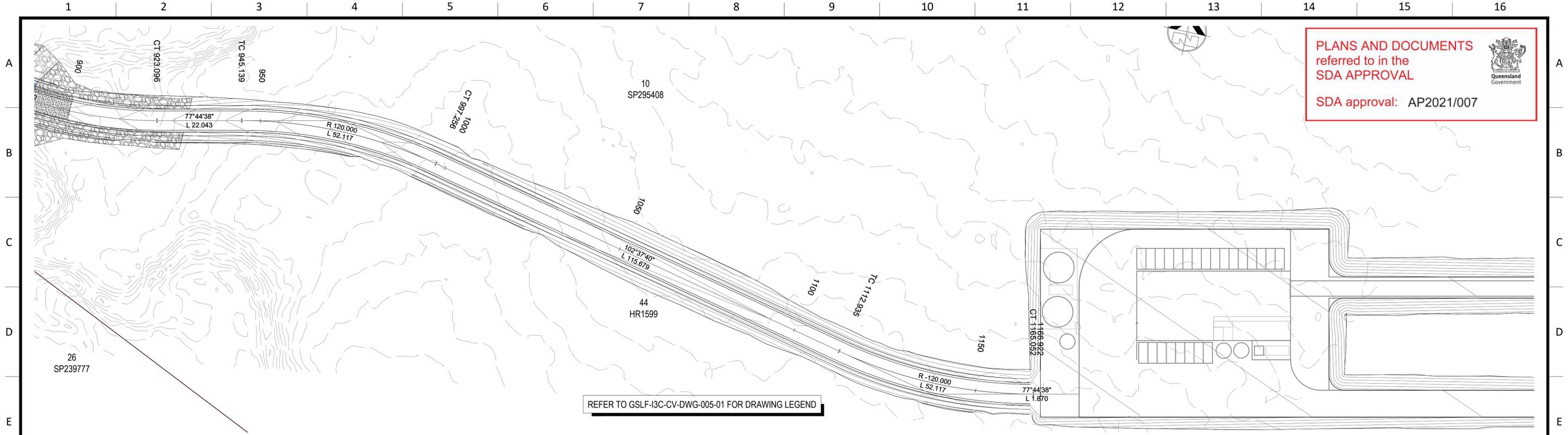


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ACCESS ROAD - LONGSECTION - SHEET 3 HORIZ SCALE 1:1000 VERT. SCALE 1:250		i ³ consulting pty ltd engineering consultants innovation, ingenuity, inspiration L2 39 Sherwood Rd Toowoong, Qld 4066 www.i3consult.com.au ABN 89 106 675 156 p 07 3870 8888		Engineers Certification: Travis Smith MIE Aust. CPEng. NPER Civil RPEQ 16400 CPESC 9500 Signature: <i>T. Smith</i> Date: 08.02.2022	PROJECT BOWEN ORBITAL SPACE PORT DRAWING TITLE BOWEN ORBITAL SPACE PORT ACCESS ROAD LAYOUT AND LONGSECTION - SHEET 3 OF 4	DRAWN T.J.S. CHECKED T.J.S. APPROVED T.J.S. DRAWING STATUS FOR APPROVAL SCALE NTS SIZE A1 DRAWING CODE GSLF-I3C-CV-DWG-005-03 REV D
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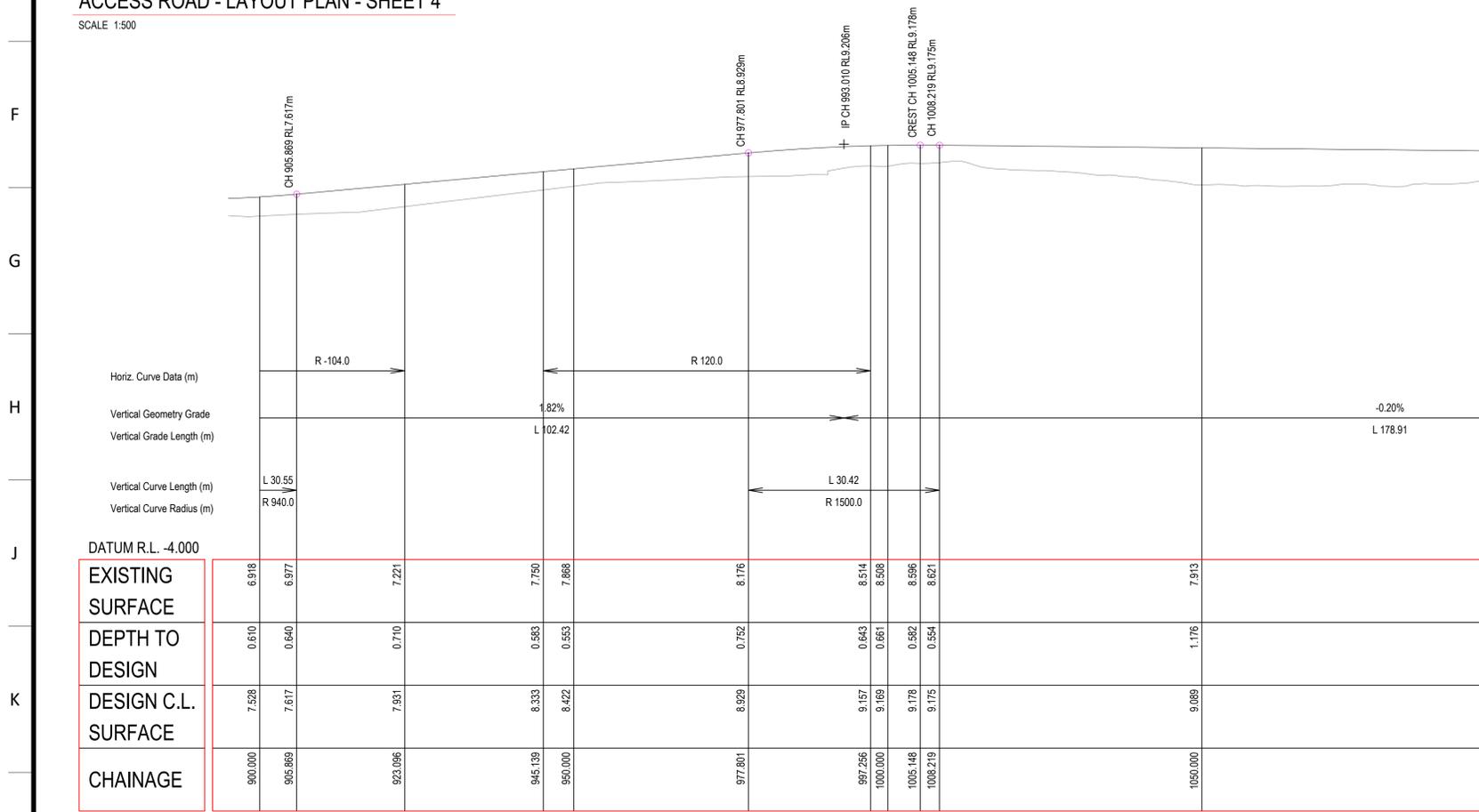
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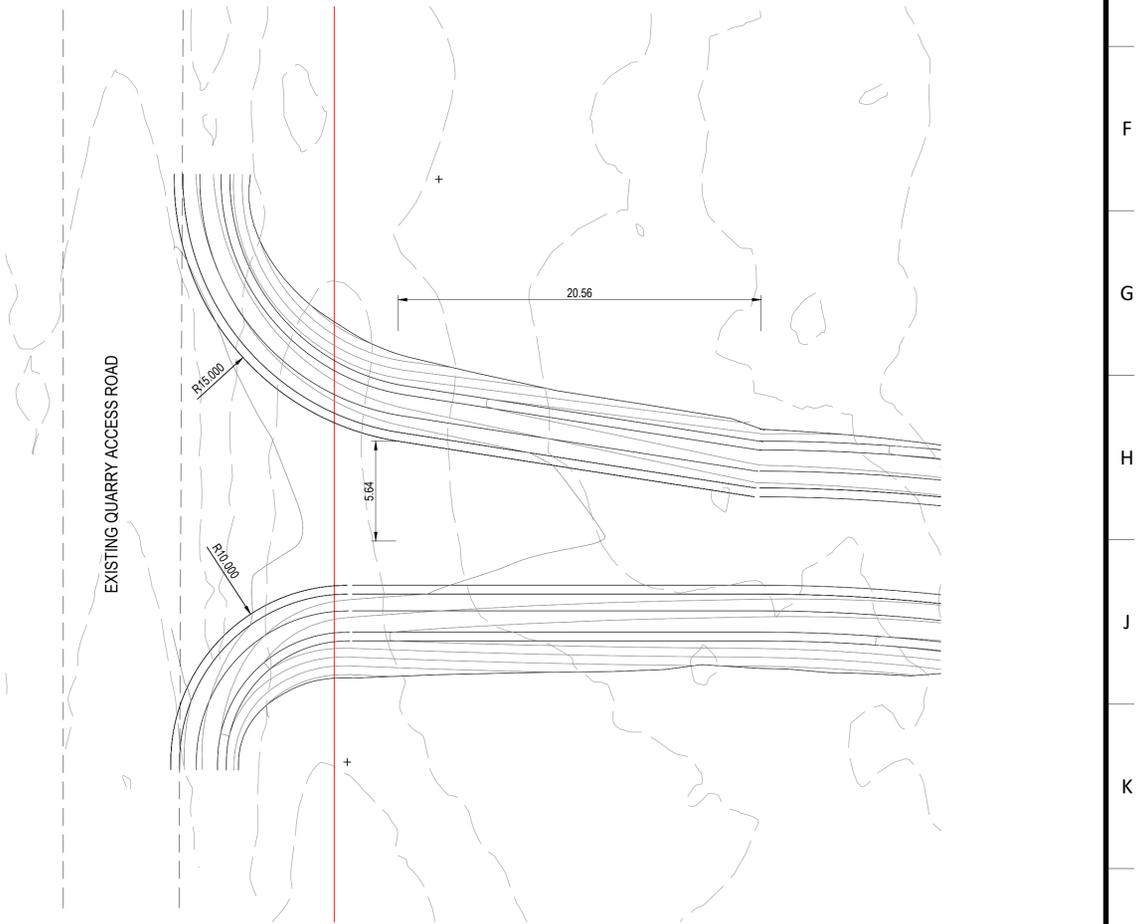
ACCESS ROAD - LAYOUT PLAN - SHEET 4

SCALE 1:500



ACCESS ROAD - LONGSECTION - SHEET 4

HORIZ. SCALE 1:1000
VERT. SCALE 1:250



ACCESS ROAD - INTERSECTION LAYOUT

SCALE 1:200

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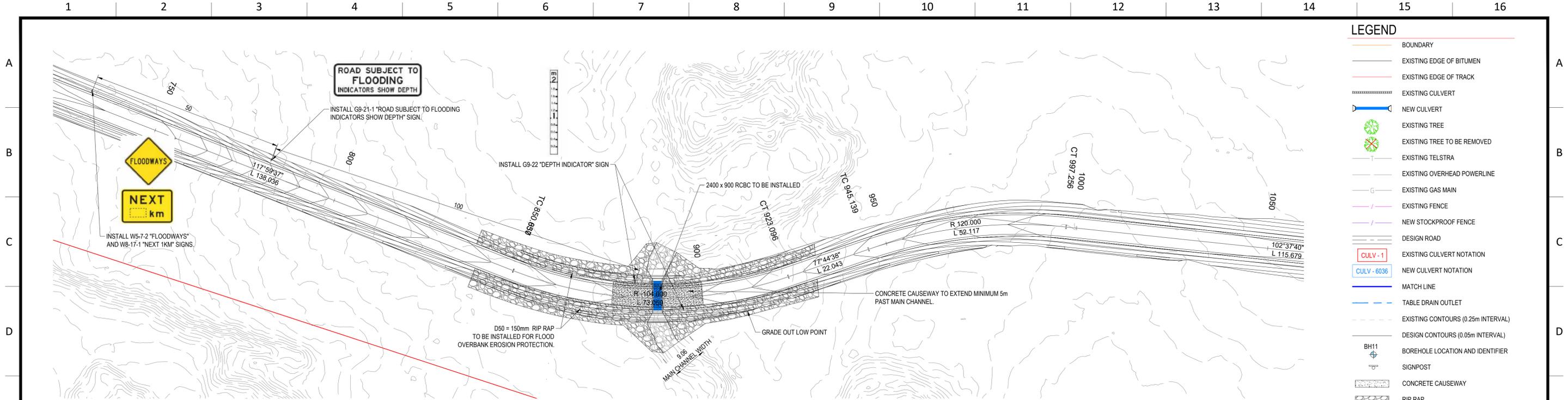
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CPESC 9500

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PROJECT
BOWEN ORBITAL SPACE PORT

DRAWING TITLE
**BOWEN ORBITAL SPACE PORT
ACCESS ROAD
LAYOUT AND LONGSECTION - SHEET 4 OF 4**

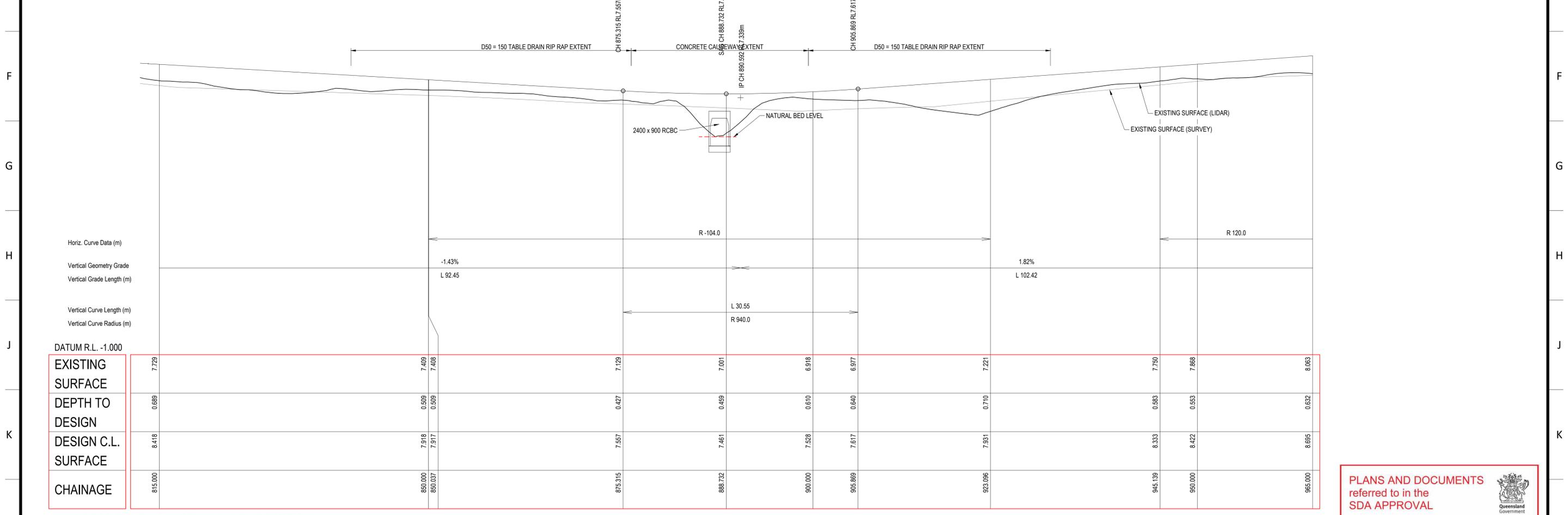
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LEGEND

- BOUNDARY
- EXISTING EDGE OF BITUMEN
- EXISTING EDGE OF TRACK
- EXISTING CULVERT
- NEW CULVERT
- EXISTING TREE
- EXISTING TREE TO BE REMOVED
- EXISTING TELSTRA
- EXISTING OVERHEAD POWERLINE
- EXISTING GAS MAIN
- EXISTING FENCE
- NEW STOCKPROOF FENCE
- DESIGN ROAD
- EXISTING CULVERT NOTATION
- NEW CULVERT NOTATION
- MATCH LINE
- TABLE DRAIN OUTLET
- EXISTING CONTOURS (0.25m INTERVAL)
- DESIGN CONTOURS (0.05m INTERVAL)
- BOREHOLE LOCATION AND IDENTIFIER
- SIGNPOST
- CONCRETE CAUSEWAY
- RIP RAP

ACCESS ROAD - CAUSEWAY 1 LAYOUT PLAN
SCALE 1:500



DATUM R.L. -1.000

EXISTING SURFACE	7.729	7.409	7.408	7.129	7.001	6.918	6.977	7.221	7.750	7.866	8.063
DEPTH TO DESIGN	0.689	0.509	0.509	0.427	0.459	0.610	0.640	0.710	0.583	0.553	0.632
DESIGN C.L. SURFACE	8.418	7.918	7.917	7.557	7.461	7.528	7.617	7.931	8.333	8.422	8.695
CHAINAGE	815.000	850.000	850.037	875.315	886.732	900.000	905.869	923.096	945.139	950.000	965.000

ACCESS ROAD - CAUSEWAY 1 LONGSECTION
HORIZ. SCALE 1:250
VERT. SCALE 1:62.5

PLANS AND DOCUMENTS referred to in the SDA APPROVAL

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Engineers Certification:
Travis Smith MIE Aust. CPEng.
NPER Civil
RPEQ 16400
CPESC 9500

Signature:

Date: 08.02.2022

PROJECT
BOWEN ORBITAL SPACE PORT

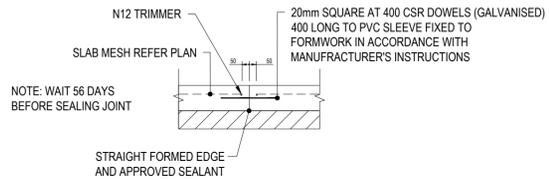
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ACCESS ROAD
FLOODWAY LAYOUT PLAN**

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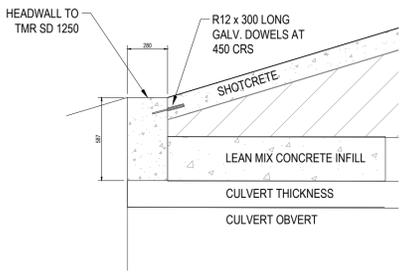


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CAUSEWAY - DOWEL JOINT DETAIL (DJ)

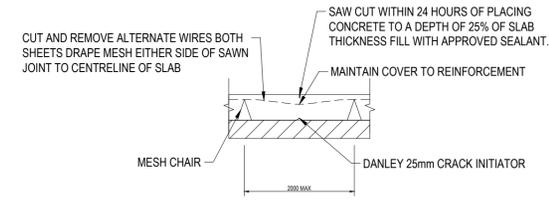
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HEADWALL AT CULVERT DETAIL

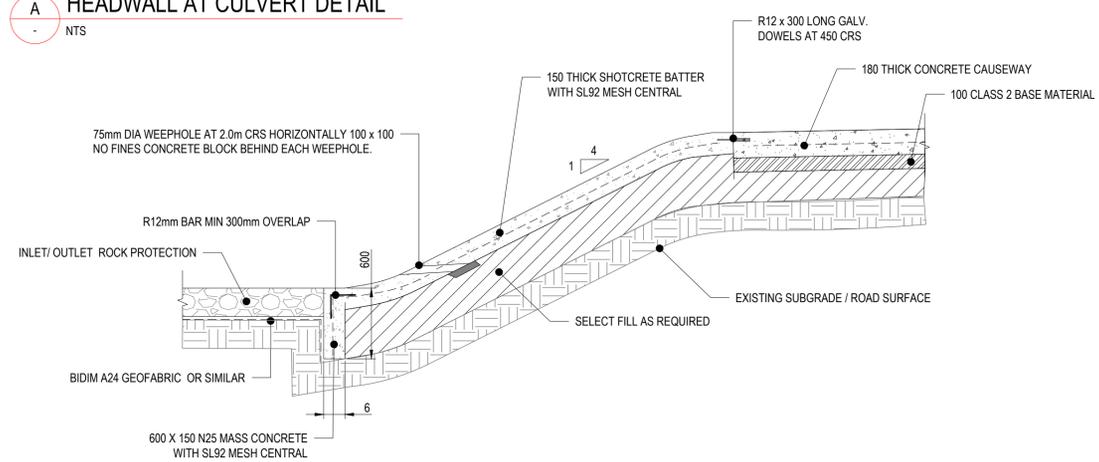
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REFER TO TMR STANDARD DRAWING SD 1250 (SHEETS 1 TO 3) FOR HEADWALL, BASE SLAB, APRON, HEADWALL AND WINGWALL DETAILS.



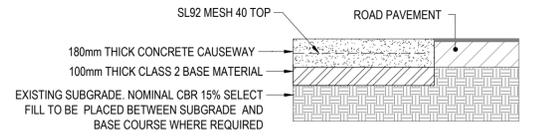
CAUSEWAY - SAWN JOINT DETAIL (SJ)

NTS



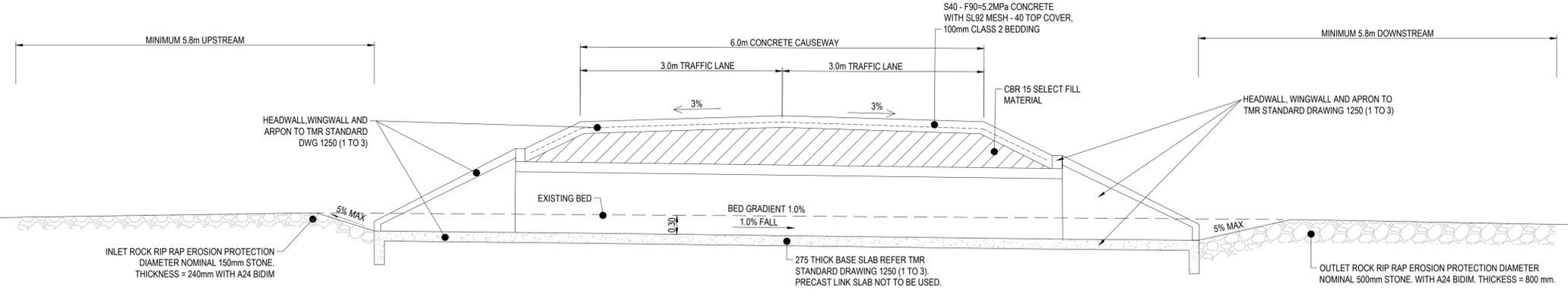
CAUSEWAY - SHOTCRETE BATTER SLOPE DETAIL

NTS



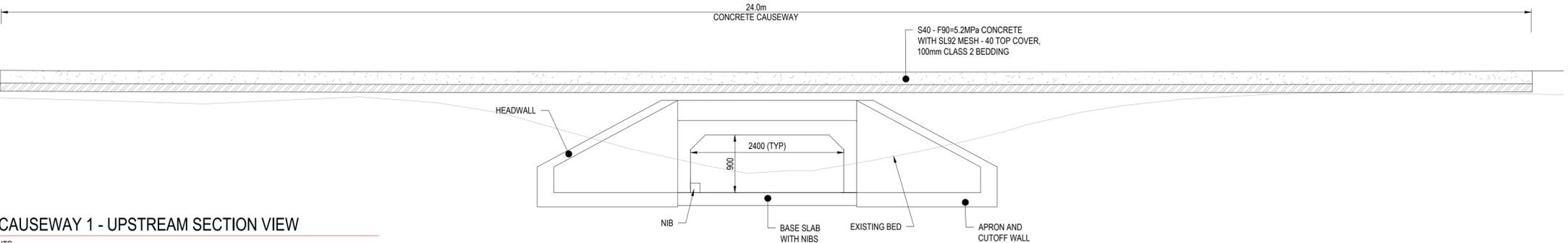
CAUSEWAY - LONGITUDINAL PAVEMENT JOINT DETAIL

NTS



CAUSEWAY 1 - CULVERT LONGSECTION

NTS



CAUSEWAY 1 - UPSTREAM SECTION VIEW

NTS

CAUSEWAY TYPICAL NOTES

- ALL CULVERTS TO SIT A MINIMUM 300mm BELOW TRUE STREAM LEVEL (REFER UPSTREAM VIEWS FOR FURTHER DETAILS).
- CULVERT LINK BASE SLAB, HEADWALLS, WINGWALLS AND APRON TO BE AS PER TMR STD DWG 1250.
- CAUSEWAY 1 TO HAVE SIDEWALL BAFFLES INSTALLED REFER TO TMR STD DWG 1270 FOR INSTALLATION AND CONSTRUCTION DETAILS AND SIDEWALL BAFFLE SETOUT PLAN FOR DETAILS.
- CAUSEWAY EXTENTS SHOWN ON LONGSECTION VIEWS (REFER GSLF-I3C-CV-DWG-007-01 AND GSLF-I3C-CV-DWG-008-01).
- TREE REMOVAL TO BE CONFIRMED BY DESIGN ENGINEER DURING CONSTRUCTION.

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CPESC 9500

Signature: *T. Smith*
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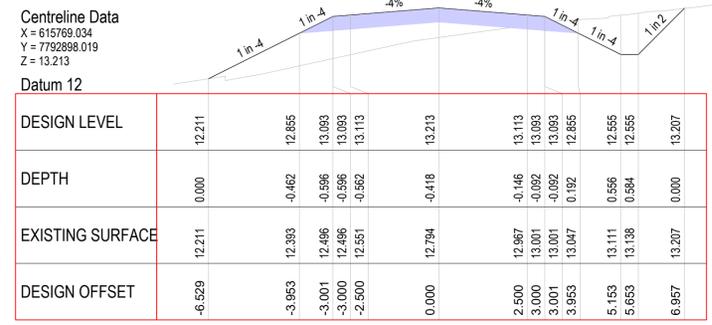
PROJECT
BOWEN ORBITAL SPACE PORT

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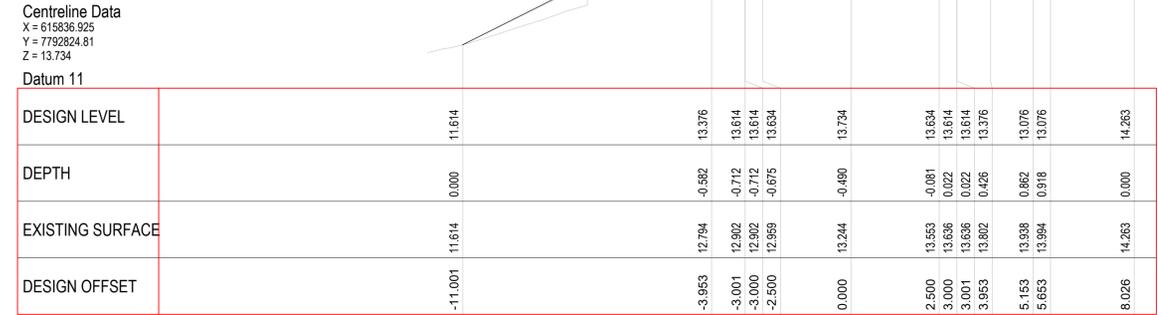
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TYPICAL CROSS SECTION NOTES

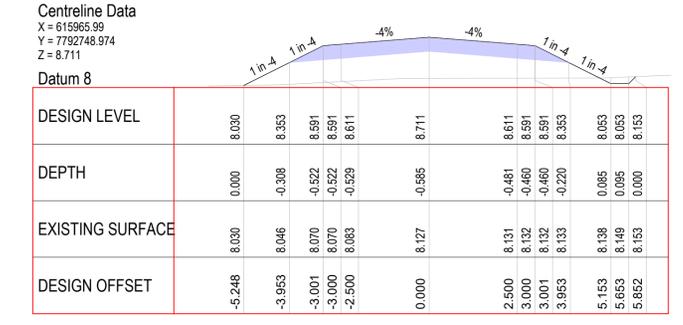
- REFER TO GLSF-I3C-DWG-005 SERIES FOR ROADWORKS UPGRADE SCHEDULE AND SPECIFIC LOCATIONS (CHAINAGES) WHERE TYPICAL CROSS SECTIONS APPLY.
- TYPICAL CROSS SECTIONS MAY VARY THROUGH THE APPLICATION OF SUPERELEVATION, DRAINAGE ELEMENTS, EXISTING ROAD WIDTH OR PAVEMENT DESIGN.
- REFER TO GLSF-I3C-DWG-007 AND 008 SERIES FOR CAUSEWAY DETAILS WHICH ALTER CROSS SECTION SURFACE.
- REFER TO GLSF-I3C-DWG-003-002 FOR PAVEMENT TYPES.
- REFER TO GLSF-I3C-DWG-005 FOR LOCATIONS OF PAVEMENT TYPES.



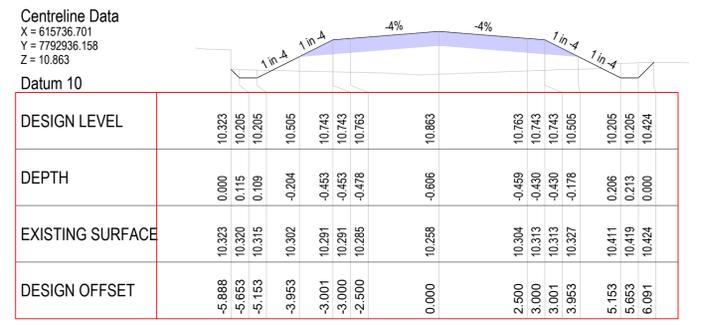
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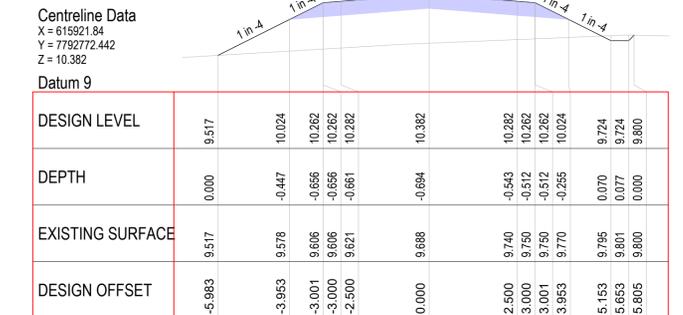
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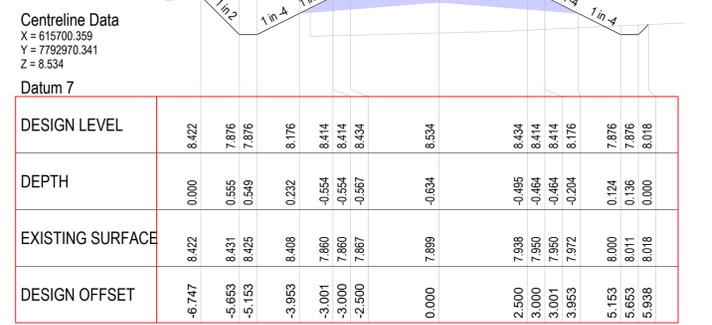
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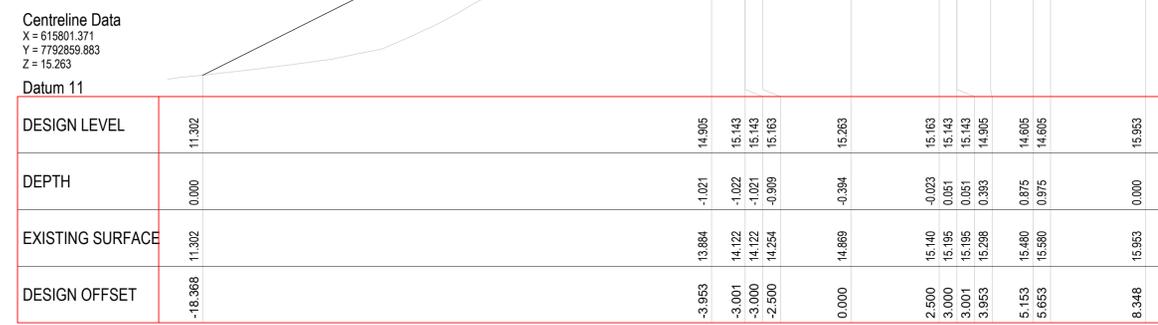
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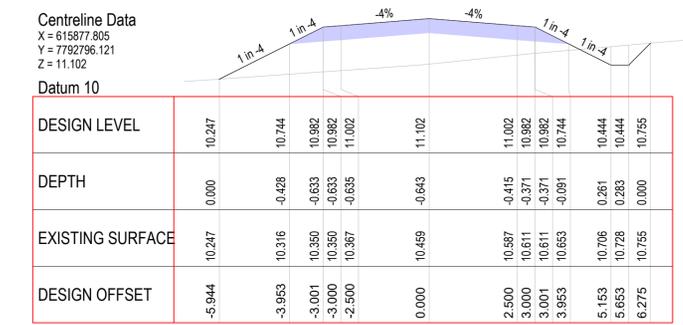
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CHAINAGE 450.000



CHAINAGE 600.000



CHAINAGE 700.000

ACCESS ROAD - CROSS SECTIONS

HORIZ. SCALE 1:100
VERT. SCALE 1:100

No	DESCRIPTION	DATE
D	FOR APPROVAL	08.02.2022
C	FOR APPROVAL	02.02.2022
B	FOR APPROVAL	19.01.2022
A	FOR REVIEW	23.11.2021
No	DESCRIPTION	DATE



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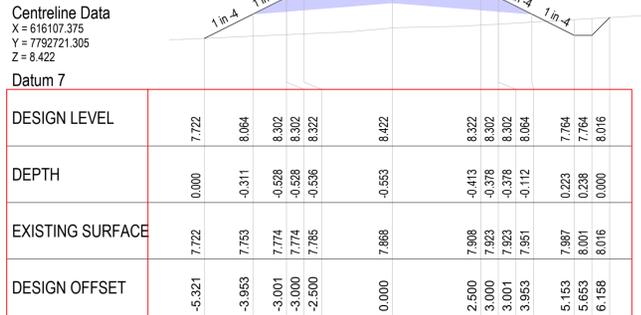
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Date: 08.02.2022

PROJECT
BOWEN ORBITAL SPACE PORT

DRAWING TITLE
**BOWEN ORBITAL SPACE PORT
ACCESS ROAD**

CROSS SECTIONS - SHEET 2 OF 3

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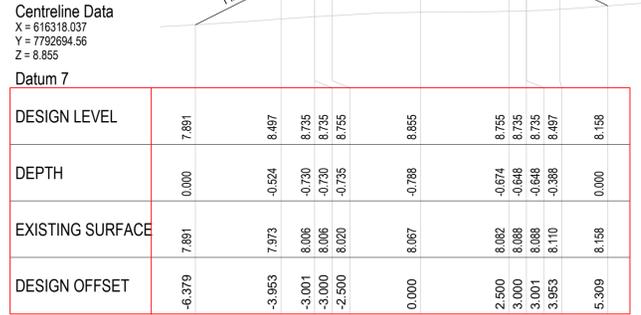
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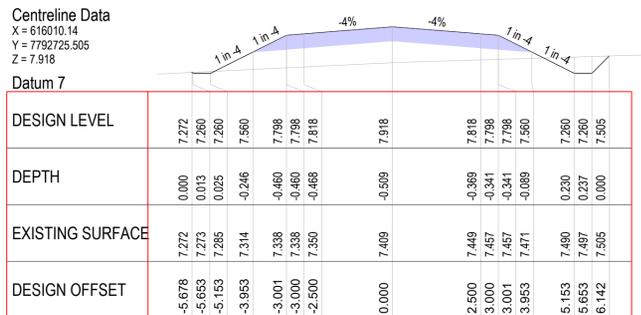
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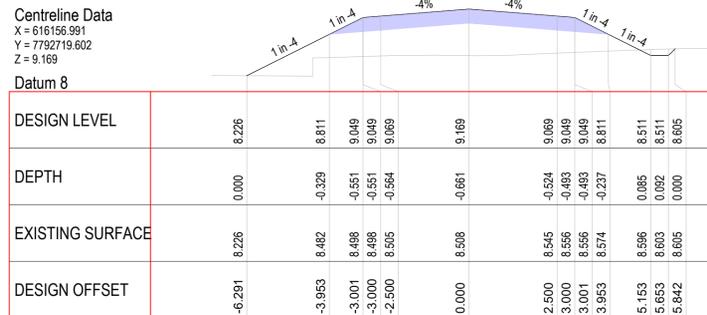
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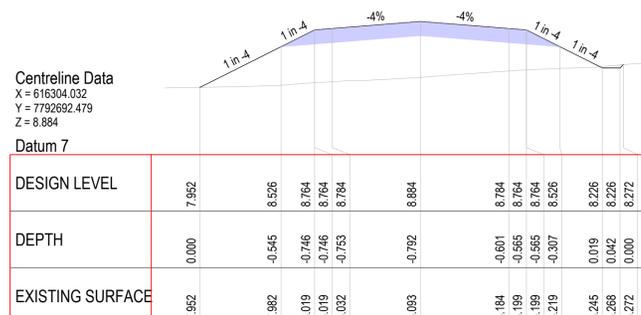
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ACCESS ROAD - CROSS SECTIONS

HORIZ. SCALE 1:100
VERT. SCALE 1:100

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C	FOR APPROVAL	02.02.2022
B	FOR APPROVAL	19.01.2022
A	FOR REVIEW	23.11.2021

REVISION HISTORY



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Engineers Certification:
Travis Smith MIE Aust. CPEng.
NPER Civil
RPEQ 16400
CPESC 9500

Signature: *T. Smith*
Date: 08.02.2022

PROJECT
BOWEN ORBITAL SPACE PORT

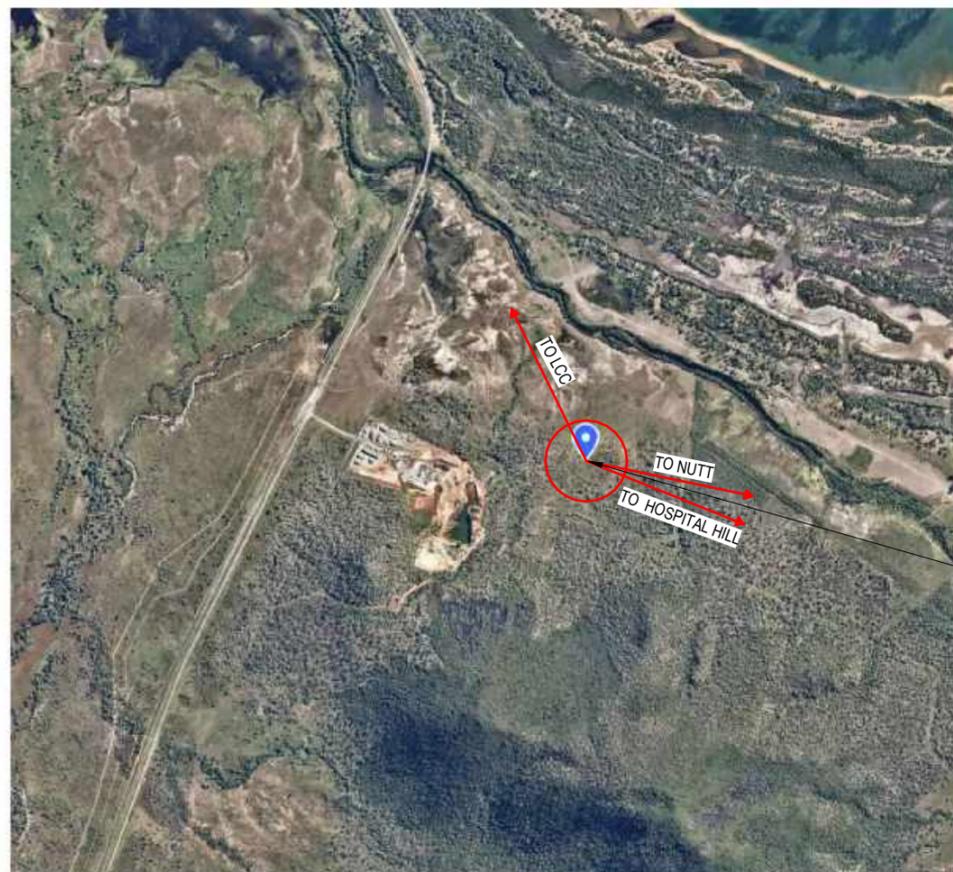
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**BOWEN ORBITAL SPACE PORT
ACCESS ROAD**

CROSS SECTIONS - SHEET 3 OF 3

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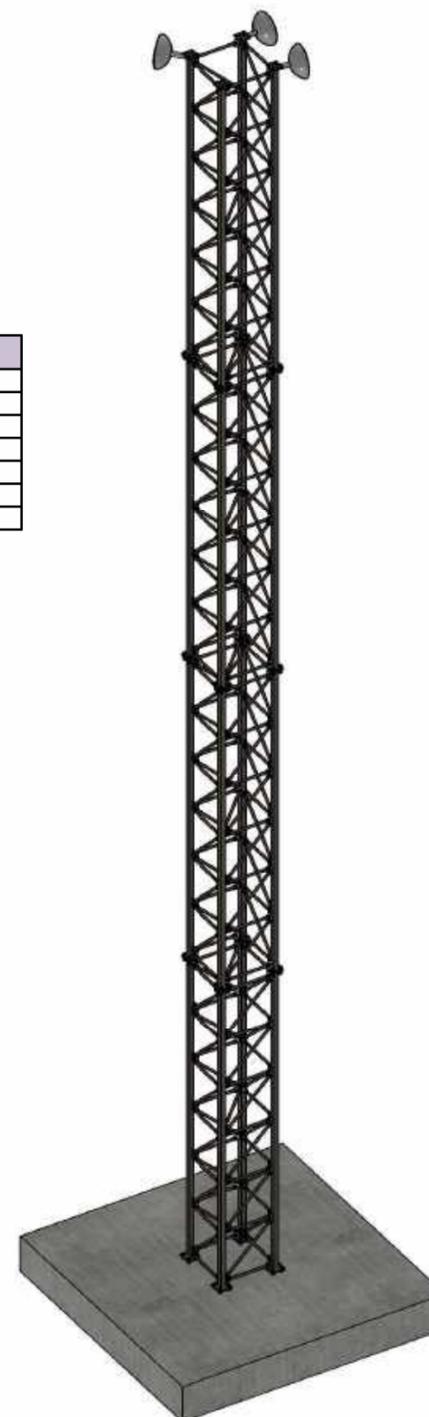
24m COMMUNICATION TOWER BOWEN ORBITAL SPACEPORT

for
TELCO ANTENNAS



DRAWING LIST	
SHEET NUMBER	SHEET NAME
S00	COVER PAGE
S01	PROJECT NOTES
S50	GENERAL ARRANGEMENT AND ELEVATION
S100	FOOTING DETAILS
S400	TOWER FRAMING PLAN AND ELEVATIONS
S401	TOWER FRAMING DETAILS

PROPOSED TOWER LOCATION
 SITE COORDINATES
 19°57'30.98"S
 148°6'44.42"E



0	FOR CONSTRUCTION	04.07.22	D.J.
REV	DESCRIPTION	DATE	BY

Status
FOR CONSTRUCTION

Project
**24m COMMUNICATION TOWER
 BOWEN ORBITAL SPACEPORT**

for
TELCO ANTENNAS

Title
COVER PAGE

Drawn	Date	Chkd	Date
DJ		RL	
Design	Date	Apprd	Date
MF		LS	
Scale	A3	Certif	Date
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GENERAL NOTES

- THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL OTHER CONSULTANTS DRAWINGS AND SPECIFICATIONS.
- BEFORE PROCEEDING WITH THE WORK ANY DISCREPANCIES IN THE CONTRACT DOCUMENTS SHALL BE REFERRED FOR DECISION TO THE ENGINEER.
- SETTING OUT DIMENSIONS AND SIZES OF STRUCTURAL MEMBERS SHALL NOT BE OBTAINED BY SCALING THE STRUCTURAL DRAWINGS.
- ANY SETTING OUT DIMENSIONS SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE CHECKED BY THE CONTRACTOR BEFORE CONSTRUCTION COMMENCES.
- THE STRUCTURE HAS BEEN DESIGNED FOR THE FINAL INSERVICE CONDITION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN AND CERTIFICATION OF ALL TEMPORARY WORKS REQUIRED TO COMPLETE THE WORKS INCLUDING, RIGGING METHODOLOGY, TEMPORARY BRACING, PROPPING, SHORING, ASSESSMENT OF CONSTRUCTION LOADS AND ASSOCIATED WORK METHOD STATEMENTS, SUCH THAT THE CONSTRUCTION LOADS DO NOT EXCEED THE CAPACITY OF THE STRUCTURE. THE STRUCTURAL ENGINEER WILL NOT ASSESS, OR APPROVE ANY TEMPORARY WORKS, NOR ADVISE ON THE TIMING FOR THEIR REMOVAL.
- ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE CURRENT EDITIONS INCLUDING AMENDMENTS OF THE RELEVANT SAA STANDARDS, SAA CODES OF PRACTICE EXCEPT AS VARIED BY THE CONTRACT DOCUMENTS AND OF THE BY-LAWS OF THE LOCAL GOVERNMENT AUTHORITY.

DESIGN CRITERIA

- GENERAL PRINCIPLES:
 - IMPORTANCE LEVEL **2**
 - DESIGN LIFE **50 YEARS**
- SELF-WEIGHT OF THE STEEL MEMBERS AND CONNECTIONS HAVE BEEN ASSESSED IN ACCORDANCE WITH AS1170.1 PERMANENT ACTION DESIGN LOADS.
- WIND LOADS HAVE BEEN ASSESSED IN ACCORDANCE WITH AS1170.2:
 - REGION **C**
 - TERRAIN CATEGORY **TC2.0**
 - WIND DIRECTION MULTIPLIER **Md = 0.9**
 - CLIMATE CHANGE MULTIPLIER **Mc = 1.05**
 - TERRAIN/HEIGHT MULTIPLIER **Mz,cat = 1.1**
 - SHIELDING MULTIPLIER **Ms = 1.0**
 - TOPOGRAPHICAL MULTIPLIER **Mt = 1.0**
 - DESIGN WIND SPEED (ULS) **Vdes = 67.9m/s**
 - DESIGN WIND PRESSURE (ULS) **qzu = 2.77kPa**

FOUNDATION NOTES

- FOOTINGS SHALL BE PLACED CENTRALLY UNDER COLUMNS UNLESS NOTED OTHERWISE.
- EXCAVATIONS SHALL BE KEPT FREE OF PONDED WATER BEFORE PLACING CONCRETE.
- FOOTINGS HAVE BEEN DESIGNED BASED ON THE FOLLOWING GEOTECHNICAL REPORT:

GEOTECHNICAL DETAILS

GEOTECHNICAL REPORT BY	CQ Soil Testing
REPORT JOB NUMBER	CQ20875
REPORT DATE	6/04/2022
SITE CLASSIFICATION TO AS2870	H2
CHARACTERISTIC SURFACE MOVEMENT (Ys)	60-70 mm
MIN. BEARING CAPACITY (ULS)	350kPa

- EXPECTED FOUNDING MATERIAL **VERY STIFF SILTY CLAY**
- GEOTECHNICAL ENGINEER TO CONFIRM FOUNDATION DESIGN PARAMETERS PRIOR TO PLACING CONCRETE BLINDING.
- PLACE BLINDING CONCRETE TO BASE OF FOOTING EXCAVATION TO ACHIEVE DESIGN AND / OR UNIFORM BEARING MATERIAL.

EARTHWORKS NOTES

- REMOVE ALL TOPSOIL FROM THE AREA OF THE WORKS. TOPSOIL TO BE STOCKPILED AND REUSED AS REQUIRED OR REMOVED FROM SITE.
- REMOVE BOULDERS AND ROCKS WITHIN 100mm OF UNDERSIDE OF CONCRETE SLABS AND PAVEMENTS.
- CUT SURFACE TO BE COMPACTED TO 98% STANDARD COMPACTION.
- ANY SETTING OUT DIMENSIONS SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE CHECKED BY THE CONTRACTOR BEFORE CONSTRUCTION COMMENCES.

GROUT NOTES

- DUE TO HIGHLY REACTIVE SOIL FOUNDATION THE TOWER MAY NEED RESETTING VERTICALLY FROM TIME TO TIME BY REMOVING THE GROUT, ADJUSTING THE ANCHOR BOLT NUTS AND RE-GROUTING THE BASE PLATES.
- GROUT IS TO BE CEMENTITIOUS. HIGH STRENGTH AND NON-SHRINK (FOSROC CONBEXTRA BB92 OR EQUIVALENT).
- INSTALLATION IS TO BE IN ACCORDANCE WITH MANUFACTURES SPECIFICATION.

CONCRETE NOTES

- ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 3600 & AS 1379.
- CONCRETE QUALITY:

ELEMENT	MAX SIZE AGGREGATE	CONCRETE GRADE
FOOTING	20mm	N32
- CLEAR CONCRETE COVER TO REINFORCEMENT (OUTSIDE OF STIRRUPS AND TIES) SHALL BE AS FOLLOWS UNLESS NOTED OTHERWISE.

ELEMENT	CLEAR COVER
FOOTING	50 COVER
- SPECIFIED STRUCTURAL THICKNESSES FOR CONCRETE ELEMENTS DO NOT INCLUDE THICKNESS OF APPLIED FINISHES.
- CONSTRUCTION JOINTS OR POUR BREAKS WHERE NOT SHOWN ON PLANS OR DETAILS SHALL BE LOCATED AND FORMED TO THE APPROVAL OF THE ENGINEER.
- NO PENETRATIONS, RECESSES OR CHASES OTHER THAN THOSE SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE MADE IN CONCRETE MEMBERS WITHOUT APPROVAL OF THE ENGINEER.
- AT PENETRATIONS IN SLABS UNLESS OTHERWISE DETAILED REINFORCEMENT MUST NOT BE CUT BUT SHALL BE GATHERED EQUALLY TO EACH SIDE OF PENETRATION AND EXTRA REINFORCEMENT PROVIDED BETWEEN THE PENETRATIONS AS DIRECTED BY THE ENGINEER.
- REINFORCEMENT IS REPRESENTED DIAGRAMMATICALLY. IT IS NOT NECESSARILY SHOWN IN TRUE PROJECTION.
- PROVIDE THE ENGINEER WITH 48 HOURS NOTICE OF REINFORCEMENT BEING READY FOR INSPECTION. NO CONCRETE IS TO BE POURED WITHOUT THE APPROVAL OF THE ENGINEER. THIS IS TO BE CONFIRMED AT A LATER DATE.
- SPLICES IN REINFORCEMENT SHALL BE MADE ONLY IN THE POSITIONS SHOWN. WHERE LAP LENGTH IS NOT SHOWN IT SHALL BE SUFFICIENT TO DEVELOP THE FULL STRENGTH OF THE REINFORCEMENT. THE FOLLOWING MINIMUM SPLICE LENGTHS SHALL BE USED UNLESS NOTED OTHERWISE.

THE FOLLOWING MINIMUM BAR SPLICE LENGTHS ARE APPLICABLE FOR $f_c \geq 25MPa$.
 A - FOR VERTICAL OR HORIZONTAL BARS WITH LESS THAN 300mm OF CONCRETE CAST BELOW

BAR DIAMETER	N10	N12	N16	N20	N24	N28
LAP LENGTH	360mm	440mm	605mm	865mm	1165mm	1485mm
BAR DIAMETER	N32	N32				
LAP LENGTH	1835mm	2210mm				

B - FOR HORIZONTAL BARS GREATER THAN OR EQUAL TO 300mm OF CONCRETE CAST BELOW

BAR DIAMETER	N10	N12	N16	N20	N24	N28
LAP LENGTH	470mm	570mm	785mm	1125mm	1550mm	1958mm
BAR DIAMETER	N32	N36				
LAP LENGTH	2385mm	2870mm				

- WELDING OF REINFORCEMENT WILL ONLY BE PERMITTED WITH THE PRIOR APPROVAL OF THE ENGINEER.
- REINFORCEMENT MUST NOT BE CONTINUOUS THROUGH CONTRACTION JOINTS.
- PLACE SUFFICIENT STOOLS UNDER MAIN BOTTOM REINFORCING RODS AND TOP CROSS RODS IN SLABS TO ALLOW THEM TO BE SUPPORTED IN THEIR CORRECT POSITIONS DURING CONCRETING (NOT GREATER THAN 900mm).
- REINFORCEMENT SYMBOLS:

SYMBOL	SPECIFICATION
N	GRADE D500N DEFORMED BAR
R	STRUCTURAL GRADE ROUND BAR
RF AND SL	HARD DRAWN SHEET RIBBED WIRE REINFORCING FABRIC
- THE NUMBER FOLLOWING THESE SYMBOLS IS THE BAR DIAMETER IN MILLIMETERS. SLABS TO BE CURED BY COVERING WITH 0.20mm BLACK POLYETHYLENE SHEETING AND KEPT MOIST FOR 7 DAYS MINIMUM.
- NO CONCRETE TO BE POURED WHEN SITE TEMPERATURE EXCEEDS 35°C OR FALLS BELOW 5°C.
- SUPPLY AND LAY FABRIC IN FLAT SHEETS AT SPLICES. FABRIC SHALL BE LAPPED AS SPECIFIED IN AS 3600.

COATING NOTES

- THE FOLLOWING COATING REQUIREMENTS HAVE BEEN DETERMINED BY AS4312.
- ALL FABRICATED STRUCTURAL STEELWORK TO BE PREPARED WITH ABRASIVE BLAST CLASS 2.5.
- SURFACES REQUIRING ONSITE TREATMENT ARE TO BE PRIMED IN ACCORDANCE WITH SURFACE TREATMENT MANUFACTURERS REQUIREMENTS.
- COATINGS HAVE BEEN SPECIFIED BASED ON THE FOLLOWING:

CORROSION CATEGORY	C3 (MEDIUM)
STEEL CORROSION RATE $\mu m/y$	25-50
TYPICAL ENVIRONMENT	COASTAL OR INDUSTRIAL
DURABILITY CLASS	EL (EXTRA LONG TERM)
LIFE TO FIRST MAINTENANCE	50 YEARS
SURFACE TREATMENT:	
TOWER MEMBERS	HDG600

STRUCTURAL STEELWORK NOTES

- ALL STEELWORK TO BE IN ACCORDANCE WITH AS4100 UNO.
- ALL WELDING TO BE IN ACCORDANCE WITH AS 1554 EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS. WELDING CONSUMABLES TO HAVE A MINIMUM NOMINAL TENSILE STRENGTH $f_w = 490MPa$. ALL WELDS NOT DESIGNATED ON PLAN SHALL BE 6mm GENERAL PURPOSE FILLET WELDS. COMPLETE PENETRATION BUTT WELDS (CPBW) SHALL BE STRUCTURAL PURPOSE WELDS.
- UNLESS NOTED OTHERWISE, ALL STEEL SHALL BE IN ACCORDANCE WITH:

	BHP GRADE 300 PLUS	FOR UNIVERSAL BEAMS AND COLUMNS
	GRADE 250 PLUS	FOR ALL PLATES AND CLEATS
	AS 1163	FOR SHS AND RHS SECTIONS GR350 OR 450 AS APPLICABLE
	AS1163	FOR CHS SECTIONS GR250 OR 350 AS APPLICABLE
- THE CONTRACTOR SHALL PREPARE FABRICATION DRAWINGS AND SUBMIT TO THE ENGINEER FOR REVIEW. FABRICATION IS NOT TO COMMENCE UNTIL FABRICATION DRAWINGS HAVE BEEN APPROVED.
- ALL STEELWORK THAT WILL BE EXPOSED TO VIEW IS TO HAVE WELD SPATTER, FLUX, DAGS AND BURRS REMOVED, AND ALL SEALING AND BUTT WELDS GROUND FLUSH.
- THE BUILDER SHALL PROVIDE ALL CLEATS AND HOLES FOR FIXING ALL BUILDING ELEMENTS TO STEEL AS REQUIRED BY THE DRAWINGS WHETHER OR NOT SHOWN.
- BOLTS:

4.6/S	COMMERCIAL BOLT GRADE 4.6 TO AS1111 SNUG TIGHT.
8.8/S	HIGH STRENGTH STRUCTURAL BOLT GRADE 8.8 TO AS1252 SNUG TIGHT.
8.8/TB	HIGH STRENGTH STRUCTURAL BOLT GRADE 8.8 TO AS1252 TENSIONED TO AS4100 BEARING JOINT.
8.8/TF	HIGH STRENGTH STRUCTURAL BOLT GRADE 8.8 TO AS1252 TENSIONED TO AS4100 FRICTION JOINT.
- ALL BOLTS TO BE HOT DIP GALVANISED EXCLUDING PURLIN BOLTS.
- ALL BOLTED CONNECTIONS OF FRICTION GRIP TYPE SHALL HAVE CONNECTION SURFACES UNPAINTED.
- MECHANICAL PROPERTIES AND PROCEDURES CERTIFICATES FOR ALL MATERIALS, BOLTS AND WELDS SHALL BE MAINTAINED BY THE MAIN CONTRACTOR AND PROVIDED ON DEMAND.
- REFER TO ARCHITECTURAL DETAILS FOR ADDITIONAL NON-STRUCTURAL STEELWORK.

ERECTION NOTES

- INSTALLATION / ERECTION BY OTHERS.
- THE CONTRACTOR / INSTALLER IS TO ENSURE THE TOWER IS MAINTAINED IN A STABLE CONDITION AND THAT NO PART OF THE STRUCTURE IS OVERSTRESSED DURING CONSTRUCTION.
- INSTALLATION OF TOWER TO BE ERECTED IN ACCORDANCE WITH AS4100.
- ENSURE ALL BOLT HEADS & NUTS SIT FLAT ON FLANGES.
- ALL FLANGES MUST MAKE FULL CONTACT AT EACH BOLT PRIOR TO 'SNUG-TIGHT' BOLTS. ADVISE DESIGNER IF THIS IS NOT ACHIEVED.
- ERECTION TOLERANCES SHALL BE LIMITED TO:
 - VERTICALITY - LESS THAN H/360
 - TWIST - LESS THAN 2° PER MODULE
- TOWER EARTHING DESIGNED & SPECIFIED BY OTHERS.

TOWER ACCESS

- STRUCTURAL ELEMENTS HAVE BEEN ASSESSED FOR LOADS GENERATED FROM CLIMBING/WORKING AT HEIGHTS. A SINGLE PERSON LOAD OF 15kN IS APPLIED IN ACCORDANCE WITH TABLE 3.1 IN AS1891.4.
- AS1891.4 REQUIRES THAT SIGNAGE BE INSTALLED AT THE TOWER BASE DESCRIBING WHICH AREAS OF THE STRUCTURE CAN BE USED FOR ANCHORAGE.
- THE TOWER SHALL ONLY BE ASCENDED BY QUALIFIED AND COMPETENT PERSONNEL.
 - FALL ARREST DEVICES MUST ONLY BE ATTACHED TO THE LEG MEMBER OR A DIAGONAL CROSS BRACES OR FALL ARREST ATTACHMENT POINT NOMINATED ON THE DRAWINGS.
 - PERSONNEL CLIMBING THE TOWER ARE TO HAVE APPROPRIATE CLIMBING GEAR TO SUIT THE LEG OR BRACING MEMBERS.
 - ONLY THE BRACE MEMBERS SHOWN IN Purple IN THE GENERIC DIAGRAM BELOW CAN BE USED AS A CLIMBING/WORK AT HEIGHTS ANCHOR POINT.
 - THE SPECIFIED ANCHOR POINTS ARE LIMITED TO ONE (1) PERSON AT ANY TIME.
 - PRIOR TO ANCHORING TO ANY ELEMENT, VISUALLY CHECK CONNECTIONS ARE COMPLETE AND HAVE NO DAMAGE. ANY DEFECTS SHOULD BE REPORTED TO THE MANUFACTURER.
 - ANY STRUCTURAL MEMBER MAY BE USED TO PHYSICALLY MOVE AROUND THE STRUCTURE.
 - DO NOT ATTACH FALL ARREST DEVICES TO HORIZONTAL CROSS BRACING.
 - DO NOT ATTACH FALL ARREST DEVICES TO BRACING OR ATTACHMENT POINTS THAT EXHIBITS DAMAGE, RUST OR CRACKING.



FIGURE 1
 FIGURE 1 - LANYARD HOOK SAFE PLACEMENT (PURPLE SHADING)

0	FOR CONSTRUCTION	04.07.22	D.J.
REV	DESCRIPTION	DATE	BY

Status

FOR CONSTRUCTION

Project

24m COMMUNICATION TOWER BOWEN ORBITAL SPACEPORT

for

TELCO ANTENNAS

Title

PROJECT NOTES

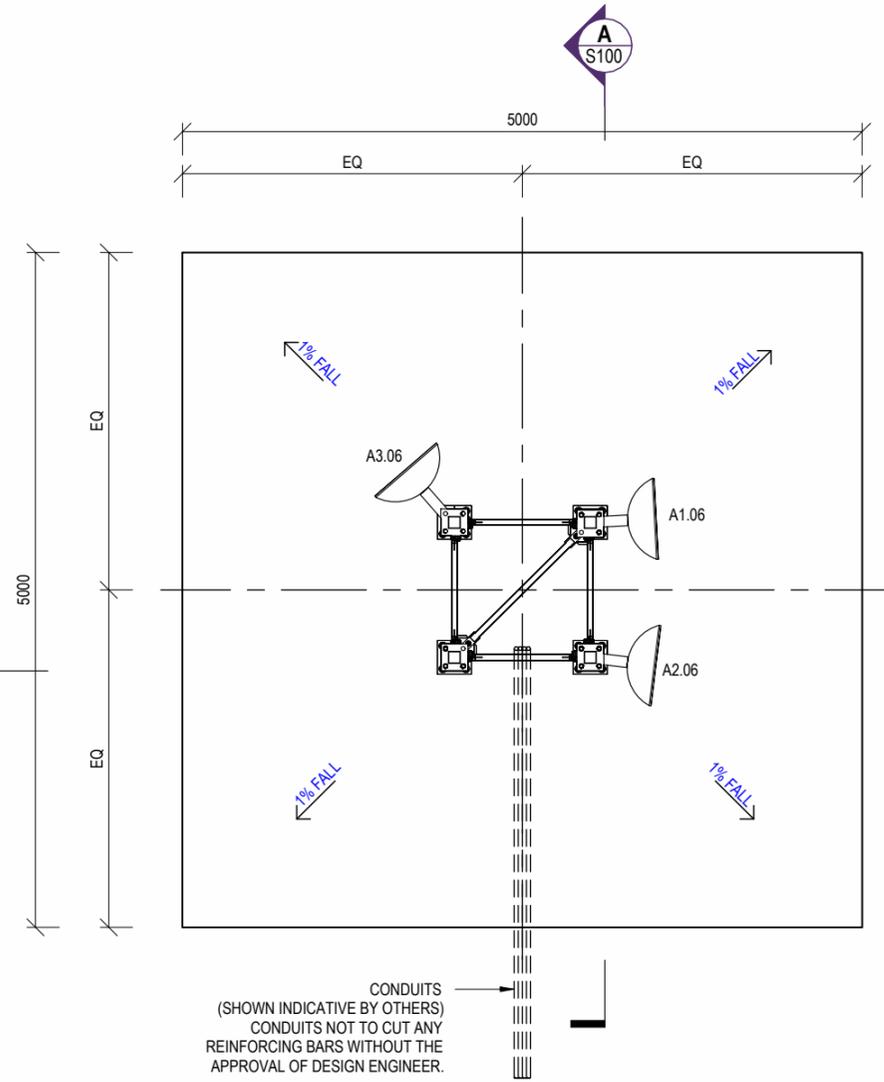
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Project No.	Dwg. No.	Rev	
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GENERAL ARRANGEMENT

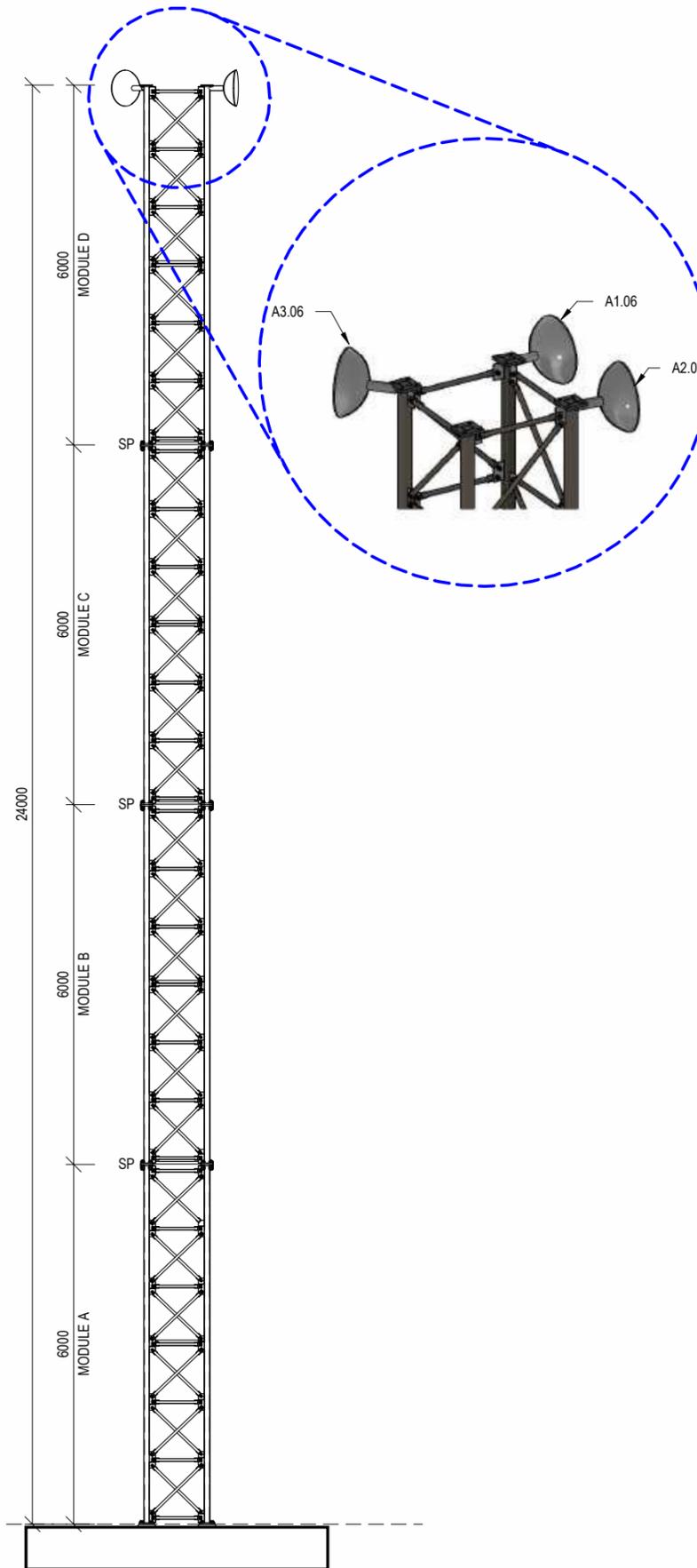
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ANTENNA SCHEDULE				
ID	SIZE / STYLE	BEARING	WEIGHT (kg)	ABOVE GROUND LEVEL (AGL)
A1.06	600 DIAMETER PARABOLIC ANTENNA	102°	8	24m
A2.06	600 DIAMETER PARABOLIC ANTENNA	112°	8	24m
A3.06	600 DIAMETER PARABOLIC ANTENNA	334°	8	24m
FUTURE	600 DIAMETER PARABOLIC ANTENNA	(TBC)	8	22m
FUTURE	600 DIAMETER PARABOLIC ANTENNA	(TBC)	8	22m

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ELEVATION

1 : 100

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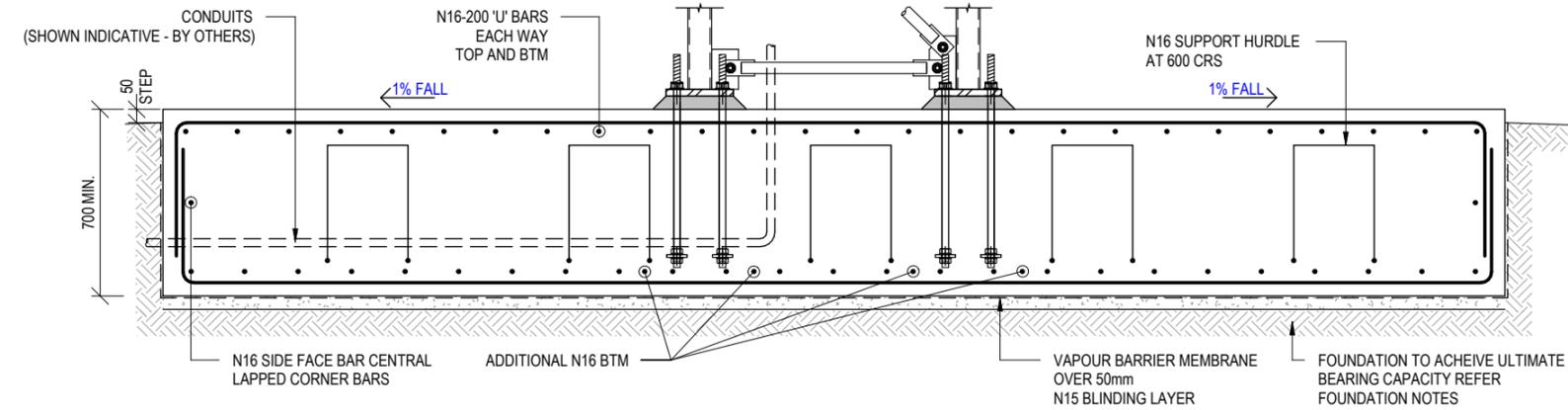
Project
**24m COMMUNICATION TOWER
BOWEN ORBITAL SPACEPORT**

for
TELCO ANTENNAS

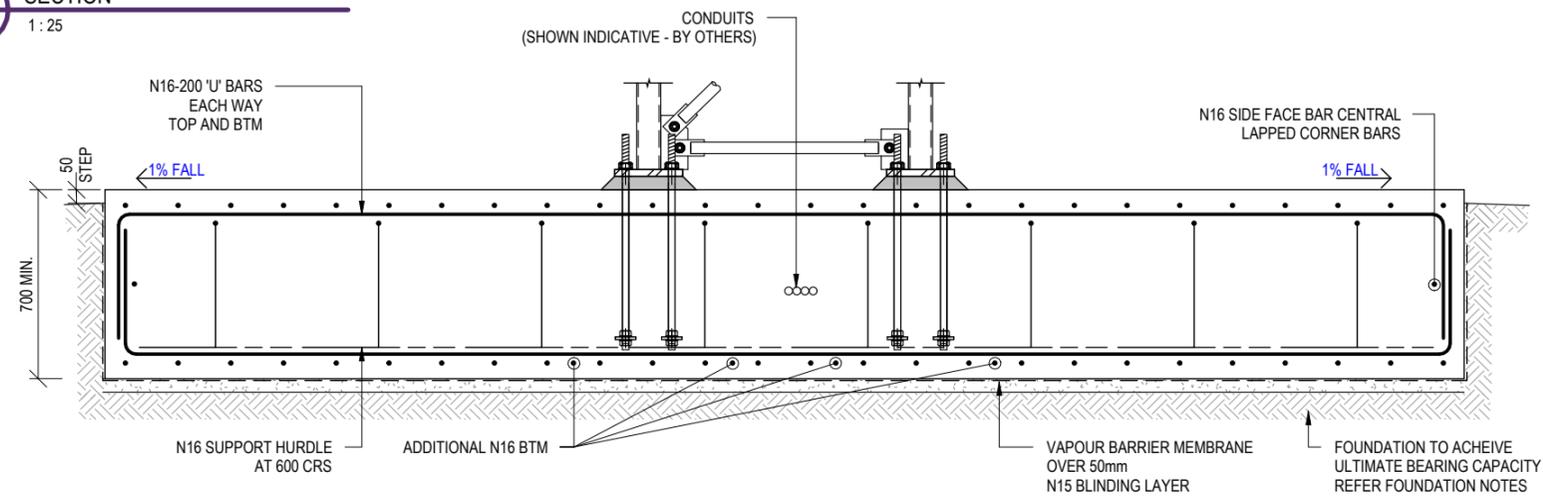
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**GENERAL ARRANGEMENT AND
ELEVATION**

Drawn	Date	Chkd	Date
DJ		RL	
Design	Date	Apprd	Date
MF		LS	
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NTS		LS	
Project No.	Dwg. No.	Rev	
22-055	S50	0	

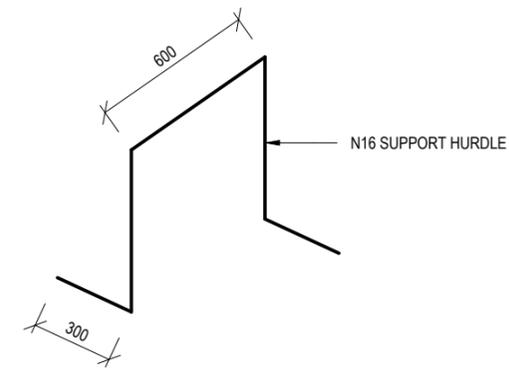
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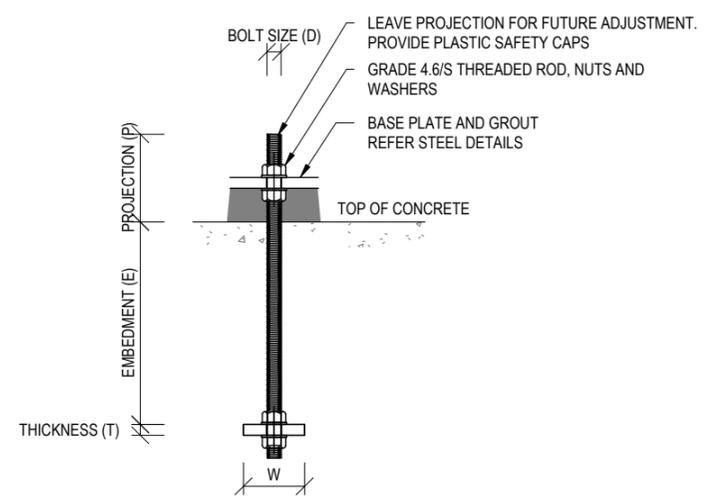
A SECTION
S50 1:25



B SECTION
S50 1:25



SUPPORT HURDLE DETAIL
1:25



HD BOLT DETAIL - THREADED ROD
1:10

HOLD DOWN BOLT				
BOLT DIAMETER (D)	BOLT		WASHER	
	EMBEDMENT (E)	PROJECTION (P)	SQUARE WASHER (W)	THICKNESS (T)
30	550	200	100	25

PLANS AND DOCUMENTS referred to in the SDA APPROVAL

SDA approval: APC2022/007



0	FOR CONSTRUCTION	04.07.22	D.J.
REV	DESCRIPTION	DATE	BY

Status
FOR CONSTRUCTION

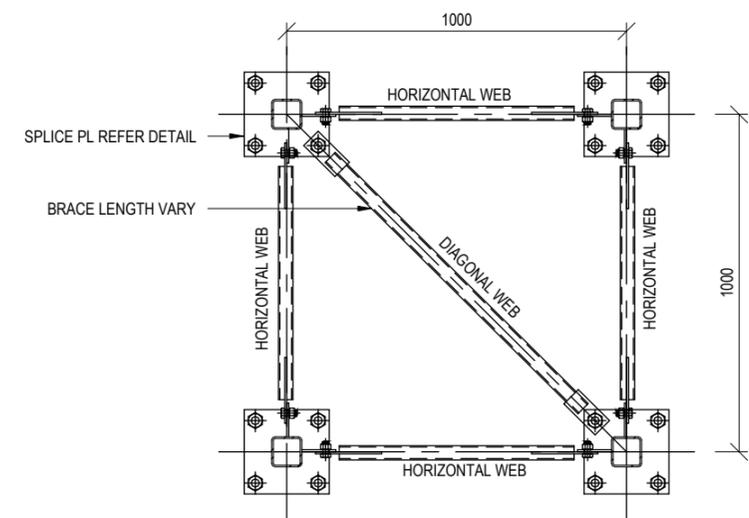
Project
24m COMMUNICATION TOWER BOWEN ORBITAL SPACEPORT

for
TELCO ANTENNAS

Title
FOOTING DETAILS

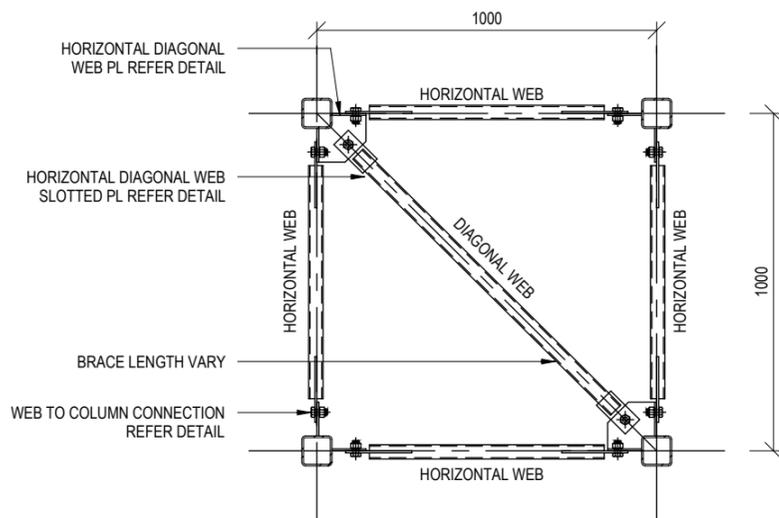
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DJ		RL	
Design	Date	Apprd	Date
MF		LS	
Scale	A3	Certif	Date
NTS		LS	
Project No.	Dwg. No.	Rev	
22-055	S100	0	

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TYPICAL SECTION AT SPLICE

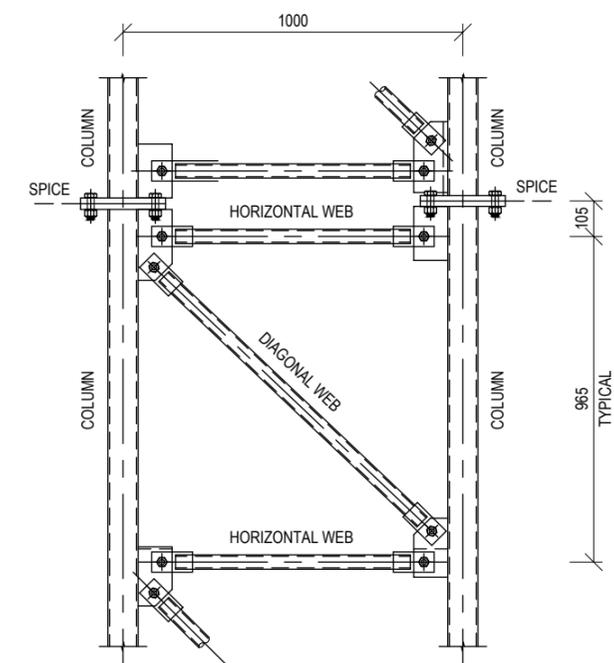
1 : 20



TYPICAL SECTION AT MID-SECTION

1 : 20

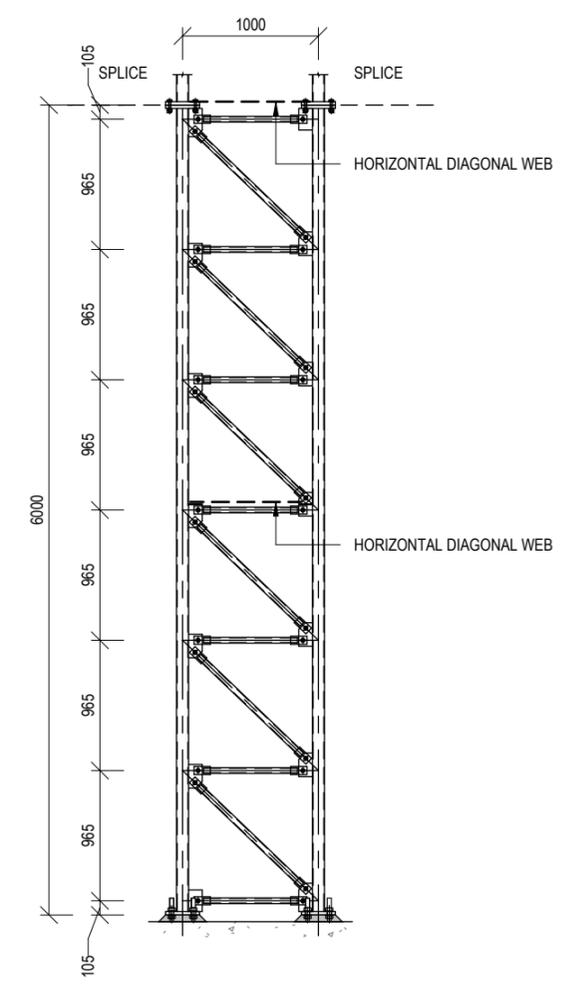
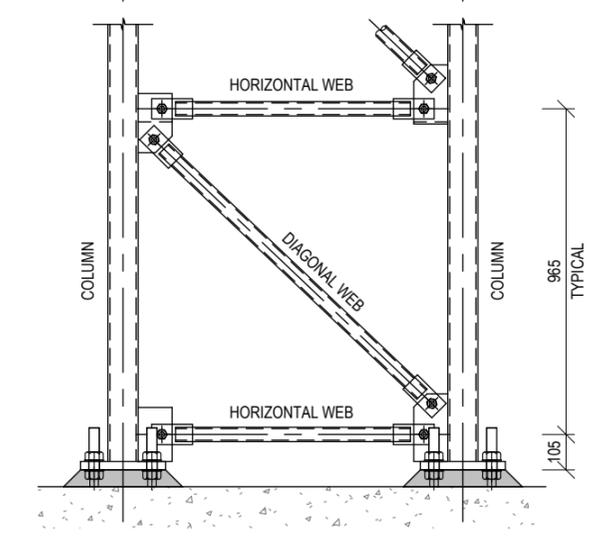
MEMBER SCHEDULE			
MODULE	MEMBER	DESCRIPTION	GRADE
MODULE A	COLUMN	89x89x6.0 SHS	350
MODULE B TO D	COLUMN	89x89x3.5 SHS	350
MODULE A TO D	HORIZONTAL AND DIAGONAL WEB	42.4x3.2 CHS	250



LEG AND WEB MEMBER SET OUT

1 : 20

NOTE:
 ALL LEG TO SPLICE/BASE PLATE CONNECTIONS
 TO BE COMPLETE PENETRATION BUTT WELDS.
 ALL OTHER WELDS TO REMAIN 6mm CFW (U.N.O.).



TYPICAL MODULE

1 : 50

PLANS AND DOCUMENTS
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Status
FOR CONSTRUCTION

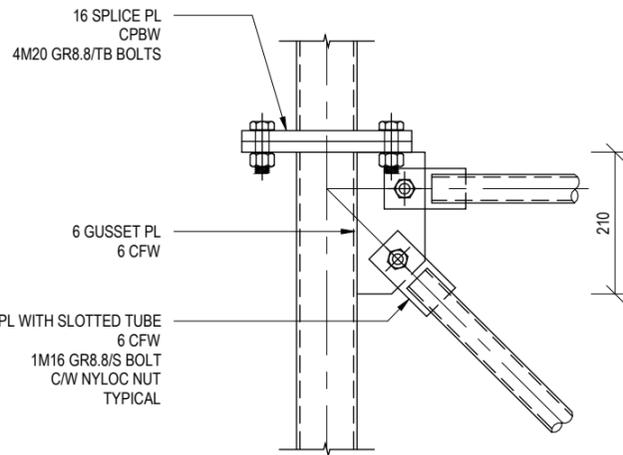
Project
**24m COMMUNICATION TOWER
 BOWEN ORBITAL SPACEPORT**

for
TELCO ANTENNAS

Title
**TOWER FRAMING PLAN AND
 ELEVATIONS**

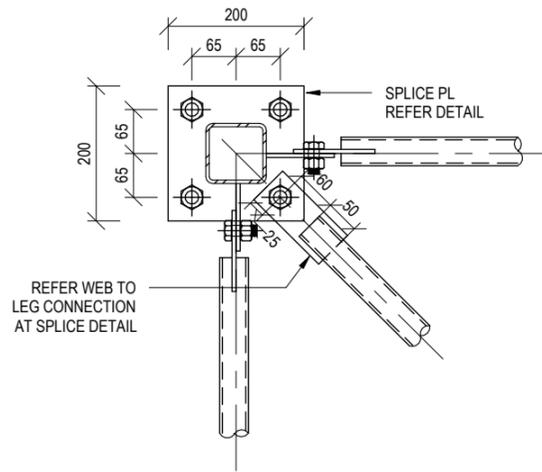
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JAW		RL	
Design	Date	Apprd	Date
LS		LS	
Scale	A3	Certif	Date
		LS	
Project No.	Dwg. No.	Rev	
22-055	S400	0	

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WEB TO LEG CONNECTION AT SPLICE

1 : 10



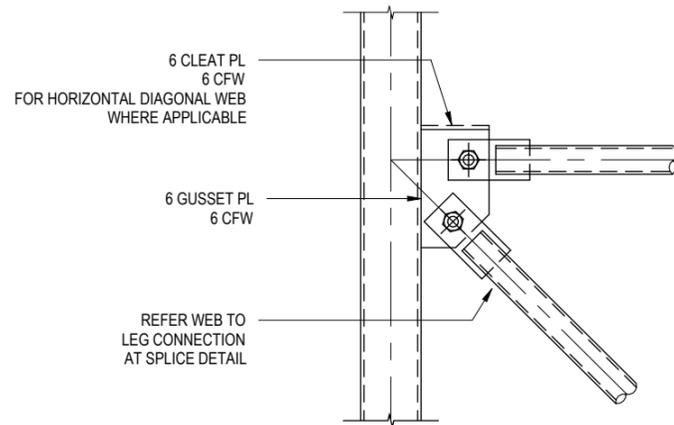
DIAGONAL WEB TO SPLICE PLAN DETAIL

1 : 10

PLANS AND DOCUMENTS referred to in the SDA APPROVAL

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 ABN 89 106 675 156 ACN 106 675 156
 p 07 3870 8888



WEB TO LEG CONNECTION

1 : 10

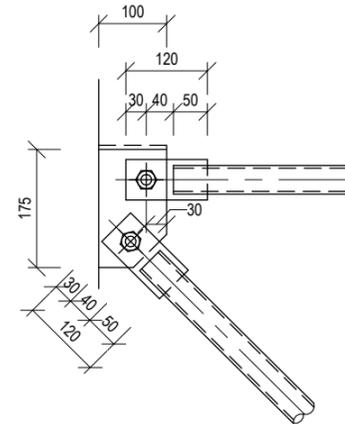
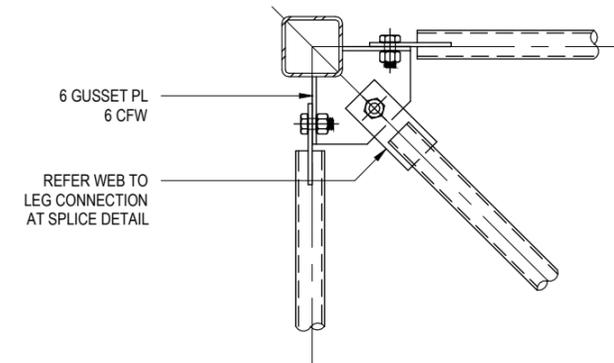


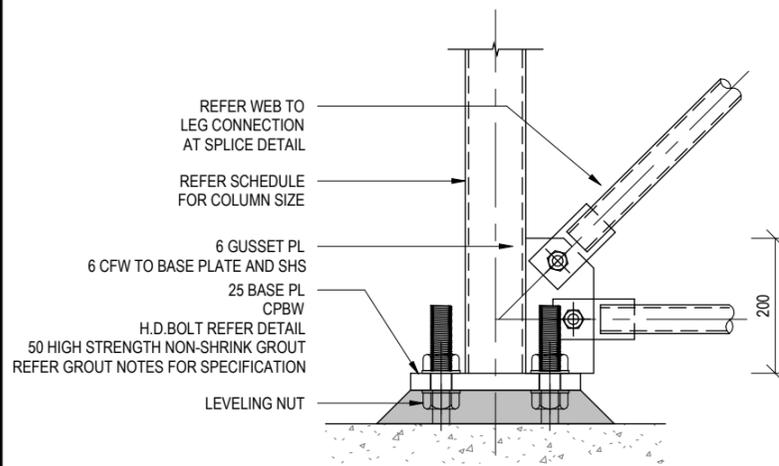
PLATE SET OUT

1 : 10



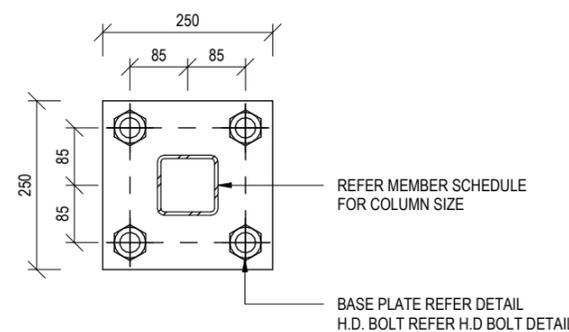
DIAGONAL WEB TO LEG PLAN DETAIL

1 : 10



BASE PLATE DETAIL

1 : 10



TYPICAL BASE PLATE

1 : 10

0	FOR CONSTRUCTION	04.07.22	D.J.
REV	DESCRIPTION	DATE	BY

Status
FOR CONSTRUCTION

Project
24m COMMUNICATION TOWER BOWEN ORBITAL SPACEPORT

for
TELCO ANTENNAS

Title
TOWER FRAMING DETAILS

Drawn	Date	Chkd	Date
JAW		RL	
Design	Date	Apprd	Date
LS		LS	
Scale	A3	Certif	Date
		LS	

Project No.	Dwg. No.	Rev
22-055	S401	0

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4/07/2022 3:41:00 PM

STRUCTURAL COMPUTATION REPORT

22-055 –24m COMMUNICATION TOWER AT BOWEN ORBITAL SPACEPORT

Prepared for:

TECLO ANTENNAS

WWW.TECLOANTENNAS.COM.AU

PLANS AND DOCUMENTS
referred to in the
SDA APPROVAL



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Client / Project Telco Antennas / 24m Steel Tower at Bowen Orbital Spaceport		Job No. 22-055			
Section Structural Computation Report		Sheet No./Rev. 2 / 1			
Calc. by MF	Date 04/07/22	Chk'd by LS	Date 04/07/22	App'd by LS	Date 04/07/22

Document1	
Prepared By	MF
Approved By	LS
Date	04/07/22
Job Number	22-055
Document Name	Structural Computation Report
Version	V 1.0

Document Revision History

Version	Revision History
1.0	Initial issue

Leonel Sobral
Senior Structural Engineer
MIEAust CPEng NER RPEQ APECEng IntPE(Aust)

Matthew Falcke
Graduate Structural Engineer

STATEMENT OF LIMITATION

Data and conclusions of this report are the findings and opinions of icubed consulting and are not an expressed or implied representation, warranty or guarantee. This report has been prepared for Telco Antennas. icubed consulting does not accept liability for any third party's use or reliance on this report.



Client / Project Telco Antennas / 24m Steel Tower at Bowen Orbital Spaceport				Job No. 22-055	
Section Structural Computation Report				Sheet No./Rev. 3 / 1	
Calc. by MF	Date 04/07/22	Chk'd by LS	Date 04/07/22	App'd by LS	Date 04/07/22

TABLE OF CONTENTS

1	Scope.....	4
1.1	Design scope:.....	4
1.2	Structural Assessment & Certification Limitations.....	4
2	Client Specification.....	5
2.1	Site Location.....	5
3	Applicable Design Standards.....	6
4	Design Actions.....	7
4.1	General Principals.....	7
4.2	Permanent Actions.....	7
4.3	Imposed Actions.....	7
4.4	Wind Actions.....	8
5	Tower Climbing Adequacy.....	9
6	Safety In Design.....	10
7	Structural Analysis & Results.....	11
7.1	Lateral Displacement.....	12
7.2	Tower Base Reactions.....	12
7.3	Geotechnical Parameters.....	12
7.4	Footing Design.....	12



Client / Project Telco Antennas / 24m Steel Tower at Bowen Orbital Spaceport		Job No. 22-055			
Section Structural Computation Report		Sheet No./Rev. 4 / 1			
Calc. by MF	Date 04/07/22	Chk'd by LS	Date 04/07/22	App'd by LS	Date 04/07/22

1 Scope

i3 consulting was engaged by Telco Antennas to undertake a structural design and certification of the 1m face steel tower and footing for the proposed project at Orbital Spaceport Bowen QLD. This 24m high tower is to support communication equipment (ie. parabolic antennas)

1.1 Design scope:

The following structural design and certification was performed on the steel tower structure, connections and concrete footing:

- Calculate wind loads for the proposed orbital spaceport site in accordance with AS1170.2-2021
- Determine wind loads on the tower and the specific set of antennas.
- Structural model and analysis of the proposed tower
- Design check steel member sizes and connections for the bolted web members
- Design reinforced concrete pad footing
- Structural drawings of the footings, steel towers and connection details
- Design computation report and design compliance statement (form 15)

1.2 Structural Assessment & Certification Limitations

This design and certification is based on the fabrication and installation of the steel tower being carried out in accordance with i3 computation report and drawings 22-055 – S00, S01, S50, S100, S400 and S401.



Client / Project Telco Antennas / 24m Steel Tower at Bowen Orbital Spaceport			Job No. 22-055		
Section Structural Computation Report			Sheet No./Rev. 5 / 1		
Calc. by MF	Date 04/07/22	Chk'd by LS	Date 04/07/22	App'd by LS	Date 04/07/22

2 Client Specification

Client provided information for the proposed 24m steel framed tower

- Geometry of 1m square steel frame tower
- Proposed antennas size, above ground level and bearings – refer antenna schedule in section 4.2

2.1 Site Location

The proposed steel tower is to be installed at Orbital Spaceport Bowen, Queensland with the following GPS co-ordinates:





Client / Project Telco Antennas / 24m Steel Tower at Bowen Orbital Spaceport		Job No. 22-055			
Section Structural Computation Report		Sheet No./Rev. 6 / 1			
Calc. by MF	Date 04/07/22	Chk'd by LS	Date 04/07/22	App'd by LS	Date 04/07/22

3 Applicable Design Standards

AS/NZS 1170.0:2002	Structural Design Actions – General principles
AS/NZS 1170.1-2002	Structural Design Actions – Permanent, imposed, and other actions
AS/NZS 1170.2-2011	Structural Design Actions – Wind actions
AS 1891.4:2009	Industrial fall-arrest systems and devices – selection, use and maintenance
AS 3995 -2009	Design of steel lattice masts & Masts (Section E1)
AS/NZS 3678 2011	Structural Steel – hot-rolled plates, floorplates and slabs
AS/NZS 3679.1 2016	Structural Steel – hot rolled bars and sections
AS 1163 2016	Cold-formed structural steel hollow sections
AS/NZS 4100 2020	Steel Structures
AS/NZS 1554.1 2014	Structural Steel Welding – Welding of Steel Structures
AS 3600 2018	Concrete Structures



Client / Project Telco Antennas / 24m Steel Tower at Bowen Orbital Spaceport			Job No. 22-055		
Section Structural Computation Report			Sheet No./Rev. 7 / 1		
Calc. by MF	Date 04/07/22	Chk'd by LS	Date 04/07/22	App'd by LS	Date 04/07/22

4 Design Actions

The following design parameters were adopted in the structural analysis and design of the steel tower and concrete footing

4.1 General Principals

- Importance level 2
- Design working life 50 years

4.2 Permanent Actions

- Design loads based on AS1170.1
- Self-weight of steel tower members and connections
- Self-weight of concrete footing
- Antenna details as tabled below

ANTENNA SCHEDULE				
ID	SIZE / STYLE	BEARING	WEIGHT (kg)	ABOVE GROUND LEVEL (AGL)
A1.06	600 DIAMETER PARABOLIC ANTENNA	102°	8	24m
A2.06	600 DIAMETER PARABOLIC ANTENNA	112°	8	24m
A3.06	600 DIAMETER PARABOLIC ANTENNA	334°	8	24m
FUTURE	600 DIAMETER PARABOLIC ANTENNA	(TBC)	8	22m
FUTURE	600 DIAMETER PARABOLIC ANTENNA	(TBC)	8	22m

4.3 Imposed Actions

- Design loads based on AS1891.4 Industrial fall arrest systems and devices; part 4
- Single point anchorage - 15kN applied at 5° from vertical to simulate real world conditions

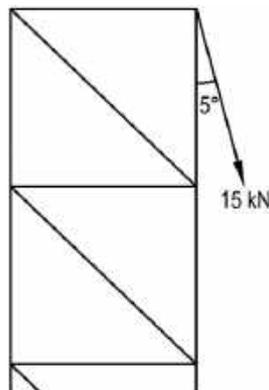


Figure 1 – Fall Arrest Load



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Section Structural Computation Report				Sheet No./Rev. 8 / 1	
Calc. by MF	Date 04/07/22	Chk'd by LS	Date 04/07/22	App'd by LS	Date 04/07/22

4.4 Wind Actions

The following wind parameters were used based on AS3995 and AS1170.2:

- Regions: C (refer map below for Australian wind regions)
- Terrain category: 2
- Terrain / height multiplier: 1.098
- Wind directional multiplier mast / antennas: 0.9
- Topographical Multiplier: 1.0
- Climate Change Multiplier: 1.05
- Shielding Multiplier: 1.0
- Lateral deflection to allow continuous communication is taken from AS3995 Appendix E1 which specifies a wind speed of 27m/s
- The ultimate wind speed and pressures (without the aerodynamic shape factors C_{fig}) are listed in the following table:

Region	V_R (m/s)	V_{des} (m/s)	P_w (kpa)
C	65.6	67.9	2.77

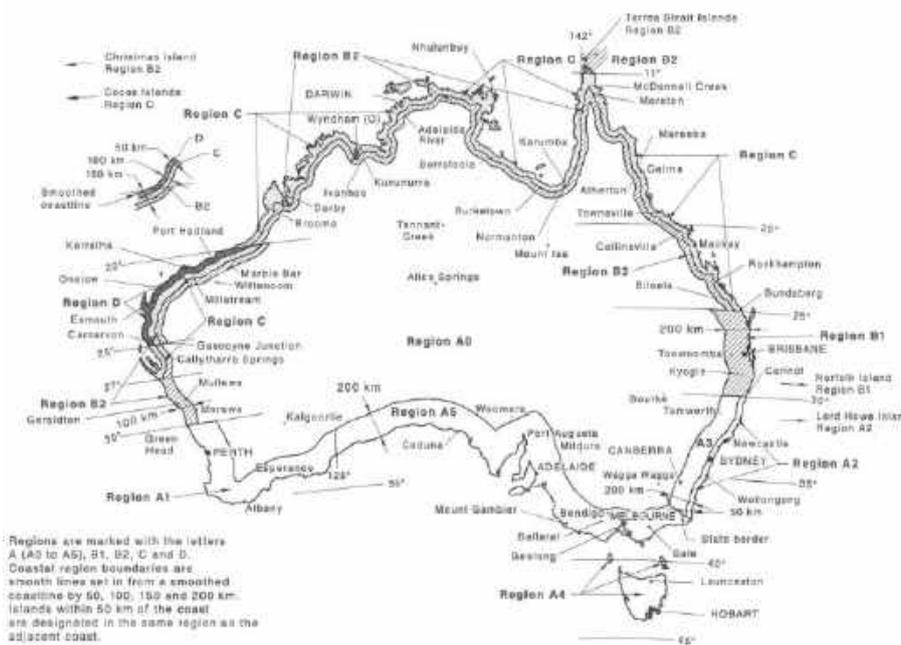


Figure 3.1(A) — Wind regions — Australia

Figure 2 – AS1170.2 - Wind Regions - Australia



Client / Project Telco Antennas / 24m Steel Tower at Bowen Orbital Spaceport		Job No. 22-055			
Section Structural Computation Report		Sheet No./Rev. 9 / 1			
Calc. by MF	Date 04/07/22	Chk'd by LS	Date 04/07/22	App'd by LS	Date 04/07/22

5 Tower Climbing Adequacy

Structural elements have been assessed for loads generated from climbing / working at heights. A single person load of 15kN is applied in accordance with Table 3.1 in AS1891.4.

AS1891.4 requires that signage be installed at the tower base describing which elements of the structure can be used for anchorage.

Any climber / worker at heights must be competent and qualified to do so.

Two (2) climbers / workers at heights can be supported by the tower with adherence to the following specifications.

- ONLY** the members shown in purple in the generic diagram below can be used as a climbing / work at heights anchor point.
- The specified anchor points are limited to one (1) person at any time.
- Prior to anchoring to any element, visually check connections are complete and have no damage. Any defects should be reported to the manufacturer.
- Do not attach fall arrest devices to horizontal cross bracing.
- Any anchor point is limited to the tower leg above the brace connection points.

Generic Tower Anchor points

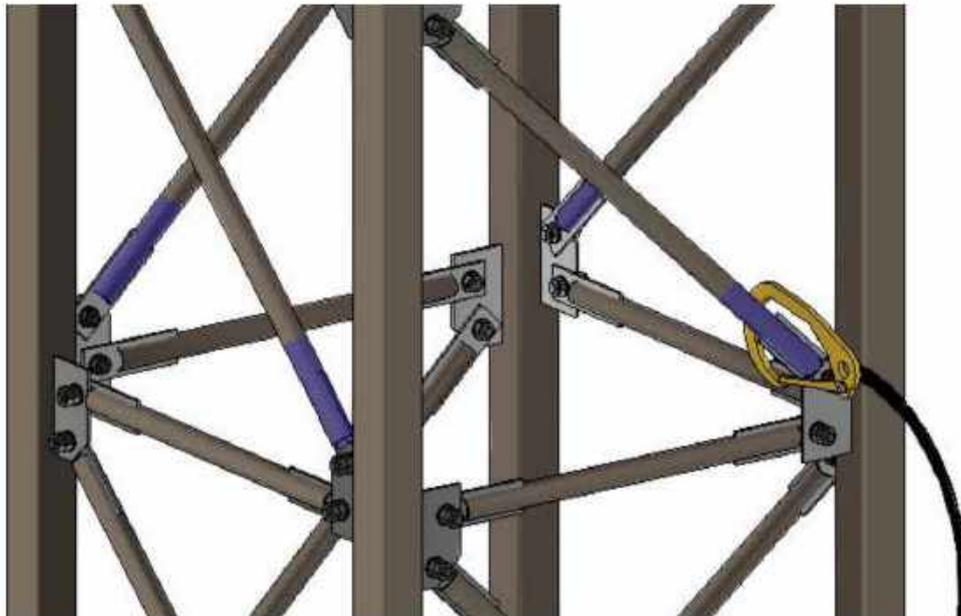


Figure 3 – Lanyard Hook must be placed around diagonal tower web above bracing connections only (purple shading)



Client / Project Telco Antennas / 24m Steel Tower at Bowen Orbital Spaceport			Job No. 22-055			
Section Structural Computation Report			Sheet No./Rev. 10 / 1			
Calc. by MF	Date 04/07/22	Chk'd by LS	Date 04/07/22	App'd by LS	Date 04/07/22	

6 Safety In Design

Safety in Design (SID) is a statutory requirement on construction projects. In all jurisdictions within Australia there is a general requirement that the safety of a design is reviewed where non-standard construction techniques or novel building or structural designs are proposed.

4.2.1.1 DESIGN RISK ASSESSMENT

PROJECT NAME / NUMBER:	24m Tower at Bowen Orbital Spaceport / 22 - 055
DRAWING NUMBERS: icubed consulting drawings (DRAWING LIST)	S00 - S401
PARTICIPANTS: icubed consulting (NAMES)	Matthew Falcke, Leonel Sobral
DATE OF REVIEW:	15/06/2022
DISTRIBUTION:	

LIKELIHOOD - How likely is this event to happen?		CONSEQUENCES - If this does happen, how severe would the outcome be?		RISK RATING				
CODE	DESCRIPTION	CODE	DESCRIPTION	Frequency	Severity	Minor	Major	Catastrophic
A	Always certain	1	Catastrophic	1	1	1	1	1
B	Likely	2	Major	2	2	2	2	2
C	Possible	3	Moderate	3	3	3	3	3
D	Unlikely	4	Minor	4	4	4	4	4
E	Rare	5	Insignificant	5	5	5	5	5

PRA Ref	Hazard	Risk	Site / Building Location	PHASE			Suggested Treatment - Change or specify new control	RESIDUAL RISK			Responsibility	Status (Open / Closed)
				CO	OP / US	MAINT		L	C	SCORE		
1	Structural Collapse	The tower could collapse under an extreme wind event	ALL	✓	✓	✓	Tower designed to AS/NZS 1170.1-2002 and AS/NZS 4100 2020. The design was also peer reviewed and signed off by a senior engineer.	E	2	L	i3	CLOSED
2	Working at Heights	Worker could fall from height when climbing the tower	TOWER	✓	✗	✓	Instruction have been provided for climbing the tower/signage will be installed at the base of the tower describing which areas of the structure can be climbed and used as an anchor point/ climbers must be working from heights trained	C	3	M	Telco Antennas	OPEN
3	Dangerous Weather Conditions	personal injury / commercial loss during high winds / thunderstorms / Earthquake	ALL	✓	✓	✓	Avoid working on or around the tower during extreme weather events	C	2	M	Telco Antennas	OPEN
4	Exposed Steel during construction	A worker could fall onto the slab reo causing personal injury	TOWER	✓	✗	✗	Warn workers of the potential hazard.	D	2	L	Telco Antennas	OPEN
5	Falling objects	Someone working at the top of the tower could drop something from a height and hit someone.	ALL	✓	✗	✓	Hard hats are to be worn within the near vicinity of the tower and workers are to use the proper anchoring points when lifting is required.	D	5	M	Telco Antennas	OPEN
6	Manual handling issue	A worker manipulating steel members or antennas could possibly injure themselves whilst doing so	ALL	✓	✗	✓	Proper lifting technique is to be carried out at all times and workers are to use appropriate lifting tools/devices when required.	C	2	M	Telco Antennas	OPEN
7	PPE	Personal injury / fatigue / stress	ALL	✓	✓	✓	Standard work health and safety methods are to be implemented and all works must wear required PPE.	C	4	H	Telco Antennas	OPEN
8	Improper Foundation	The soil under the foundations cannot resist the forces applied to it causing failure	ALL	✓	✓	✓	Soil tests required to confirm minimum bearing capacity	C	3	M	Telco Antennas	OPEN
9	Trip Hazards	There is potential for someone to trip whilst walking around the site. Both around the tower and at the edge of the concrete slab	ALL	✓	✓	✓	Workers to take care when moving around the site	D	1	L	Telco Antennas	OPEN
10	Access/Egress	Limited Access to rescue someone from the tower during an emergency	TOWER	✓	✗	✓	2 working from heights trained people must be on site when the tower needs to be climbed	E	4	M	Telco Antennas	OPEN
11	Electricity	Potential electrocution	TOWER	✓	✓	✓	If a faulty or exposed wire/connection is discovered work on the tower is to stop and a certified electrician must repair the issue before work can commence.	E	5	M	Telco Antennas	OPEN



Client / Project Telco Antennas / 24m Steel Tower at Bowen Orbital Spaceport				Job No. 22-055	
Section Structural Computation Report				Sheet No./Rev. 11 / 1	
Calc. by MF	Date 04/07/22	Chk'd by LS	Date 04/07/22	App'd by LS	Date 04/07/22

7 Structural Analysis & Results

Below are the analysis and capacity results from the structural modelling for the 24m high, 1m face steel tower:

- The tower was analysed with the calculated ultimate and serviceability design loads
- Antenna loads were applied as a concentrated load at the specified AGL and bearing orientation as noted in section 4.2.

1m Face Lattice Tower – 24m high	
Wind region	C
Material	Steel
Tower leg	
- module A	89 x 6 SHS (G350)
- module B, C and D	89 x 3.5 SHS (G350)
Tower web	42.4 x 3.2 CHS (G250)
leg centre to centre	1000 mm
max tower design height	24 m
No. of modules	4 x 6.0m
Leg max design stress (Mpa)	171.27
Grade 350 steel stress capacity (Mpa)	350
Web max design stress (Mpa)	94.52
Grade 250 steel stress capacity (Mpa)	250

It can be seen from the table above that the stress capacity of the tower framing members are greater than the maximum design stress. Therefore, the steel tower is deemed structurally adequate.

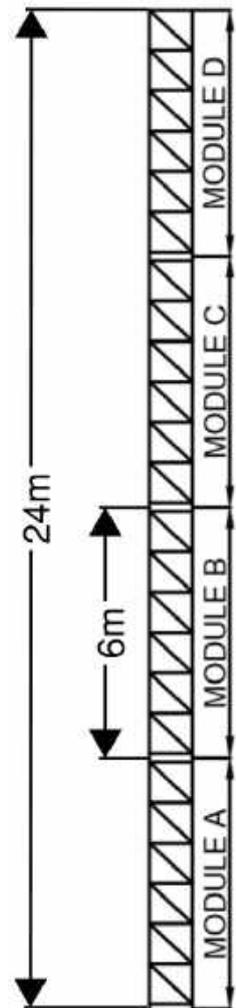


Figure 4 – Tower Layout



Client / Project Telco Antennas / 24m Steel Tower at Bowen Orbital Spaceport				Job No. 22-055	
Section Structural Computation Report				Sheet No./Rev. 12 / 1	
Calc. by MF	Date 04/07/22	Chk'd by LS	Date 04/07/22	App'd by LS	Date 04/07/22

7.1 Lateral Displacement

Tower lateral displacement at the top of the tower is tabled below

24m Tower at Bowen Orbital Spaceport	Lateral shift	Rotation
Lateral displacement at top of tower based on 27m/s wind	42.5mm	1.1°

Notes:

- Deflections for communication serviceability taken as 27m/s as per AS3995 appendix E1
- Actual deflections are subject to the antenna size, shape, orientation and placement on the tower.

7.2 Tower Base Reactions

From the structural analysis model, the table below provides the base reaction forces per leg to be supported by the footing system.

1m Face Lattice Tower – 24m high – Design Actions				
Location	Uplift	Shear	Bearing	Bending
Max tower base reaction ULS (kN)	498.28	14.97	509.76	-

7.3 Geotechnical Parameters

Geotechnical data of soil properties and conditions were obtained in the Site Classification & Geotechnical Recommendations report from CQ Soil Testing number CQ20875, dated 06/04/22. The results are shown below.

Soil Description & Assumed Design Parameters	
Soil type / description	silty clay / very stiff
Friction angle Φ	19°
Undrained shear strength C_u (kPa)	350 kPa(ULS)
Static Stress-Strain E_s (MPa)	8-30

7.4 Footing Design

See the below capacity summary of the concrete footing.

Concrete footing Design Actions	Design Load	Design Capacity	Capacity Utilisation
Bearing	50.9 kPa	150 kPa	33.9 %
Sliding	51.42 kN	263.01 kN	19.6 %
Bending Moment	213.5 kN-m	481.4 kN-m	44.3 %
Shear	304.4 kN	522.6 kN	58.3 %
Punching Shear	509.76 kN	3078.6 kN	16.6 %
Minimum Steel	5313mm ²	6232mm ²	85.3%

As seen in the above table, the footing resistance against the design actions is satisfactory and therefore can be concluded that the footing system will be adequate for the conditions at Bowen Orbital Spaceport.



Office of the
Coordinator-General

Our ref: DGBN22/126

Your ref: M1775

21 June 2022



Ms Sarah Jones
Senior Town Planner
Milford Planning
sjones@milfordplanning.com.au

Dear Ms Jones

AP2021/007 – SDA application for a material change of use for a high impact industry (launch facility) in the Abbot Point State Development Area (SDA)

Reference is made to your SDA application for a material change of use for a high impact industry (launch facility) in the Abbot Point SDA, lodged with the Coordinator-General and deemed properly made on 11 October 2021.

In accordance with section 84E of the *State Development and Public Works Organisation Act 1971*, the Coordinator-General has approved your SDA application with conditions.

Please find enclosed the SDA approval for your reference.

If you require any further information, please contact Bec Taylor, Principal Project Officer, Planning and Services, Office of the Coordinator-General, on (07) 3452 7654 or by email at Bec.Taylor@coordinatorgeneral.qld.gov.au, who will be pleased to assist.

Yours sincerely

David Stolz
Assistant Coordinator-General
Planning and Services
(as delegate of the Coordinator-General)

Enc

1 William Street
Brisbane Queensland 4000
PO Box 15517
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Telephone 13 QGOV (13 74 68)
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ABN 29 230 178 530

Decision notice

Application details:

Application type	SDA application for a material change of use for a high impact industry (launch facility)
Reference #	AP2021/007
Proponent	Milford Planning Pty Ltd
Land subject of the SDA application	Lots 8, 9 and 10 on SP295408
State development area	Abbot Point State Development Area
Decision date	21 June 2022
Currency period	Refer to condition 3

Decision details:

In accordance with section 84E of the *State Development and Public Works Organisation Act 1971*, the Coordinator-General has decided to **approve with conditions** the above SDA application for a material change of use for a high impact industry (launch facility).

The following operational work is authorised by this SDA approval as SDA self-assessable development, see conditions 41 – 43:

- Excavation or filling that materially affects premises or their use
- Undertaking work, in, on, over or under premises that materially affects premises or their use
- Performing work in a wetland protection area.



David Stolz
Assistant Coordinator-General
Planning and Services
(as delegate of the Coordinator-General)

SDA approval – conditions

Material change of use

Condition 1 – approved plans and documents		Timing
1.1	Carry out the approved development generally in accordance with the approved plans and documents as referenced in Table 1 (including any amendments marked in red), except insofar as modified by any of the conditions of this approval.	<i>To be maintained at all times.</i>

Table 1 – approved plans and documents

Title	Prepared By	Plan reference / Document ID	Issue / Rev	Date Approved
Bowen Orbital Space Port Access Road Layout Plan Launch Facility	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-006-01	E	09/02/2022
Bowen Orbital Spaceport Site Layout	Gilmour Space	BOS-PADS-LAY, Sheet 1 of 3	1	08/03/2022
	Gilmour Space	BOS-PADS-LAY, Sheet 2 of 3	1	08/03/2022
	Gilmour Space	BOS-PADS-VAB, Sheet 3 of 3	1	08/03/2022
Bowen Orbital Space Port Access Road Locality Plan and Drawing Index, as amended in red by the Department of Environment and Science	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-001-01	E	09/02/2022
Bowen Orbital Space Port Access Road Sediment and Erosion Control Typical Details	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-002-01	D	08/02/2022
Bowen Orbital Space Port Access Road Typical Notes and Details – Sheet 1 of 3	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-003-01	D	08/02/2022
Bowen Orbital Space Port Access Road Typical Notes and Details – Sheet 3 of 3	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-003-02	D	08/02/2022
Bowen Orbital Space Port Access Road Typical Notes and Details – Sheet 1 of 3	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-003-03	D	08/02/2022
Bowen Orbital Space Port Access Road Layout and Long section – Sheet 1 of 4	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-005-01	D	08/02/2022
Bowen Orbital Space Port Access Road	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-005-02	D	08/02/2022

Title	Prepared By	Plan reference / Document ID	Issue / Rev	Date Approved
Layout and Long section – Sheet 2 of 4				
Bowen Orbital Space Port Access Road Layout and Long section – Sheet 3 of 4	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-005-03	D	08/02/2022
Bowen Orbital Space Port Access Road Layout and Long section – Sheet 4 of 4	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-005-04	D	08/02/2022
Bowen Orbital Space Port Access Road Floodway Layout Plan	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-007-01	D	08/02/2022
Bowen Orbital Space Port Access Road Floodway Details Plan	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-007-02	D	08/02/2022
Bowen Orbital Space Port Access Road Cross Sections – Sheet 1 of 3	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-008-01	D	08/02/2022
Bowen Orbital Space Port Access Road Cross Sections – Sheet 2 of 3	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-008-02	D	08/02/2022
Bowen Orbital Space Port Access Road Cross Sections – Sheet 3 of 3	i ³ Consulting Pty Ltd	GSLF-I3C-CV-DWG-008-03	D	08/02/2022
Bowen Orbital Spaceport Water Deluge System Proposed Pad Layout	Gilmour Space	BOS-PADS-LAY	A	18/01/2022

Condition 2 – land tenure		Timing
2.1	Obtain appropriate tenure for the land the subject of the application as shown on the plans referenced in condition 1.	<i>Prior to commencement of site works.</i>

Condition 3 – limit of development approval		Timing
3.1	The approved use must cease to be carried out ten (10) years from the date of obtaining the Commonwealth Minister’s approval, in accordance with the <i>Space (Launches and Returns) Act 2018</i> , for a launch facility licence to operate a launch facility on the land, the subject of this approval.	<i>As indicated</i>

Condition 4 – limit of use		Timing
4.1	Only the three-stage ERIS small class orbital launch vehicle that comprises:	<i>At all times.</i>

	(a) a hybrid propulsion system for the first and second stages fuelled by a stabilised high concentration hydrogen peroxide in combination with an inert polymer solid fuel grain, and a (b) third stage that is fuelled by a traditional liquid oxygen and kerosene propulsion system, forms part of the approval.	
4.2	The maximum number of launch events in any calendar year shall not exceed twelve.	<i>At all times.</i>
4.3	The development is not approved for a 'return' activity as defined by the <i>Space (Launches and Returns) Act 2018</i> (Cth).	<i>At all times.</i>
4.4	Provide a copy of landowner's consent obtained to authorise the implementation and enforcement of an exclusion zone, required to satisfy the public safety provisions under the Flight Safety Code 2019, ten (10) business days prior to each launch event.	<i>As indicated.</i>
4.5	Provide a copy of each launch permit to the Coordinator-General, 10 business days before a launch event.	<i>As indicated.</i>
4.6	The construction and operation of the Launch Control Centre does not form part of this development approval.	<i>At all times.</i>

Condition 5 – launch scheduling		Timing
5.1	The operator of the development must consult with North Queensland Bulk Ports Corporation Pty Ltd regarding launch schedules and coordinate, as far as practicable, with port infrastructure operators.	<i>Forward schedule to be provided 12 months prior to launch dates, unless otherwise agreed to in writing by North Queensland Bulk Ports Corporation Pty Ltd .</i>
5.2	The operator of the development is required to work with the Aurizon Network to coordinate with its Critical Asset Availability Calendar, and Train Plans for the period relevant to each proposed launch date.	<i>Prior to finalisation of forward schedule identified in Condition 5.1.</i>

Condition 6 – dilapidation surveys		Timing
6.1	Prior to and following each permitted launch, RPEQ certified dilapidation survey is to be conducted of: (a) Abbot Point Road to be conducted from Nulla Bridge (north) to NQBP Security Gate (south), and (b) rail transport infrastructure and other rail infrastructure, as agreed to by the railway manager.	<i>As indicated.</i>
6.2	Should the comparison of the pre- and post-launch surveys identify that rectification works, if attributable to launch operations, are required to that part of Abbot Point Road identified under condition 6.1 or to rail transport infrastructure and other rail infrastructure: (a) the operator is required to undertake all necessary rectification works at the operator's expense, to ensure the road and/or rail transport infrastructure or other rail	<i>(a) Prior to the next permitted launch.</i>

	infrastructure is reinstated post-launch to its pre-launch condition or better, to the satisfaction of NQBP, railway manager and (b) provide RPEQ certification to the Coordinator-General, North Queensland Bulk Ports for Abbot Point Road via approvals@nqbp.com.au , or the railway manager for rail transport infrastructure or other rail infrastructure confirming that the rectification works have been designed and constructed in accordance with part (a) of this condition.	(b) <i>Within two (2) weeks of completion of all rectification works.</i>
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Condition 7 – Abbot Point Road – access		Timing
7.1	The operator of the development is required to provide a plan, that covers the 12-week period prior to each launch. The plan must ensure access along Abbot Point road is not adversely impacted during that period, and that the safe and efficient operation of the Port of Abbot Point is maintained. The plan is required to be developed in consultation with NQBP and provided for review via Approvals@nqbp.com.au .	<i>12 weeks prior to each launch.</i>
7.2	The operator of the development must ensure that access for emergency service vehicles, along Abbot Point Road, is maintained, including during the periods of implementation of exclusion zones.	<i>At all times.</i>

Condition 8 – notification		Timing
8.1	Notify the Coordinator-General, in writing, of the date of commencement of construction.	<i>Within 10 business days after commencement of construction.</i>
8.2	Notify the Coordinator-General, in writing, of the date of commencement of use.	<i>Within 10 business days after the commencement of use.</i>
8.3	Notify the Coordinator-General, in writing, of the date of date of the inaugural launch.	<i>Within 10 business days prior to launch.</i>
8.4	Notify the Coordinator-General and Whitsunday Regional Council, in writing, of each permitted launch.	<i>A minimum of 10 business days prior to the permitted launch.</i>
8.5	Notify the Coordinator-General, in writing, of the transfer of the launch facility licence.	<i>Within 5 business days of the Minister transferring the launch facility licence.</i>

Condition 9 – auditing		Timing
9.1	Prepare and submit an audit report to the Coordinator-General. The audit report must be prepared by an independent suitably qualified	<i>As indicated.</i>

	<p>person to determine whether the conditions of this approval have been complied with.</p> <p>Audit reports are required for both temporary and permanent infrastructure within 30 business days of the following:</p> <ul style="list-style-type: none"> (a) commencement of site works (b) commencement of the use (c) every three months from the commencement of use (d) rehabilitation. <p>An audit report will contain detail consistent with the information provided in Enclosure 1.</p>	
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Condition 10 – inspection		Timing
10.1	Permit the Coordinator-General, or any person authorised by the Coordinator-General, to inspect any aspect of the development.	<i>At all times.</i>
10.2	<p>Ensure records and documents required to be kept by a condition of this approval or as described in the Environmental Management Plan:</p> <ul style="list-style-type: none"> (a) are kept at the premises for a period of not less than 5 years, (b) can be made available for inspection by the Coordinator-General or a delegate of the Coordinator-General. <p><i>Note: Where practicable, at least forty-eight (48) hours' notice will be provided.</i></p>	<i>At all times.</i>

Condition 11 – detailed plans		Timing
11.1	<p>Submit to the Coordinator-General and Whitsunday Regional Council the detailed design plans certified by a Registered Professional Engineer of Queensland (RPEQ) that identify the following:</p> <ul style="list-style-type: none"> (a) the final location of all structures, pads, tank farms, hardstand and laydown areas as well as the on-site utilities of the development (b) the final location of drainage structures and waterway crossing(s) (c) the final location of access road, internal circulation and manoeuvring area and any maintenance tracks. 	<i>Prior to the commencement of construction.</i>
11.2	<p>Submit to the Coordinator-General and Whitsunday Regional Council final layout plans and building plans (to scale and dimensioned) for the development, including at a minimum:</p> <ul style="list-style-type: none"> (a) cross sections and elevations (b) setback distances (c) building heights (d) pavement treatment. 	<i>Prior to the commencement of construction.</i>

Condition 12 – environmental management plan		Timing
12.1	Prepare and submit to the Coordinator-General and Whitsunday Regional Council, a detailed project specific Environmental Management Plan (EMP) addressing both the construction and operational phases of the project.	<i>Prior to the commencement of construction.</i>

	<p>The EMP must be certified by an independent suitably qualified third-party confirming the adequacy of the EMP in accordance with current best practice. The EMP must include the following matters:</p> <ul style="list-style-type: none"> (a) air quality and dust management (refer to enclosure 2) (b) flora and fauna management (refer to enclosure 3) (c) soils, erosion and sediment control (refer to enclosure 4) (d) general and hazardous waste management (refer to enclosure 5) (e) surface water and groundwater management (f) stormwater management (refer to enclosure 6) (g) lighting management (refer to condition 30) (h) traffic management (refer to enclosure 7) (i) noise and vibration management (refer to enclosure 8) (j) cultural heritage management (k) safety and emergency management (refer to enclosure 9) (l) bushfire hazard assessment and management (refer to enclosure 10) (m) acid sulfate soils management (refer to condition 13 and enclosure 11) (n) site-based land management (refer to enclosure 12) (o) risk management (refer to condition 33) (p) decommissioning and rehabilitation management (refer to enclosure 13) (q) operational management strategy to limit the impacts on the outstanding values of the Great Barrier Reef Marine Park (r) a monitoring program to identify issues of non-compliance, actions for correcting any non-compliance and who is responsible for undertaking those actions (s) a timetable and process for review of the EMP to assess its effectiveness and to implement amendments as required. <p>The EMP(s), for the construction and operational phases, are to account for any impacts outside the Abbot Point State Development Area and the EMPs are to contain detail consistent with the information provided in enclosures 2 – 13.</p>	
12.2	Implement and undertake the development in accordance with the certified EMP(s) submitted under condition 12.1	<i>At all times.</i>
12.3	The EMP(s) must be current and available on-site, with staff being made aware of the location of the EMP and being appropriately informed of their relevant obligations under the EMP.	<i>At all times.</i>
12.4	If any part of the EMP(s) is inconsistent with the conditions of this approval, the conditions prevail.	<i>At all times.</i>

Condition 13 – acid sulfate soils		Timing
13.1	Acid sulfate soil sampling and testing should be undertaken prior to earthworks to determine the presence of acid sulfate soils.	<i>At all times</i>
13.2	In the event that the works cause disturbance or oxidisation of acid sulfate soil, the affected soil must be treated and thereafter managed (until the affected soil has been neutralised or contained) in accordance with the current Queensland Acid Sulfate Soil Technical Manual: Soil management guidelines, prepared by the Department of Science, Information Technology, Innovation and the Arts, 2014.	<i>Upon disturbance or oxidisation until the affected soil has been neutralised or contained.</i>

13.3	<p>Certification by an appropriately qualified person, confirming that the affected soil has been neutralised or contained, in accordance with condition 13.2 above is to be provided to palm@des.qld.gov.au or mailed to:</p> <p>Department of Environment and Science Permit and Licence Management Implementation and Support Unit GPO Box 2454 Brisbane Qld 4001</p> <p><i>Note: Appropriately qualified person means a person or persons who has professional qualifications, training, skills and experience relevant to soil chemistry or acid sulfate soil management and can give authoritative assessment, advice and analysis in relation to acid sulfate soil management using the relevant protocols, standards, methods or literature.</i></p>	<p><i>At the time the soils have been neutralised or contained.</i></p>
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Condition 14 – earthworks and construction timing		Timing
14.1	Earthworks and construction must only occur during April to October of the dry season.	As indicated

Condition 15 – clean fill		Timing
15.1	Only clean and uncontaminated fill is to be used on site.	At all times
15.2	A record of the clean fill’s originating site, in conjunction with a record of that site’s historical activities is to be retained.	At all times.
15.3	A copy of the record required by condition 15.2 must be provided to the Coordinator-General upon request.	Within 48 hours of the request being made.

Condition 16 – services and utilities		Timing
16.1	Obtain the necessary approvals for all required services and utilities (power, potable water, sewer, gas, wastewater, communications etc) for both construction and operation.	Prior to commencement of site works.
16.2	Provide and maintain to the relevant standards all services and utilities (power, potable water, sewer, gas, wastewater, communications etc) necessary to the development.	At all times.
16.3	Submit to the Coordinator-General and Whitsunday Regional Council approval for the on-site sewerage treatment facility.	Prior to commencement of use.
16.4	<p>Prepare and submit to the Coordinator-General and Whitsunday Regional Council a construction and operational water supply strategy demonstrating how the development will be adequately serviced by a water supply.</p> <p>The water supply strategy must clearly identify any expectation of Whitsunday Regional Council to supply water.</p>	Prior to the commencement site works.
16.5	Any required provision, relocation and/or alteration to any public service, utility or facility installation must be carried out at no cost to Whitsunday Regional Council or the Coordinator-General.	Prior to the commencement of use and to be maintained.

Condition 17 – ‘As constructed’ plans		Timing
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17.1	<p>Prepare and submit to the Coordinator-General, Whitsunday Regional Council and palm@des.qld.gov.au 'As constructed' plans certified by an RPEQ or other independent suitably qualified person.</p> <p>The plans must show all relevant elements of the development, including drainage structures and the access road.</p> <p>Plans must be submitted in electronic pdf and shape files.</p>	<p><i>Within two (2) weeks of the completion of works and prior to commencement of use.</i></p>
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Condition 18 – repair of damage		Timing
18.1	Repair any damage to infrastructure, services, property, assets, utilities, fencing, roads damaged during any works carried out in association with the construction or during the operation of the development.	<i>Prior to commencement of use and ongoing.</i>
18.2	Re-instate existing signage and pavement markings that have been removed during any works carried out in association with the development.	<i>Prior to commencement of use and ongoing.</i>
18.3	Where damage occurs from either the construction or the operation of the launch facility occurs, rectification must be undertaken at the developer's own cost, and be to the satisfaction of the Office of the Coordinator-General and the relevant service provider.	<i>At all times.</i>

Condition 19 – complaints and incidents		Timing
19.1	<p>Record all complaints received relating to the development in a register that includes, as a minimum:</p> <ul style="list-style-type: none"> (a) date and time when complaint was received (b) complainant's details including name and contact information (c) reasons for the complaint (d) investigations undertaken and conclusions formed (e) actions taken to resolve this complaint, including the time taken to implement these actions include a notation in the register as to the satisfaction (or dissatisfaction) of the complainant with the outcome. 	<i>At all times.</i>
19.2	Prepare and provide a response to the complainant within 48 hours of receipt of the complaint.	<i>As indicated.</i>
19.3	Keep an up-to-date copy of the complaints register and provide it to the Coordinator-General, when requested.	<i>Within 48 hours of the request being made.</i>
19.4	Keep an up-to-date incident register at the premises, including information about any explosions, launch failures, damage to property, fires at the premises, any release, spills or leakages, and the actions taken and timeframes to undertake those actions in response to the incident and any penalties incurred as a result of the incident.	<i>At all times.</i>
19.5	Provide an up-to-date copy of the incident register if requested by the Coordinator-General.	<i>Within 48 hours of the request being made.</i>

Condition 20 – site security	Timing
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20.1	Install and maintain the operation of a security gate at the point of the new access road.	<i>Prior to commencement of use and to be maintained at all times.</i>
20.2	Install security fencing around the perimeter of the vehicle assembly building, internal road and launch pad operations area so as to prevent public access to all operational areas of the development as illustrated in the plan entitled, Bowen Orbital Spaceport Site Layout, prepared by Gilmour Space, plan reference BOS-PADS-LAY, Sheet 1 of 3, revision 1, dated 08/03/2022.	<i>Prior to commencement of use and to be maintained at all times.</i>
20.3	Install adequate signage to warn the public of operations and safety hazards.	<i>Prior to commencement of use and to be maintained at all times.</i>

Condition 21 – site management		Timing
21.1	The construction and operation of the development must not adversely impact the effective and efficient operation of the Port of Abbot Point.	<i>At all times.</i>
21.2	The construction and operation of the development must not adversely impact access to, or along Abbot Point Road except during a launch, as managed by the plan required in condition 7.1.	<i>At all times.</i>
21.3	The construction and operation of the development must not result in damage to infrastructure, services, property, assets or utilities during the construction or operation of the development.	<i>At all times.</i>
21.4	If any damage results to infrastructure, services, property, assets or utilities during the construction or operation of the development, rectification must be undertaken at no cost to, and to the satisfaction of North Queensland Bulk Ports or the relevant service provider.	<i>At all times.</i>

Condition 22 – railway level crossing safety		Timing
22.1	A Traffic Management Plan, certified by a RPEQ, must be given to the Program Delivery and Operations Unit, Mackay Whitsunday Region (Mackay.Whitsunday.IDAS@tmr.qld.gov.au) within the Department of Transport and Main Roads.	<i>Prior to the commencement of construction.</i>
22.2	The Traffic Management Plan must ensure that there is no disruption to the safety and operational integrity of railway level crossings impacted on by development generated traffic, including but not limited to railway level crossings: ID: 5159 on the North Coast Line at Abbot Point Road and ID: 843 at Abbot Point Road on the Abbot Point Branch Railway. In particular, the maximum design vehicle for the construction and operation of the development must not exceed 19m in length. The Traffic Management Plan must detail at least the communication and safety controls to be implemented to manage short stacking.	<i>Prior to the commencement of construction and ongoing.</i>
22.3	The development must be undertaken in accordance with the Traffic Management Plan.	<i>At all times.</i>

Condition 23 – railway corridor safety and integrity – Rocket Management Plan	Timing
23.1 The development must ensure that there is no disruption to the safety and operational integrity of the railway corridor from rocket launching and similar and associated activities.	<i>At all times.</i>
<p>23.2 The operator of the development must provide a Rocket Launch Management Plan to the Program Delivery and Operations Unit, Mackay Whitsunday Region within the Department of Transport and Main Roads (Mackay.Whitsunday.IDAS@tmr.qld.gov.au), which addresses potential impacts on the safety and operational integrity of the railway corridor and the management and monitoring mechanisms to mitigate these impacts. The Rocket Launch Management Plan is to address, to the satisfaction of the Department of Transport and Main Roads, the following relevant considerations:</p> <ul style="list-style-type: none"> (a) Pre and post launch dilapidation surveys of rail transport infrastructure and other rail infrastructure (b) Flight paths, trajectories, exclusion zones, launch vehicles, frequency, timing and scheduling of launches and the like (c) Details on the pre, during and post procedures for rocket launches in relation to the railway corridor (d) Railway operational requirements and scheduled railway closures (e) The requirement for the operator of the development to engage a RPEQ to establish the baseline structural and ground movement and vibration readings on the railway corridor (f) The requirement to agree with the Department of Transport and Main Roads and the railway manager as to the level of acceptable movement and trigger levels and monitoring instrumentation (g) Protocols to be complied with when the movement and trigger levels are breached, including specific actions to be undertaken and who is responsible for each, the notification process, lines of communication, and stop work procedure (h) The requirement to provide the overall monitoring results to the Department of Transport and Main Roads and the railway manager (i) A risk assessment in accordance with <i>Attachment 1: Risk Assessment Guide of the Guide for Development in a Transport Environment: Rail</i> (j) Details of the mitigation measures, management measures and protocols to minimise any identified risks to the railway corridor, including but not limited to: <ul style="list-style-type: none"> (i) minimising or controlling the outbreak of fire (ii) controlling smoke and/or gas release and dispersion (iii) limiting the possibility of the railway corridor being blast damaged (iv) providing stability or contingency measures in the proposed development and its operations (v) providing safe emergency access and egress; and (k) ensuring effective containment and clean-up of hazards and incidents. (l) Emergency protocols and notification procedures to be complied with in any emergencies such as fire, explosion, catastrophic failure and the like 	<i>Prior to the commencement of use.</i>

	(m) The requirement for the developer to rectify any damage to rail transport infrastructure, other rail infrastructure or rail corridor land caused by the operation of the development.	
23.3	The operation of the development must be carried out in accordance with the Rocket Launch Management Plan required under condition 23.2.	<i>At all times.</i>
23.4	The minimum setback of the launch pad from the railway corridor must be generally in accordance with the Bowen Orbital Space Port Access Road Locality Plan and Drawing Index, as amended in red by the Department of Environment and Science, prepared by i3 Consulting Pty Ltd, plan reference GSLF-I3C-CV-DWG-001-01, revision E, dated 09/02/2022.	<i>Prior to the commencement of use and to be maintained at all times</i>

Condition 24 – stormwater and drainage		Timing
24.1	Drainage from the development works/building shall not adversely impact upon adjacent properties. No ponding, concentration or redirection of stormwater shall occur on adjoining land.	<i>At all times.</i>
24.2	Provide the discharge of stormwater drainage flows to a legal point of discharge.	<i>At all times.</i>
24.3	Drainage works shall be designed and constructed in accordance with the Queensland Urban Drainage Manual.	<i>Prior to the commencement of construction.</i>
24.4	Stormwater and flooding management of the development must ensure no worsening or actionable nuisance to adjoining land or the Newlands System/Abbot Point Branch railway corridor.	<i>At all times.</i>
24.5	Any works on the land must not: <ul style="list-style-type: none"> (a) create any new discharge points for stormwater runoff onto the Newlands System/Abbot Point Branch railway corridor (b) interfere with and/or cause damage to the existing stormwater drainage on the Newlands System/Abbot Point Branch railway corridor (c) surcharge any existing culvert or drain on the Newlands System/Abbot Point Branch railway corridor (d) reduce the quality of stormwater discharge onto the Newlands System/Abbot Point Branch railway corridor (e) impede or otherwise interfere with hydraulic conveyance or overland flow paths on the site (f) reduce the floodplain storage capacity of the site. 	<i>At all times.</i>
24.6	Untreated stormwater from the works must be diverted or bypassed around the wetland in the Wetland Protection Area.	<i>At all times.</i>

Condition 25 – air quality		Timing
25.1	An Ambient Air Quality Monitoring (AAQM) Program must be developed and implemented to specify how the ambient dust impacts of the project will be monitored. The AAQM Program as outlined in “ <i>Table 1 – Maximum ground level concentration limit and monitoring program</i> ” below must include, but not necessarily be limited to: <ul style="list-style-type: none"> (a) locations, frequencies and methods for monitoring of potential air contaminants for determining the actual impacts 	<i>Prior to the commencement of use.</i>

	<p>from the proposed activity on the receiving environment values</p> <p>(b) provision for the use of at least three air quality samplers (CO, CO₂ and NO₂) and one meteorological station capable of monitoring wind speed and direction, humidity, temperature and precipitation</p> <p>(c) air quality sampling must be conducted in accordance with the Queensland Air Quality Sampling Manual and applicable Australian Standards and</p> <p>(d) should an alternative sampling method be required; the proponent must seek approval from administering authority to exclude this requirement. In seeking such exclusion, the reasons for the exclusion shall be provided and be justified.</p> <p>Table 1: Maximum ground level concentration limit and monitoring program.</p> <table border="1"> <thead> <tr> <th>Contaminant</th> <th>Limit Type</th> <th>Air Quality Limit</th> <th>Monitoring frequency²</th> </tr> </thead> <tbody> <tr> <td>Carbon monoxide (CO)</td> <td>Maximum as one hour average</td> <td>31 mg/m³</td> <td rowspan="5">At least for 24-hour period covering the rocket launching event</td> </tr> <tr> <td>Carbon monoxide (CO)</td> <td>Maximum as 8- hour average</td> <td>11 mg/m³</td> </tr> <tr> <td>Carbon Dioxide (CO₂)</td> <td>Maximum as one hour average</td> <td>60 µg/m³</td> </tr> <tr> <td>Nitrogen Dioxide</td> <td>Maximum as one hour average</td> <td>250 µg/m³</td> </tr> <tr> <td>Meteorological¹</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> </tr> </tbody> </table> <p>¹ Wind speed and direction, humidity, temperature and precipitation using AS 3580.14 - 2011: Methods for sampling and analysis of ambient air – Part 14: Meteorological monitoring for ambient air quality monitoring applications.</p> <p>² mg/m³ means milligram per cubic metre at 0 degrees Celsius and an atmospheric pressure of 1.</p>	Contaminant	Limit Type	Air Quality Limit	Monitoring frequency ²	Carbon monoxide (CO)	Maximum as one hour average	31 mg/m ³	At least for 24-hour period covering the rocket launching event	Carbon monoxide (CO)	Maximum as 8- hour average	11 mg/m ³	Carbon Dioxide (CO ₂)	Maximum as one hour average	60 µg/m ³	Nitrogen Dioxide	Maximum as one hour average	250 µg/m ³	Meteorological ¹	-	-	
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25.2	The activities at the development must not exceed the air quality limits specified in “ <i>Table 1 – Maximum ground level concentration limit and monitoring program</i> ” to condition 25.1, at or beyond the boundaries of the development.	<i>At all times.</i>																				

Condition 26 – launch facility noise limits		Timing																						
26.1	<p>The operator of the development must ensure that noise generated by launch activities does not cause the criteria in “<i>Table 1 - Noise limits for launch activities</i>”, to be exceeded at a sensitive place or commercial premises.</p> <p>Table 1 – Noise limits for launch activities</p> <table border="1"> <thead> <tr> <th colspan="2">Sensitive Place</th> </tr> </thead> <tbody> <tr> <td>Noise level dB(A) measured as:</td> <td>All Launch activities</td> </tr> <tr> <td>L_{Amax}</td> <td>96</td> </tr> <tr> <td>SEL</td> <td>110</td> </tr> <tr> <td>Day Night Average Sound Level (DNL)</td> <td>70</td> </tr> <tr> <td>Vibration</td> <td>10mm/s</td> </tr> <tr> <th colspan="2">Commercial Place</th> </tr> <tr> <td>Noise level dB(A) measured as:</td> <td>All launch activities</td> </tr> <tr> <td>L_{Amax}</td> <td>115</td> </tr> <tr> <td>SEL</td> <td>115</td> </tr> <tr> <td>Day Night Average Sound Level (DNL)</td> <td>80</td> </tr> </tbody> </table>	Sensitive Place		Noise level dB(A) measured as:	All Launch activities	L _{Amax}	96	SEL	110	Day Night Average Sound Level (DNL)	70	Vibration	10mm/s	Commercial Place		Noise level dB(A) measured as:	All launch activities	L _{Amax}	115	SEL	115	Day Night Average Sound Level (DNL)	80	<i>For all launch activities.</i>
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	Vibration	15mm/s
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Condition 27 – matters of state environmental significance - waterways providing for fish passage		Timing
27.1	Development authorised under this approval is limited as follows: (a) the operational works to raise or construct a waterway barrier works that is a culvert crossing within un-named waterway, and marked on plans as causeway 1 and shown in Bowen Orbital Space Port – Access Road – Floodway Layout Plan, prepared by i3 consulting, plan reference GSLF-13C-CV-DWG-007-001, revision D, dated 08/02/2022, and (b) Bowen Orbital Space Port – Access Road – Floodway Details Plan, prepared by i3 consulting, plan reference GSLF-13C-CV-DWG-007-002, revision D, dated 08/02/2022.	<i>At all times.</i>
27.2	The maintenance of the culvert crossing must be undertaken generally in accordance with Chapter 7 - Maintenance Schedule of Bowen Orbital Spaceport (BOS) Development Erosion and Sediment Control Management Plan prepared by FYFE reference 43076-1-ENV-REP_1, revision 1, dated 24/08/2021.	<i>At all times.</i>
27.3	Provide written notice to notifications@daf.qld.gov.au, when the development authorised under this approval: (a) will start, and (b) when it has been completed. These notices must state this permit number AP2021/007.	<i>Within 15 business days of the completion of the fisheries development works and prior to the commencement use.</i>
27.4	This fisheries development (as defined by the <i>Fisheries Act 1994</i>) constitutes a place that is required to be open for inspection by an inspector at all times, pursuant to section 145 of the <i>Fisheries Act 1994</i> .	<i>At all times.</i>
27.5	In-stream works are to be completed as quickly as possible, but must be avoided during times of elevated flows, namely - 63% AEP or greater flows.	<i>As indicated.</i>
27.6	Spoil is not disposed of on tidal lands or within waterways and spoil must be managed to prevent acid soil development.	<i>At all times.</i>
27.7	Land profiles that are temporarily disturbed by the development works (other than those within the permanent development footprint, as shown on Bowen Orbital Space Port – Access Road – Floodway Layout Plan, prepared by i3 consulting, dated 08/02/2022, plan reference GSLF-13C-CV-DWG-007-001 and revision D), must be promptly restored to pre-work profiles as shown on the same plan.	<i>Upon completion of the works and prior to commencement of use.</i>

Condition 28 – wetland buffer		Timing
28.1	Provide a 50-metre wide buffer for the purpose of protecting the adjacent wetlands shown as the '50m buffer zone' on Locality Plan and Drawing Index as amended in red by the Department of Environment and Science, prepared by i3 Consulting Pty Ltd, plan	<i>Prior to commencement of use and to be</i>

	reference GSLF-I3C-CV-DWG-001-01, revision E, dated 09/02/2022.	<i>maintained at all times.</i>
28.2	Provide buffer elements in the location shown as the '50m buffer zone' on Locality Plan and Drawing Index as amended in red by the Department of Environment and Science, prepared by i3 Consulting Pty Ltd, plan reference GSLF-I3C-CV-DWG-001-01 revision E, dated 09/02/2022, designed to achieve the purposes set out in the Queensland Wetland Buffer Planning Guidelines 2011.	<i>Prior to commencement of use.</i>
28.3	Written evidence from a suitably qualified person that (a) and (b) have been fulfilled is to be provided palm@des.qld.gov.au or mailed to: Department of Environment and Science Permit and Licence Management GPO Box 2454 Brisbane Qld 4001 Note: <i>Suitably qualified person means a person or persons who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.</i>	<i>Prior to commencement of use.</i>

Condition 29 – environmental nuisance or harm		Timing
29.1	The construction and operation of the development must not cause environmental nuisance or harm at a nuisance sensitive place unless specifically authorised by a condition of this approval or where alternative lawful arrangements are in place. Nuisance sensitive places include, but not limited to, the: (a) Caley Valley Wetlands (b) Coral Sea Marine Park (c) Eastern Beach (d) Euri Creek residential dwellings (e) Great Barrier Reef Marine Park and World Heritage Area (f) Saltwater Creek.	<i>At all times</i>

Condition 30 – lighting		Timing
30.1	Ensure outdoor lighting installed within the development minimises light spill in the adjacent properties and sensitive places in accordance with AS4282:1997 Control of obtrusive effects of outdoor lighting. Sensitive places include, but are not limited to, the: (a) Caley Valley Wetlands (b) Eastern beach (c) Great Barrier Reef Marine Park and World Heritage Area.	<i>To be maintained</i>

Condition 31 – waste management		Timing
31.1	Reuse, recycle or lawfully dispose of all waste (other than treated wastewater released to land) generated by the development.	<i>At all times.</i>
31.2	Solid waste is to be stored on site in vermin-proof facilities until it is transferred to a licensed refuse facility.	<i>At all times.</i>
31.3	Prepare and implement a refuse management strategy which outlines the method and frequency of refuse collection for the	<i>Prior to commencement</i>

	development.	<i>of use and ongoing.</i>
31.4	All vehicles involved in the excavation and/or building or operational waste and are departing the property with waste materials, spoil or loose matter must have their loads fully covered before entering the public roadway.	<i>At all times.</i>

Condition 32 – hazardous materials / dangerous goods		Timing
32.1	All flammable and combustible liquids (including hazardous waste materials) must be contained within an on-site containment system, controlled in a manner that prevents environmental harm and must be maintained in accordance with the current edition of <i>AS1940—Storage and Handling of Flammable and Combustible Liquids</i> and in accordance with any other relevant Australian Standard.	<i>At all times.</i>
32.2	All containers must be secured to prevent movement during a flood event.	<i>At all times.</i>
32.3	All hazardous and dangerous goods must be transported, receipted, stored, used, handled and disposed of in accordance with the Hazardous and Dangerous Goods Management Plan (HDGMP).	<i>At all times.</i>
32.4	Development involving dangerous goods must not adversely impact on the safety or operation of the railway corridor.	<i>At all times.</i>

Condition 33 – chemical and fuel storage		Timing
33.1	<p>Prepare and implement a Risk Management Plan (RMP) to specify how the risk will be managed from the storage of hazardous chemicals and catastrophic failure of rocket launch. The RMP must include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> (a) identification of potential effects of accidental release of hazardous chemicals (b) identification of potential causes that will lead to the incident identified for each accident (c) documentation of appropriate steps that must be taken to prevent accidental spills as well as the control measures that can be implemented to reduce the risk to an acceptable residual risk level (d) identification of chemical spills that may occur over the marine environment and how this impact will be mitigated (e) description of emergency response procedures should an accident occur, emergency response program includes emergency health care and procedures for informing the public and response agencies (e.g., the fire department) should an accident occur, and (f) development of prevention program that must include safety precautions and maintenance, monitoring, and employee training. 	<i>Prior to the commencement of launch activities.</i>
33.2	<p>Any facilities on the site involving the storage of chemicals and/or fuel are sited and constructed to ensure contaminants do not enter surface and/or ground waters. Such facilities, including the vehicle assembly building, are to be:</p> <ul style="list-style-type: none"> (a) located above the 1% AEP flood event (b) undercover in a building or similar structure 	<i>At all times.</i>

	(c) in or on a dedicated impervious secondary containment store or device that permits full recovery of spills (d) in a manner that prevents the movement of packages/containers from their place of storage during a flood event (e) in accordance with AS1940-2004: The storage and handling of flammable and combustible liquids and/or AS1692: Steel tanks for flammable and combustible liquids.	
33.3	Chemical and fuel storage is conducted in accordance with relevant Australian legislation, standards and codes.	<i>At all times.</i>
33.4	No spent or empty or fuel storage containers are to be burned or otherwise disposed of on the site.	<i>At all times.</i>

Condition 34 – fire fighting		Timing
34.1	The development must be provided with an adequate and accessible supply of water for firefighting purposes in accordance with AS2419.1-2005.	<i>Prior to commencement of use and to be maintained at all times.</i>
34.2	Provide adequate and safe access for firefighting/other emergency vehicles and for safe evacuation.	<i>At all times.</i>

Condition 35 – land contamination		Timing
35.1	Contaminants must not: (a) be buried on site (b) be in contact with the soil at the site (c) directly or indirectly seep or penetrate into the soil or groundwater at the site.	<i>At all times.</i>
35.2	Contamination of land arising from the operation of the rail maintenance and provisioning facility shall be lawfully remediated by the operator, at the operator's cost.	<i>At all times.</i>

Condition 36 – vehicle parking and manoeuvring		Timing
36.1	A minimum of 48 car parking spaces shall be provided.	<i>At all times.</i>
36.2	All parking is to occur on site.	<i>At all times.</i>
36.3	The design, layout, signage, line marking, lighting, physical controls, internal roadways, on-site circulation and manoeuvring areas for vehicles on site shall be in accordance with AS2890.1: 2004 Parking facilities: Part 1 and AS2890.2:2002: Part 2.	<i>Prior to commencement of works and to be maintained.</i>
36.4	Provide disabled car parking in accordance with AS2890.6.	<i>Prior to commencement of the use and to be maintained.</i>
36.5	The car parking area is to be line marked.	<i>Prior to commencement of the use and to be maintained.</i>
36.6	Ensure all vehicle movements to and from the property are conducted in forward gear.	<i>At all times.</i>

36.7	Completed works are certified by an RPEQ as having been constructed in accordance with good engineering practice to the relevant standard reasonable for commercial purposes.	<i>Prior to commencement of the use.</i>
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Condition 37 – temporary uses		Timing
37.1	All temporary uses are to remain no longer than twelve months from the completion of construction, unless otherwise agreed to in writing by the Coordinator-General.	<i>As indicated</i>
37.2	Remove all temporary works once the temporary use has ceased and rehabilitate the site/s to their original condition, or as otherwise agreed to with the landowner, in accordance with the EMP outlined in condition 12.1.	<i>Within twelve months from the completion of construction.</i>

Condition 38 – rehabilitation plan		Timing
38.1	Should the use cease for a period of more than twelve months, the subject land must be decommissioned and rehabilitated in accordance with the detailed rehabilitation plan required by condition 12.1	<i>As indicated</i>
38.2	Provide a notice to the Coordinator-General stating the rehabilitation of land has been completed in accordance with the rehabilitation plan together with photographic evidence of decommissioning activities and rehabilitation outcomes.	Within six (6) months of completion of all decommissioning activities.

Condition 39 – maritime safety		Timing
39.1	The operator of the development must notify the Regional Harbour Master, (Townsville Region), Maritime Safety Queensland of the sea areas affected by the flight path and range safety exclusion zones required each launch event, that will cross over any portion of: (a) the Abbot Point Pilotage Area (b) State waters extending into the two-way route for Abbot Point (c) Australian waters comprising of a section of the Great Barrier Reef inner route extending to the edge of the Reef Vessel Traffic Services area.	<i>As indicated.</i>
39.2	The request for the Maritime Exclusion Zones, notified under condition 39.1 of this condition, must be made 60 days prior to each launch, unless otherwise agreed to in writing by the Regional Harbour Master, Marine Operations (Townsville Region).	<i>As indicated.</i>
39.3	The request for the Maritime Exclusion Zones, required under condition 39.1 of this condition, must include: (a) coordinates for items 39.1(a), 39.1(b) and 39.1(c), (b) date, time and duration of the exclusion zone(s) (c) a Marine Traffic Management Plan, prepared in consultation with maritime authorities (Maritime Safety Queensland, Australian Maritime Safety Authority, Queensland Water Police), detailing strategies and measures to be implemented to ensure, but not be limited to: (i) the hazard area is clear of marine traffic (ii) waterway users are aware of the exclusion zone (iii) exclusion zone monitoring (iv) exclusion zone compliance by mariners.	<i>At all times.</i>

	<i>Note: Depending on the area to be monitored, the operator of the development should commence monitoring maritime exclusion zones at T-4 hours or earlier, noting speed of watercrafts in the area may require considerable time to clear the hazard area.</i>	
39.4	Prepare and provide written evidence to the Regional Harbour Master (Townsville Region), Maritime Safety Queensland, Department of Transport and Main Roads, 60 Ross Street, Townsville Qld 4810 GPO Box 1921, Townsville Qld 4810, P: (07) 4421 8100, F: (07) 4721 2028, E: RHMTownsville@msq.qld.gov.au, 60 days prior to launch unless agreed to in writing by the Regional Harbour Master (Townsville Region), detailing: (a) the management measures to be implemented to ensure maritime users are notified of each launch event, and (b) the required maritime exclusion zone, to enable publishing of the same in the government gazette.	<i>As indicated.</i>
39.5	The operator of the development must notify Regional Harbour Master, (Townsville Region), of (a) any debris, obstruction or hazard to safe vessel navigation resulting from a failure of a launch - immediately; and (b) remove and dispose of the debris, obstruction or hazard of at the operator's cost within a timeframe agreed with the relevant authority. <i>Note: Relevant authorities include Maritime Safety Queensland, Australian Maritime Safety Authority, Great Barrier Reef Marine Park Authority.</i>	(a) <i>Immediately.</i> (b) <i>As agreed with the relevant authority.</i>

Condition 40 – land management plan		Timing
40.1	Landscape all disturbed areas during construction, through the planting of native trees, bushes and scrubs, to allow the root network to stabilise the underlying soils.	<i>Prior to commencement of use.</i>
40.2	Maintain landscaping and replace any failed or failing trees or shrubs.	<i>At all times.</i>
40.3	Implement the pest management plan prepared in accordance with condition 12.1 of this condition document.	<i>At all times.</i>

SDA self-assessable development authorised by this SDA approval

The following operational work is authorised by this SDA approval as SDA self-assessable development. SDA self-assessable development must comply with the conditions stipulated below and with Schedule 3 of the Abbot Point Basin SDA Development Scheme.

For operational work not authorised by this SDA approval, the proponent must obtain the relevant approvals or authorisations as per the relevant authorising process.

Operational work condition 41 – excavation or filling that materially affects premises or their use		Timing
41.1	Submit to the Coordinator-General detailed earthworks plans prepared by an RPEQ and certified by a suitably qualified independent third party, generally in accordance with AS3798 –	<i>Prior to commencement of site works.</i>

	<p>1996 Guidelines on Earthworks for Commercial and Residential Developments. The plans shall:</p> <ul style="list-style-type: none"> (a) include a geotechnical soils assessment of the site (b) include an assessment that confirms that all cut/fill batters, retaining structures and embankments associated with the development achieve a minimum long-term factor of safety (FoS) of 1.5 and a short term (during construction) FoS of 1.3, unless otherwise certified by an RPEQ (c) include details of any associated retaining structures which are to be designed in accordance with AS4678 – 2002 Earth Retaining Structures (d) be consistent with the Erosion and Sediment Control plans required by condition 12.1 and enclosure 4 of this approval. (e) where appropriate, provide full details of areas where dispersive soils will be disturbed, treatment of dispersive soils and their rehabilitation (f) provide full details of any areas where surplus soils are to be stockpiled (g) include an appropriate monitoring program for the period the site works are being undertaken, identify actions for correcting any failings in management and who is responsible for undertaking those actions. 	
41.2	Carry out the earthworks generally in accordance with the certified plans required under condition 41.1.	<i>Prior to the commencement of use.</i>
41.3	Submit to the Coordinator-General certification by an RPEQ that all earthworks have been carried out generally in accordance with the certified plans required under condition 41.1 and any unsuitable material encountered has been treated or replaced with suitable material.	<i>Prior to the commencement of use.</i>

Operational work condition 42 – undertaking work, in, on, over or under premises that materially affects premises or their use		Timing
42.1	Limit works to the area(s) shown on the plans specified in Table 1 to condition 1 of this approval.	<i>At all times</i>

Operational work condition 43 – performing work in wetland protection area		Timing
43.1	Limit all works performed in a wetland area to the location shown on plan titled Bowen Orbital Space Port Access Road Locality Plan and Drawing Index, as amended in red by the Department of Environment and Science, prepared by i3 Consulting Pty Ltd, plan reference GSLF-I3C-CV-DWG-001-01, revision E, dated 09/02/2022 and detailed in Table 1 to condition 1 of this approval.	<i>At all times</i>
43.2	<p>Prepare and implement a wetland protection management plan (by a suitably qualified person in accordance with current best practise) that:</p> <ul style="list-style-type: none"> (a) is consistent with the plan showing the proposed work in the wetland protection area (b) identifies all impacts associated with the identified operations 	<i>Prior to commencement of site works.</i>

	(c) contains management actions that address the impacts associated with performing work in a wetland protection area in accordance with current best practices, and (d) contains an appropriate monitoring program, identifies actions for correcting any failings in management and who is responsible for undertaking those actions.	
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Advice

Currency period

This SDA approval is valid until the end of the currency period, four years after the date of approval, unless the approval states a different period. For the SDA approval to remain valid the proponent must have, before the end of the currency period:

- substantially started the development; or
- made an application to the Coordinator-General to extend the currency period.

Other approvals

This approval relates solely to the material change of use for a high impact industry (launch facility) in the Abbot Point State Development Area. All other approvals and/or permits required under local, state and/or commonwealth legislation must be obtained prior to the commencement of the use.

If a development does not comply with the conditions of this material change of use approval, a new SDA application may be required to be lodged with the Coordinator-General in accordance with the Abbot SDA Development Scheme.

Department of Agriculture and Fisheries

If an exclusion area for the launch period or longer is required, this may affect commercial fishing operations in the vicinity. For guidance on identifying potential impacts to commercial fishing operations, contact the fisheries managers (fisheriesmanagers@daf.qld.gov.au) with details of any proposed marine exclusions and the timing and geographic areas of exclusion. Advice should also be sought on how to negotiate a suitable fisheries adjustment package with the impacted commercial fishers where applicable.

Department of Transport and Main Roads

Works on a railway

Pursuant to section 255 of the *Transport Infrastructure Act 1994*, the railway manager's written approval is required to carry out works in or on a railway corridor or otherwise interfere with the railway or its operations.

Prior to the commencement of works, the applicant should contact the railway manager (Aurizon) regarding the following:

- (a) the requirement for relevant approvals/agreements from Aurizon such as a licence to enter or wayleave agreement, to address any procedures required pre, post and during the rocket launching. Please refer to the following weblink for more information:

<https://www.aurizon.com.au/what-we-deliver/network/accessing-the-rail-corridor>

- (b) the conditioned requirement for a Traffic Management Plan and to notify of changes to vehicular traffic over railway level crossings: ID: 5159 on the North Coast Line at Abbot Point Road and ID: 843 at Abbot Point Road on the Abbot Point Branch Railway.

This development approval does not constitute an approval under section 255 of the *Transport Infrastructure Act 1994* and that such approvals need to be separately obtained from the relevant railway manager.

The applicant should contact the Aurizon at CorridorEnquiries@aurizon.com.au in relation to this matter.

Emergencies

The facility operator should establish emergency procedures with the railway manager (Aurizon) and include them within the required contacts for landowners' consent for Lot 1 on RP748626 and in the Rocket Launch Management Plan.

Early notification of any situation will be required so that operations can be managed. The Emergency Response Plan (ERP) for the facility should include protocols for contacting Train Control so that appropriate emergency actions can be put in place. Aurizon should be contacted immediately via the metropolitan control centre for Queensland Rail on telephone number 1800 079 303 in relation to any dangerous goods or rocket launch events impacting on the railway corridor.

Cultural heritage – duty of care

Where items of archaeological importance are identified during construction of the project, the proponent must comply with its duty of care under the *Aboriginal Cultural Heritage Act 2003* and the Department of Environment and Heritage Protection 2014 guideline: archaeological investigations. All work must cease, and the relevant State agency must be notified. Work can resume only after State agency clearance is obtained.

Office of Industrial Relations | Major Hazardous Facilities Unit (OIR|MHFU)

This high impact industry (launch facility) development, commonly referred to as the Bowen Orbital Spaceport, is now required to notify hazardous chemicals as per:

<https://www.worksafe.qld.gov.au/safety-and-prevention/incidents-and-notifications/hazardous-chemical-notifications>.

Queensland Fire and Emergency Services

The contact for consultation on both the Bushfire Management Plan (with Rural Fire Service) and the Safety and Management Plan (Fire and Rescue Service) for this development is:

Office of The Assistant Commissioner, Northern Region (NR)
Queensland Fire and Emergency Service
PO Box 5845, Townsville, Qld, 4810 E: NR.AC@qfes.qld.gov.au

Resources Health and Safety Queensland (RSHQ)

Any future development involving materials and processes administered by the *Explosives Act 1999* and Explosives Regulation 2017 are notified to the Explosives Inspectorate for consideration, comment and review. This includes the use of solid rocket motors, black powder or other authorised primary and initiating explosives.

Enclosure 1 – audit report

To demonstrate compliance with **condition 9** of this development approval, the following information will be required in an audit report:

- (a) details of the development approval, including the SDA approval number, the date of approval and a summary of the audit reporting requirements. This should include a schedule of the dates by which audit reporting is to be provided to the Coordinator-General.
- (b) details of the independent, suitably qualified person(s) (see Schedule 1 in the Abbot Point SDA Development Scheme) (the auditor) responsible for preparing the audit report, including the auditor(s):
 - (i) name, position, company and contact details
 - (ii) qualifications and experience
 - (iii) proof that the auditor is an independent third party unaffiliated with the proponent.
- (c) details of any external suitably qualified person(s) used to supplement reports/plans outside of the auditor's expertise.
- (d) an audit evaluation matrix including but not limited to:
 - (i) each condition of the SDA approval, and the status of the condition at the end of the relevant audit period
 - (ii) where a condition is current or complete, (to be activated, activated, complete), whether compliance has been achieved (compliant, non-compliant or not applicable), how compliance has been achieved (description of works, tasks or actions undertaken) and how the evaluation of the audit has been undertaken
 - (iii) a full description of the relevant standards, practices etc. against which works have been assessed together with evidence (reports, site photographs, certification documentation) to support the evaluation of the works against the compliance standards
 - (iv) the title, date, location and holder of any documentation referred to in the compliance evaluation matrix but not provided with the audit to allow the Coordinator-General to call upon these documents as required
 - (v) details of any non-compliances identified by any party during the current audit period and a methodology specifying how compliance has been/will be achieved and by when it will be achieved, and
 - (vi) details of previous audit reports (if relevant) with an update on any non-compliance, corrective actions and revised practices (as relevant) undertaken and the current status of any corrective actions.
- (e) additional evidence to support the compliance evaluation, including the date and locations of any site inspection/s conducted during the preparation of the audit report and details of any employees of the proponent interviewed for the audit.
- (f) the auditor's declaration whereby the auditor:
 - (i) certifies the conditions contained in the SDA approval have been satisfactorily complied with, subject to any qualifications which the author has outlined in the audit report
 - (ii) certifies that to the best of the auditor's knowledge, all information provided in the audit report is true, correct and complete, and
 - (iii) acknowledges it is an offence under section 157O of the *State Development and Public Works Organisation Act 1971*, to give the Coordinator-General a document containing information the auditor knows is false or misleading in any material particular.
- (g) any further attachments the auditor considers relevant to the audit report.

An audit report guideline has been prepared to provide guidance to proponents and auditors in compiling audit reports. The guideline is available on the Department of State Development, Manufacturing, Infrastructure and Planning website at:

<https://www.statedevelopment.qld.gov.au/coordinator-general/state-development-areas/development-schemes-applications-and-requests> or by contacting the SDA Division on 1800 001 048 or via sdainfo@coordinatorgeneral.qld.gov.au.

Enclosure 2 – air quality and dust management plan

To demonstrate compliance with **condition 12.1** and **condition 25** of this development approval, prepare a site-based air quality and dust management plan (by a suitably qualified person) that addresses, but is not necessarily limited to, the following matters:

- (a) An ‘*Ambient Air Quality Monitoring Program*’
- (b) mitigation and measures proposed to prevent spray drift, odour, noise, dust, smoke, or ash emission on nuisance sensitive places
- (c) mitigation and measures proposed to ensure dust deposition attributable to project activities, when measured at a nuisance sensitive place must not exceed 120 milligrams per square metre per day, averaged over 1 month
- (d) mitigation and measures proposed to ensure other indicators that a measured at any nuisance sensitive place must not exceed the air quality objectives specified in Schedule 1 of the *Environmental Protection (Air) Policy 2019*
- (e) site clearance and soil stockpiles must be maintained using all reasonable and practicable measures using water sprays or alternative dust suppression and/or mitigation measures
- (f) ensure all access roadways, material storage areas and vehicle entry points have appropriate dust mitigation
- (g) restrict vehicle movements to specifically defined areas and adhere to onsite speed limits
- (h) ambient dust monitoring program that includes parameters such as dust deposition (insoluble matter) and suspended particulate concentrations of PM10 and PM2.5.
- (i) undertake visual monitoring for fugitive dust during construction and implement appropriate controls to contain fugitive dust
- (j) ensure that all plant and equipment are maintained and operated in accordance with Australian Design Rules and manufacturers specifications.

Enclosure 3 - flora and fauna management plan

To demonstrate compliance with **condition 12.1** of this development approval, prepare a site-based flora and fauna management plan (by a suitably qualified person) that addresses, at a minimum, the following matters:

- (a) the location, extent, condition and significance of native terrestrial and marine fauna populations, including individual endangered, threatened (or near threatened) and vulnerable species and communities in the surrounding area, including on land, wetlands (Caley Valley Wetland), waterways and the marine environment
- (b) inclusion of a monitoring and recording program for populations of endangered, threatened (or near threatened) and vulnerable species of state significance, inclusive of a count of the relevant species, prior to the commencement of the use (a launch event) and monitored on regular annual intervals, during both dry and wet seasons, for the duration of the approval period
- (c) detail the ability of populations or individuals to recover
- (d) the mitigation and management measures required to protect threatened species, including among other things:
 - (i) actions and procedures to be followed during the pre-construction, construction, operational and (if appropriate) rehabilitation phases of the project
 - (ii) a program of monitoring, reporting and review to facilitate adaptive management of the actions and measures, should it be required
 - (iii) the developments compliance with all relevant provisions of the *Nature Conservation Act 1992 (Qld)*.
- (e) provision for the relocation of fauna prior to each launch event
- (f) measures to prevent bird strike
- (g) measures to prevent fauna being harmed from noise and heat exposure must be implemented during operational activities and immediately before a launch event
- (h) monitoring and management of flora and fauna pest species, including prevention of pest animals accessing putrescible waste at facilities.

Enclosure 4 – soils, erosion and sediment control plan

To demonstrate compliance with **condition 12.1** of this development approval, prepare and implement a site-specific soils, erosion and sediment control plan (by a suitably qualified person) in accordance with Best Practice Erosion and Sediment Control (BPESC) guidelines for Australia (International Erosion Control Association) that addresses the following:

- (a) erosion and sediment control plans (minimum A3 size to scale) for the use, with the following attributes:
 - (i) property boundaries
 - (ii) general soil types on block
 - (iii) contours – existing and final
 - (iv) location of existing improvements and final building and infrastructure
 - (v) location of stormwater discharge points
 - (vi) location of all final impervious areas
 - (vii) location and description of existing vegetation
 - (viii) location of all drainage lines, creeks, wetlands, tidal waters and other water bodies potentially affected by the development
 - (ix) catchment area boundaries
 - (x) limits of clearing
 - (xi) location of vegetation buffer strip
 - (xii) location of entry/exit
 - (xiii) location of stockpile areas
 - (xiv) location of roads, stormwater drainage areas, underground services
 - (xv) location of temporary drainage control measures
 - (xvi) location of proposed sediment control measures
 - (xvii) permanent site stabilisation measures.
- (b) an erosion and sediment control plan report that addresses the following information:
 - (i) description of development and staging
 - (ii) description of adjoining land
 - (iii) description of soil materials to be exposed or disturbed
 - (iv) description and location of existing vegetation
 - (v) location and assessment of any critical areas
 - (vi) measures to prevent the release of sediment to all drainage lines, creeks, wetlands, tidal waters and other water bodies potentially affected by the development
 - (vii) confirmation of sodic (clay) soils capture and containment. It is noted that stormwater containing sodic sediment can have detrimental impact upon adjacent wetland areas.
- (c) an erosion prevention and sediment control strategy that addresses the following information:
 - (i) details of timing of erosion works and project staging
 - (ii) site access controls and treatment
 - (iii) diversion of runoff around work sites
 - (iv) location and design of temporary and permanent erosion and sediment control structures. This should include calculations to support the sizing of sediment detention basins, catch drains and catch dams etc.
 - (v) descriptions of onsite dust control measures
 - (vi) proposed vegetated buffer strips
 - (vii) revegetation program including stream bank rehabilitation near permanent roads and temporary crossings
 - (viii) final landscaping proposals
 - (ix) maintenance program
 - (x) monitoring program
 - (xi) corrective action strategies and procedures and who is responsible.
- (d) a risk assessment analysis of conducting earthworks during the wet season (unless written confirmation that no earthworks will take place within the wet season)
- (e) prepare an acid sulphate soils management plan for any earthworks in areas below 5m AHD or areas of probable acid sulphate soils.

Enclosure 5 – general and hazardous waste management plan

To demonstrate compliance with **condition 12.1** of this development approval, prepare a general and hazardous waste management plan (by a suitably qualified person) based on the following criteria:

- (a) reuse, recycle or lawfully dispose of all waste (other than treated wastewater released to land) generated by the development
- (b) prepare a refuse management strategy which outlines the method and frequency of refuse collection
- (c) hazardous materials (including hazardous waste materials) must be contained within an onsite containment system and controlled in a manner that prevents environmental harm and must be maintained in accordance with the current edition of AS1940 – Storage and Handling of Flammable and Combustible Liquids
- (d) ensure pest animals are prevented from accessing putrescible waste around the development.

Enclosure 6 – stormwater management plan

To demonstrate compliance with **condition 12.1** of this development approval, prepare a site-based stormwater management plan (by a suitably qualified person) that addresses the following:

- (a) topsoil stripping phase
- (b) development phase
- (c) post-development and rehabilitation phase
- (d) confirmation of measures to be put in place during high rainfall events (minimum Cyclone Category 3) that will require pump out
- (e) the release criteria for controlled runoff events or pumped discharges from the construction site
- (f) prevention of ponding or other significant effect on other properties, watercourses, creeks or lakes to ensure stormwater does not adversely affect the values of the receiving environment
- (g) the location and number of stormwater monitoring points
- (h) confirmation of the number and location of meteorological monitoring stations and flow gauging stations on key watercourses that would affect flooding in proximity to the site
- (i) confirmation of destination of water collected in the sediment basin where proposed and monitoring measures to be established to ensure any overflows are addressed
- (j) confirmation of measures to be implemented to prevent sediment and pollutants from entering the waterways and groundwater supply
- (k) monitoring of stormwater management devices
- (l) final stormwater discharge from the detention basin/s, if used, must not cause ponding of stormwater on adjacent site/s and any significant on adjacent water courses/creeks/lakes
- (m) contaminants must not be directly or indirectly released to waters
- (n) be prepared having regard to Module 18.2 – Stormwater and Drainage Impacts on State Transport Infrastructure State Code of the State Development Assessment Provisions (available at <https://dsdmipprd.blob.core.windows.net/general/sdap-1-10-module-18.pdf>).
- (o) demonstrate that the management of stormwater (quantity and quality) post development can achieve a no worsening impact (on the pre-development condition) for all flood and stormwater events that exist prior to development and up to a 1% Annual Exceedance Probability (AEP) (equivalent to 1/100 year Average Recurrence Interval (ARI)). Stormwater management for the proposed development must ensure no worsening to the railway, including rail transport infrastructure, caused by peak discharges, flood levels, frequency/duration of flooding, flow velocities, water quality, sedimentation and scour effects
- (p) incorporate appropriate hydraulic and hydrological analysis demonstrating:
 - (i) design flood peak discharges for the site and surrounding area which exist prior to the development for all flood and stormwater events up to a 1% Annual Exceedance Probability (AEP) (equivalent to 1/100-year Average Recurrence Interval (ARI)). This should include at least the following flood and stormwater events: 50%, 20%, 10%, 5%, 2% and 1% AEP (equivalent to 2, 5, 10, 20, 50 and 100-year ARI events)
 - (ii) design flood peak discharges for the site after the development has occurred for all flood and stormwater events up to a 1% Annual Exceedance Probability (AEP) (equivalent to 1/100-year Average Recurrence Interval (ARI)). This should include at least the following flood and stormwater events: 50%, 20%, 10%, 5%, 2% and 1% AEP (equivalent to 2, 5, 10, 20, 50 and 100-year ARI events).
- (q) ensure the following are addressed, where applicable:
 - (i) all relevant legal points of discharge for the development site are identified.
 - (ii) overland flow paths are identified, and hydraulic conveyance is maintained on the site as part of the proposed development
 - (iii) flood storage capacity is maintained on the site as part of the proposed development
 - (iv) the adverse impacts from sheet flow on the railway are prevented
 - (v) the proposed development does not cause a concentration of stormwater (including floodwater) flows discharging on the railway during construction or thereafter

- (vi) retaining structures, filling/excavation, landscaping, construction activities or any other works to the land have been designed to include provision for drainage so as not to adversely impact on the railway
 - (vii) the proposed development does not impede or interfere with any drainage, stormwater or floodwater flows from the railway
 - (viii) stormwater or floodwater flows have been designed to maintain the structural integrity of the rail transport infrastructure
 - (ix) existing stormwater drainage infrastructure on the railway is not interfered with or damaged by the proposed development such as through concentrated flows, surcharging, scour or deposition
 - (x) the quality of stormwater discharging onto the railway is not reduced through erosion and sedimentation.
- (r) include details of the mitigation measures proposed to address any potential stormwater impacts (including flooding impacts) of the proposed development. The design flood peak discharges should be shown for the mitigated case to demonstrate there is no worsening impact on the railway.

Enclosure 7 – traffic management plan

To demonstrate compliance with **condition 12.1** of this development approval, prepare a traffic management plan (TMP) (by a suitably qualified person) that addresses all aspects of access to and from the development.

The TMP must ensure that there is no disruption to the safety and operational integrity of railway level crossings impacted on by development generated traffic, including but not limited to railway level crossings: ID: 5159 on the North Coast Line at Abbot Point Road and ID: 843 at Abbot Point Road on the Abbot Point Branch Railway.

In particular, the maximum design vehicle for the construction and operation of the development must not exceed 19m in length. The Traffic Management Plan must detail at least the communication and safety controls to be implemented to manage short stacking.

This TMP, certified by a RPEQ, must be given to the Program Delivery and Operations Unit, Mackay Whitsunday Region (Mackay.Whitsunday.IDAS@tmr.qld.gov.au) within the Department of Transport and Main Roads.

Enclosure 8 – noise and vibration management plan

To demonstrate compliance with **condition 12.1** and **condition 26** of this development approval, a noise and vibration management plan (prepared by a suitably qualified person) must be implemented at the site of the development and must include the following as a minimum:

- (a) identification of all potential sensitive and commercial locations which may be affected by noise and vibration impacts from launch activities and quantify the cumulative noise impact at those commercial locations that accounts for launch activities occurring simultaneously (that is the existing noise levels at the commercial location plus the noise impact of a launch event)
- (b) identification of all major sources of noise and vibration emissions that may occur as result of the operation of the launch facility
- (c) description of the procedures to manage the noise and vibration emissions from the sources identified
- (d) collection and recording of noise and vibration data to compile empirical data for each launch event for the duration of the approval period
- (e) identifying adverse meteorological conditions likely to produce elevated levels of noise and vibration at a sensitive or commercial place due to launch activities
- (f) protocols to minimise the potential for noise and vibration emissions, and
- (g) description of procedures to be undertaken if any exceedance is detected.

Enclosure 9 – safety and emergency/disaster management plan

To demonstrate compliance with **condition 12.1** of this development approval, the operator of the development must prepare and operate a safety and emergency/disaster management plan in consultation with the state and regional emergency service providers, to ensure the safety and well-being of all occupants of the facility. The plan must be for both the construction and operational phases of the project and must provide details of the following:

- (a) a hazard analysis and risk assessment undertaken in accordance with AS/NZ ISO31000:2018 Risk Management Principles and Guidelines and the Whitsunday Regional Council Local Disaster Management Plan
- (b) potential natural and manmade hazards and emergency events
- (c) strategies for the protection of life and property in a disaster/emergency event
- (d) workforce numbers (including general breakdown of site access arrangements during both construction and operation)
- (e) response procedures to incidents/events including injuries, medical evacuations, road accidents, spills, fire, floods, launch vehicle explosions, and cyclones
- (f) evacuation plans and procedures, including evacuation routes and assembly areas for both the construction and operational phases of the development
- (g) demonstration that resources required for the implementation of the plan will be provided independent of resources allocated to towns in the Whitsunday region
- (h) demonstration of long-time resilience in distressed conditions in the event an evacuation cannot be achieved, including details of access to food, water, and medical supplies
- (i) training for staff who will be tasked with emergency management activities.
- (j) safety management plans and emergency response procedures prepared in consultation with the state and regional emergency service providers and provide an adequate level of training to staff who will be tasked with emergency management activities.

Enclosure 10 – bushfire hazard assessment and management plan

To demonstrate compliance with **condition 12.1** of this development approval, prepare a bushfire hazard assessment and management plan. The bushfire hazard assessment and management plan must be prepared in accordance with all relevant state and federal guidelines, policies and regulations, certified by a suitably qualified person and prepared in consultation with all landholders, Queensland Fire and Emergency Services and the Local Disaster Management Groups for Whitsunday Regional Council.

The bushfire hazard assessment and management plan must provide a bushfire hazard assessment as well as mitigation strategies to achieve the development outcomes in Part E of the State Planning Policy July 2017 – Natural Hazards, Risk and Resilience including:

- (a) identification and quantification of fire risk
- (b) strategies for the prevention and minimisation of fire hazard including details of the proposed ongoing management of fuel loads across the subject site and the management of the asset protection zone around on-site infrastructure.
- (c) strategies for the protection of life and property in the event of a bushfire
- (d) details on how the above will be implemented, including sourcing of required materials and services independent of the allocation of such materials and services to towns within the Whitsunday region.

The QFES document *Bushfire Resilient Communities: Technical Reference Guide for the State Planning Policy State Interest 'Natural Hazards, Risk and Resilience - Bushfire'*, (QFES 2019) provides specific advice on:

- (a) The process for undertaking a bushfire hazard assessment (Chapter 5)
- (b) The process for calculating asset protection zones (Chapter 7), and
- (c) The process for preparing a bushfire management, vegetation management or landscape maintenance plans (Chapter 8).

The bushfire hazard assessment and management plan shall be provided to the Queensland Fire and Emergency Services Sustainable Development Unit for review prior to commencement of use and is to be referred to:

Sustainable Development Unit
L2 85 Hudson Road Albion
sdu@qfes.qld.gov.au

Enclosure 11 – acid sulfate soils management plan

To demonstrate compliance with **condition 12.1** and **condition 13** of this development approval, prepare an acid sulfate soils management plan (by a suitably qualified person) in accordance with the current *Queensland Acid Sulfate Soils Technical Manual: Soil management guidelines*, prepared by the Department of Science, Information Technology, Innovation and the Arts, 2014.

Enclosure 12 – site-based land management plan

To demonstrate compliance within **condition 21.1** of this development approval:

- (a) Prepare a site-based land management plan that includes a site-based pest management plan in accordance with the Department of Agriculture and Fisheries '*Pest Management Planning*' guidance material that includes, but is not limited to, the following:
 - (i) a pre-works inspection of the property to locate, map and identify existing pest flora and fauna species.
 - (ii) training of site personnel in the identification of local pest species likely to occur at the site.
 - (iii) no vehicles enter the wetland protection area 50m buffer zone
- (b) Implement the procedures/requirements contained in the site-based pest management plan, prepared in accordance with (a).

Note: The applicable guidance material is available at <http://www.daf.qld.gov.au/business-priorities/biosecurity/invasive-plants-animals/pest-management-planning>

Enclosure 13 – decommissioning and rehabilitation management plan

To demonstrate compliance with **condition 21.1** of this development approval, prepare a detailed site-specific decommissioning and rehabilitation management plan (by a suitably qualified person). The plan is to include:

- (a) details of how the area will be rehabilitated, including the removal of all temporary and permanent infrastructure and facilities
- (b) details of self-sustaining species (groundcover and vegetation) to be planted within six months of site decommissioning, including proposed numbers and location
- (c) a monitoring programme, including timeframes to ensure the revegetation species will survive (including during the dry period)
- (d) details of measures to be implemented to prevent weed control and erosion of the site
- (e) identification of the proposed topography of this site after rehabilitation.

After decommissioning or abandonment for any reason, all significant disturbed land caused by the carrying out of the activity(ies) must be rehabilitated to meet the following final acceptance criteria:

- (a) any contaminated land (e.g., contaminated soils) is remediated and rehabilitated
- (b) for land that is not being cultivated by the landholder:
 - i. groundcover, that is not a declared pest species, is established and self-sustaining
 - ii. vegetation of similar species richness and species diversity to preselected analogue sites is established and self-sustaining.
- (c) for land that is to be cultivated by the landholder, cover crop is revegetated, unless the landholder will be preparing the site for cropping within three months of activities being completed.



Council reference: 20220150
Your reference: L: 8 SP: 295408
Contact Officer: A.Robins
Officer Direct Line: 4945 0651

24th February 2022

Gilmour Space Technologies Pty Ltd
C/- Milford Planning
PO Box 5463
SOUTH TOWNSVILLE QLD 4810

Dear Sir/Madam

DECISION NOTICE – APPROVAL (WITH CONDITIONS)

(Given under section 63 of the *Planning Act 2016*)

Whitsunday Regional Council wish to advise that on 24/02/2022 the development application described below was approved.

Application details

Application number: 20220150
Approval sought: DEVELOPMENT APPLICATION FOR OPERATIONAL WORKS - BULK EARTHWORKS, ACCESS ROAD & STORMWATER

Location details

Street address: Bruce Highway BOWEN
Real property description: L: 8 SP: 295408, L: 9 SP: 295408, L: 10 SP: 295408, L: 12 SP: 275843

Decision

Date of decision: 24/02/2022

Decision details:

Approved in full with conditions. These conditions are set out in Appendix 1 and are clearly identified to indicate whether the assessment manager or a concurrence agency imposed them.

Correspondence:
Chief Executive Officer,
Whitsunday Regional Council,
PO Box 104, Proserpine QLD 4800
P: 1300 WRC QLD (1300 972 753)
F: (07) 4945 0222
E: info@whitsundayrc.qld.gov.au
www.whitsundayrc.qld.gov.au
ABN 63 291 580 128



Details of the approval

Development permit Development Application for Operational Works - Bulk Earthworks, Access Road & Stormwater

Bowen
Cnr Herbert & Powell Streets
Bowen QLD 4805

Proserpine
83-85 Main Street
Proserpine QLD 4800

Collinsville
Cnr Stanley & Conway Streets
Collinsville QLD 4804

Cannonvale
Shop 23, Whitsunday Plaza
Shute Harbour Road, Cannonvale QLD 4802

Variation approval details

n/a

Conditions

This approval is subject to the conditions in Attachment 1.

Referral Agency

The referral agencies for this application are:

nil

Further development permits

Please be advised that the following development permits are required to be obtained before the development can be carried out:

- Operational Works;
 1. Access and Parking;
 2. Stormwater;
 3. Water Infrastructure; and
 4. Sewerage Infrastructure;
- Material Change of Use;
- Building Works;
- Plumbing and Drainage Works.

Properly made submissions

Not applicable—No part of the application required public notification.

Rights of appeal

The rights of applicants to appeal to a tribunal or the Planning and Environment Court against decisions about a development application are set out in chapter 6, part 1 of the *Planning Act 2016*. For certain applications, there may also be a right to make an application for a declaration by a tribunal (see chapter 6, part 2 of the *Planning Act 2016*).

Appeal by an applicant

An applicant for a development application may appeal to the Planning and Environment Court against the following:

- The refusal of all or part of the development application
- A provision of the development approval
- The decision to give a preliminary approval when a development permit was applied for
- A deemed refusal of the development application.

An applicant may also have a right to appeal to the Development tribunal. For more information, see schedule 1 of the *Planning Act 2016*.

Appeal by an eligible submitter

An eligible submitter for a development application may appeal to the Planning and Environment Court against the decision to approve the application, to the extent the decision relates to:

- Any part of the development application that required impact assessment
- A variation request.

The timeframes for starting an appeal in the Planning and Environment Court are set out in section 229 of the *Planning Act 2016*.

A copy of the relevant appeal provisions are attached.

To stay informed about any appeal proceedings which may relate to this decision, visit:

<https://planning.dsdmip.qld.gov.au/planning/our-planning-system/dispute-resolution/pe-court-database>

Currency period for the approval

This development approval will lapse at the end of the period set out in section 85 of Planning Act 2016

- If the development does not start within 2 years.

Environmental authority

n/a

Other requirements under section 38 of the Planning Regulation

Should you require any further information, please contact Council on 49451651 as referenced above.

Yours faithfully



D Mackay

Manager Development Services

enc Attachment 1—Assessment manager
 Appeal provisions
 Approved plans and specifications



Attachment 1 – Part 1
Assessment Manager Conditions
Whitsunday Regional Council

PLANNING ACT 2016

1.0 ADMINISTRATION

1.1 The approved development must be carried out to the levels, dimensions and contours as shown on the approved drawings, unless approved and/or acknowledged in writing by Council:

Plan/Document Name	Plan Number	Dated	Received
Locality Plan and Drawing Index	GSLF-13C-CV-DWG-001-01 rev E	09/02/22	14/02/22
Sediment and Erosion Control Typical Details	GSLF-13C-CV-DWG-002-01 rev D	08/02/22	14/02/22
Typical Notes and Details-Sheet 1 of 3	GSLF-13C-CV-DWG-003-01 rev D	08/02/22	14/02/22
Typical Notes and Details-Sheet 2 of 3	GSLF-13C-CV-DWG-003-02 rev D	08/02/22	14/02/22
Typical Notes and Details-Sheet 3 of 3	GSLF-13C-CV-DWG-003-03 rev D	08/02/22	14/02/22
Catchment Plan Sheet 1 of 1	GSLF-13C-CV-DWG-004-01 rev E	09/02/22	14/02/22
Layout and Long section – Sheet 1 of 4	GSLF-13C-CV-DWG-005-01 rev D	08/02/22	14/02/22
Layout and Long section – Sheet 2 of 4	GSLF-13C-CV-DWG-005-02 rev D	08/02/22	14/02/22
Layout and Long section – Sheet 3 of 4	GSLF-13C-CV-DWG-005-03 rev D	08/02/22	14/02/22
Layout and Long section – Sheet 4 of 4	GSLF-13C-CV-DWG-005-04 rev D	08/02/22	14/02/22
Layout Plan – Launch Facility	GSLF-13C-CV-DWG-006-01 rev E	09/02/22	14/02/22
Floodway Layout Plan	GSLF-13C-CV-DWG-007-01 rev D	08/02/22	14/02/22

Floodway Details Plan	GSLF-13C-CV-DWG-007-02 rev D	08/02/22	14/02/22
Cross Sections – Sheet 1 of 3	GSLF-13C-CV-DWG-008-01 rev D	08/02/22	14/02/22
Cross Sections – Sheet 2 of 3	GSLF-13C-CV-DWG-008-02 rev D	08/02/22	14/02/22
Cross Sections – Sheet 3 of 3	GSLF-13C-CV-DWG-008-03 rev D	08/02/22	14/02/22
Drainage Calculation Sheet	21-307	17/02/22	17/02/22

- 1.2 A pre-start meeting must be arranged and held, in accordance with Section CP1.09 of Council's Whitsunday Regional Council Development Manual, prior to commencement of any operational works, including clearing of any vegetation.
- 1.3 All works must be certified by an engineer registered with the Board of Professional Engineers of Queensland (RPEQ status) in a suitable area of engineering (see Professional Engineering Act 2002) who is independent of the contractor for the works. Where a hold point, witness point, milestone or any other inspection is required for the certification process, these activities must be supervised by the nominated RPEQ.
- 1.4 Where a discrepancy or conflict exists between the written conditions of this approval and the approved plans, the requirements of the written condition(s) will prevail.
- 1.5 All conditions of this approval must be complied with in full to Council's satisfaction prior to the release of the survey plan or the commencement of the use, whichever is the sooner.

2.0 CLEARING, LANDSCAPING AND FENCING

- 2.1 All vegetative waste cleared as part of the development of the site is to be either:
- a) stored neatly on site, and shredded within sixty (60) days of clearing; or
 - b) removed off the site to an approved disposal location.
- Any pruning works must be in accordance with AS 4373-2007 – Pruning of Amenity Tree.
- 2.2 Tree removal is to be conducted in stages and minimised for as much as practicable. A pre-clearance survey is to be undertaken by a qualified fauna spotter catcher to minimise disruption to native fauna.
- 2.3 The applicant shall submit, prior to start of works, a Vegetation Management Plan that complies with SC6.2.6 – Vegetation Management Plan - planning scheme policy is to be submitted and endorsed by Council. The plan must show the following:
- a) Indicate which trees will be retained and which tree will be removed for the developed area.
 - b) Include measures that will demonstrate compliance with PO18/AO18.2 of the Waterway and wetlands overlay code. Avoidance/mitigation/revegetation measures need to be proposed
 - c) Include weed management
 - d) Any disturbed areas must be revegetated

3.0 EARTHWORKS

- 3.1 Excavation and/or filling of the site must comply with Section SG1 "Earthworks" of Council's Whitsunday Regional Council Development Manual.
- 3.2 Fill must be placed, trimmed, and compacted to the standards identified in AS3798. Compaction tests results must be submitted to Council for their records prior to commencement of the use or signing of the survey plans, whichever occurs first.
- 3.3 No fill is to be placed external to the property boundary or limit of works shown on the approved plans.
- 3.4 Export of any material from the site shall require separate written approval from Council. Any request to export material from the site must be accompanied by details of the proposed haul route and proposed destination, and evidence of approval for storage and/or filling at the destination.
- 3.5 During the excavation and/or filling of the site the applicants geotechnical engineer must supervise and, at the completion, certify that the work carried out on site has meet the design intent and provide evidence that the finished work will not cause adverse impact on adjoining property and will remain stable in the long term.

4.0 ACCESS

- 4.1 The construction of the Access, Circulation Roads must comply with all dimensions, specifications and criteria as described in the approved drawings.
- 4.2 At completion of construction and prior to commencement of use on the site, the Supervising Engineer shall provide certification that all access requirements comply with Council's Development Approval Decision Notice and relevant standards.
- 4.3 The construction of all concrete works must be carried out so as to comply with Section SG7 "Concrete works" of Council's Whitsunday Regional Council Development Manual.

5.0 STORMWATER AND FLOODING

- 5.1 The construction of all stormwater must be carried out so as to comply with Section SG4 "Stormwater Drainage" of Council's Whitsunday Regional Council Development Manual.
- 5.2 The supervising engineer must certify that the internal stormwater works have been carried out in accordance with the requirements of Queensland Urban Drainage Manual and will not adversely affect upstream and/or downstream properties.

6.0 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

- 6.1 Erosion prevention and sediment control measures must be established so as to comply with the requirements of the Whitsunday Regional Council Development Manual and the Best Practice Erosion & Sediment Control – November 2008 (IECA White Book) and the requirements of the Environmental Protection Act.
- 6.2 Prior to the Operational works Pre-Start meeting Erosion and Sediment control plans must be provided to Council for review.
- 6.3 A copy of the Erosion Prevention and Sediment Control Plan for the site must be held on site at all times and produced if requested by Council officers. All staff, including sub-contractors, must be inducted and familiar with the Erosion Prevention and Sediment Control plan.
- 6.4 Discharges of water pollutants, wastewater or stormwater from the site must not cause measurable levels of water pollutants in the receiving waters to fall outside the acceptable ranges specified in the 'Australian Water Quality Guidelines for Fresh and Marine Waters', ANZECC 2000.

- 6.5 No visible emissions of dust must occur beyond the boundaries of the site during earthworks and construction activities on the site. If, at any time during the earthworks and construction activities the dust emissions exceed the levels specified above, all dust generating activities must cease until the corrective actions have been implemented to reduce dust emissions to acceptable levels or wind conditions are such that acceptable levels are achieved.
- 6.6 The applicant must ensure that when undertaking any on-site or external works, including any filling and extraction, appropriate dust control measures are implemented in accordance with the Environmental Protection Act 1994 and complies with the relevant air quality objectives defined in the Environmental Protection (Air) Policy 2008.

7.0 CATCHMENT AND LAND MANAGEMENT

- 7.1 No invasive plants (Biosecurity Act, 2014) or declared local pests (Local Law no.3) shall be planted on the site or allowed to invade the site and the site must be managed and maintained to exclude weeds.
- 7.2 To reduce the spread of weeds, all earthmoving equipment shall be free of soil and seed before being taken to the work site and again on completion of the project.
- 7.3 Acid sulphate soils are not to be disturbed during the works unless an Acid Sulfate Soils Management Plan that complies with Planning Policy SC6.2.4: Acid sulfate soils management plan, is submitted and approved by Council.
- 7.4 The applicant shall submit, prior to start of works, a SQMP that complies with the Acceptable Outcomes or the Performance Outcomes of the Infrastructure Code

8.0 MISCELLANEOUS

- 8.1 It is to be noted that the checking and approval of these drawings is on an Audit Basis only. The "Statement of Compliance" submitted with the Drawings is to be the certification on which the approval is given.
- 8.2 It is the certifying/supervising Engineer's responsibility to ensure that the design as submitted takes into account all site conditions and complies in all respect with Council's Development Approval Decision Notice Conditions, Policies, Development Manual and accepted Engineering Design and Practice.
- 8.3 Any non-compliant aspects of the work including Engineering Design, Safety and Planning Issues identified by Council Inspectors during and at the completion of this work are to be redesigned, submitted for approval, and included in the Scope of Work, prior to acceptance of the work by Council.

9.0 ADVISORY NOTES

9.1 **Hours of work**

It is the developer's responsibility to ensure compliance with Section 440R of the Environmental Protection Act 1994, which prohibits any construction, building and earthworks activities likely to cause nuisance noise (including the entry and departure of heavy vehicles) between the hours of 6.30 pm and 6.30 am from Monday to Saturday and at all times on Sundays or Public Holidays.

9.2 **Dust Control**

It is the developer's responsibility to ensure compliance with Section 15 – Environmental Nuisance of the Environmental Protection Act 1994 which prohibits unlawful environmental nuisance caused by dust, ash, fumes, light, odour, or smoke beyond the boundaries of the property during all stages of the development including earthworks and construction.

9.3 Sedimentation Control

It is the developer's responsibility to ensure compliance with Section 440ZD to 440ZG of the Environmental Protection Act 1994 and Schedule 9 of the Environmental Protection Regulation 2008 to prevent soil erosion and contamination of the stormwater drainage system and waterways.

9.4 Noise During Construction and Noise in General

It is the developer's responsibility to ensure compliance with Section 363C (3) of the Environmental Protection Act 1994.

9.5 General Safety of Public During Construction

It is the project manager's responsibility to ensure compliance with Work Health and Safety Act 2011. Section 20 states that the project manager is obliged to ensure construction work is planned and managed in a way that prevents or minimises risks to the health and safety of members of the public at or near the workplace during construction work.

It is the principal contractor's responsibility to ensure compliance with Section 20 of the Work Health and Safety Act 2011. Section 20 states that the principal contractor is obliged on a construction workplace to ensure that work activities at the workplace prevent or minimise risks to the health and safety of the public at or near the workplace during the work.

It is the responsibility of the person in control of the workplace to ensure compliance with Section 20 of the Work Health and Safety Act 2011. Section 20 states that the person in control of the workplace is obliged to ensure there is appropriate, safe access to and from the workplace for persons other than the person's workers.

Attachment 2 – PA Extract

Appeal Rights

PLANNING ACT 2016

The following is an extract from the *Planning Act* (Chapter 6, Part 1).

229 Appeals to tribunal or P&E Court

(1) Schedule 1 states— (a) matters that may be appealed to— (i) either a tribunal or the P&E Court; or (ii) only a tribunal; or (iii) only the P&E Court; and (b) the person— (i) who may appeal a matter (the appellant); and (ii) who is a respondent in an appeal of the matter; and (iii) who is a co-respondent in an appeal of the matter; and (iv) who may elect to be a co-respondent in an appeal of the matter.

(2) An appellant may start an appeal within the appeal period.

(3) The appeal period is— (a) for an appeal by a building advisory agency—10 business days after a decision notice for the decision is given to the agency; or (b) for an appeal against a deemed refusal—at any time after the deemed refusal happens; or (c) for an appeal against a decision of the Minister, under chapter 7, part 4, to register premises or to renew the registration of premises—20 business days after a notice is published under section 269(3)(a) or (4); or (d) for an appeal against an infrastructure charges notice—20 business days after the infrastructure charges notice is given to the person; or (e) for an appeal about a deemed approval of a development application for which a decision notice has not been given—30 business days after the applicant gives the deemed approval notice to the assessment manager; or (f) for any other appeal—20 business days after a notice of the decision for the matter, including an enforcement notice, is given to the person. Note— See the P&E Court Act for the court's power to extend the appeal period.

(4) Each respondent and co-respondent for an appeal may be heard in the appeal.

(5) If an appeal is only about a referral agency's response, the assessment manager may apply to the tribunal or P&E Court to withdraw from the appeal.

(6) To remove any doubt, it is declared that an appeal against an infrastructure charges notice must not be about— (a) the adopted charge itself; or (b) for a decision about an offset or refund— (i) the establishment cost of trunk infrastructure identified in a LGIP; or (ii) the cost of infrastructure decided using the method included in the local government's charges resolution.

230 Notice of appeal

(1) An appellant starts an appeal by lodging, with the registrar of the tribunal or P&E Court, a notice of appeal that— (a) is in the approved form; and (b) succinctly states the grounds of the appeal.

(2) The notice of appeal must be accompanied by the required fee.

(3) The appellant or, for an appeal to a tribunal, the registrar must, within the service period, give a copy of the notice of appeal to— (a) the respondent for the appeal; and (b) each

co-respondent for the appeal; and (c) for an appeal about a development application under schedule 1, table 1, item 1— each principal submitter for the development application; and (d) for an appeal about a change application under schedule 1, table 1, item 2—each principal submitter for the change application; and (e) each person who may elect to become a co-respondent for the appeal, other than an eligible submitter who is not a principal submitter in an appeal under paragraph (c) or (d); and (f) for an appeal to the P&E Court—the chief executive; and (g) for an appeal to a tribunal under another Act—any other person who the registrar considers appropriate.

(4) The service period is— (a) if a submitter or advice agency started the appeal in the P&E Court—2 business days after the appeal is started; or (b) otherwise—10 business days after the appeal is started.

(5) A notice of appeal given to a person who may elect to be a co-respondent must state the effect of subsection (6).

(6) A person elects to be a co-respondent by filing a notice of election, in the approved form, within 10 business days after the notice of appeal is given to the person.

231 Other appeals

(1) Subject to this chapter, schedule 1 and the P&E Court Act, unless the Supreme Court decides a decision or other matter under this Act is affected by jurisdictional error, the decision or matter is non-appealable.

(2) The Judicial Review Act 1991, part 5 applies to the decision or matter to the extent it is affected by jurisdictional error.

(3) A person who, but for subsection (1) could have made an application under the Judicial Review Act 1991 in relation to the decision or matter, may apply under part 4 of that Act for a statement of reasons in relation to the decision or matter.

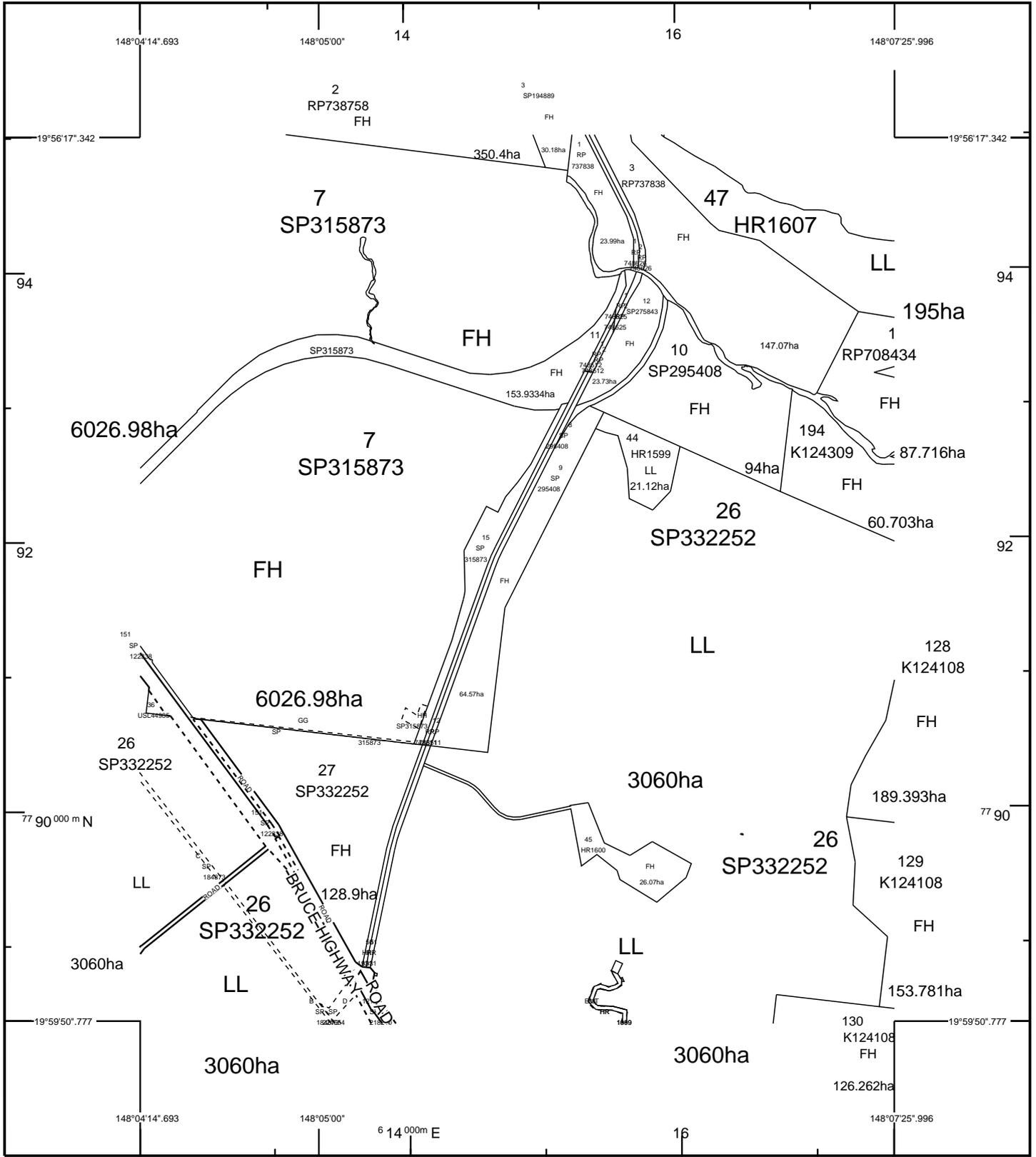
(4) In this section— decision includes— (a) conduct engaged in for the purpose of making a decision; and (b) other conduct that relates to the making of a decision; and (c) the making of a decision or the failure to make a decision; and (d) a purported decision; and (e) a deemed refusal. non-appealable, for a decision or matter, means the decision or matter— (a) is final and conclusive; and (b) may not be challenged, appealed against, reviewed, quashed, set aside or called into question in any other way under the Judicial Review Act 1991 or otherwise, whether by the Supreme Court, another court, a tribunal or another entity; and (c) is not subject to any declaratory, injunctive or other order of the Supreme Court, another court, a tribunal or another entity on any ground.

232 Rules of the P&E Court

(1) A person who is appealing to the P&E Court must comply with the rules of the court that apply to the appeal.

(2) However, the P&E Court may hear and decide an appeal even if the person has not complied with rules of the P&E Court.

Appendix 2

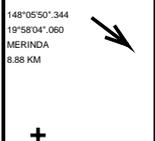


STANDARD MAP NUMBER
8558-33213

HORIZONTAL DATUM:GDA94 ZONE:55 SCALE 1 : 40000

SmartMap

MAP WINDOW POSITION & NEAREST LOCATION



SUBJECT PARCEL DESCRIPTION

DCDB	
Lot/Plan	9/SP295408
Area/Volume	64.57ha
Tenure	FREEHOLD
Local Government	WHITSUNDAY REGIONAL
Locality	BOWEN
Segment/Parcel	62389/50

CLIENT SERVICE STANDARDS

PRINTED 10/04/2024

DCDB 09/04/2024 (Lots with an area less than 1.000ha are not shown)

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An External Product of SmartMap Information Services
Based upon an extraction from the Digital Cadastral Data Base



Queensland Government
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 Subject Site
 Cadastre



DRAWING TITLE
Site Aerial
 PROPERTY ADDRESS
Bruce Highway, Bowen
Lots 8 and 10 on SP295408, Lot 12 on SP275843 and Lot 9

DRAWING No.
M1775-SK-01
 SCALE (at A3 original)
1:16,000
 DATE
17/02/2022

REVISION
B
 SHEET
1 of 1
 AUTHOR(S)
PH

100 0 100 200 300 400 m

 SOURCE(S)
 Milford Planning GIS at publication date;
 DCDB extract, State of Queensland, 2022;
 aerial imagery, Google, 2022.
 NOTE: Areas and dimensions are approximate only and
 are subject to site survey.


N

Appendix 3

State Assessment and Referral Agency

Date: 10/04/2024

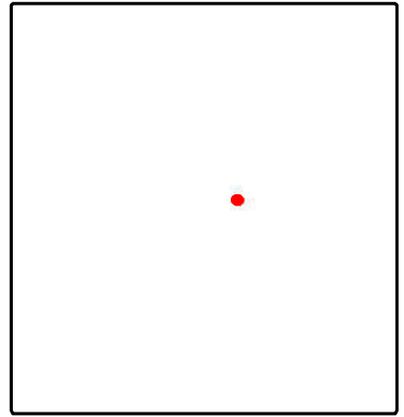


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Matters of Interest for all selected Lot Plans

Coastal management district

Coastal area - erosion prone area

Coastal area - medium storm tide inundation area

Coastal area - high storm tide inundation area

Queensland waterways for waterway barrier works

Major (tidal)

Wetland protection area trigger area

Wetland protection area wetland

Regulated vegetation management map (Category A and B extract)

Matters of Interest by Lot Plan

Lot Plan: 8SP295408 (Area: 45650 m²)

Coastal management district

Coastal area - erosion prone area

Coastal area - medium storm tide inundation area

Coastal area - high storm tide inundation area

Major (tidal)

Wetland protection area trigger area

Wetland protection area wetland

Regulated vegetation management map (Category A and B extract)

Lot Plan: 9SP295408 (Area: 645700 m²)

Coastal management district

Queensland waterways for waterway barrier works

Regulated vegetation management map (Category A and B extract)

Lot Plan: 10SP295408 (Area: 940000 m²)

Coastal management district

Coastal area - erosion prone area

Coastal area - medium storm tide inundation area

Coastal area - high storm tide inundation area

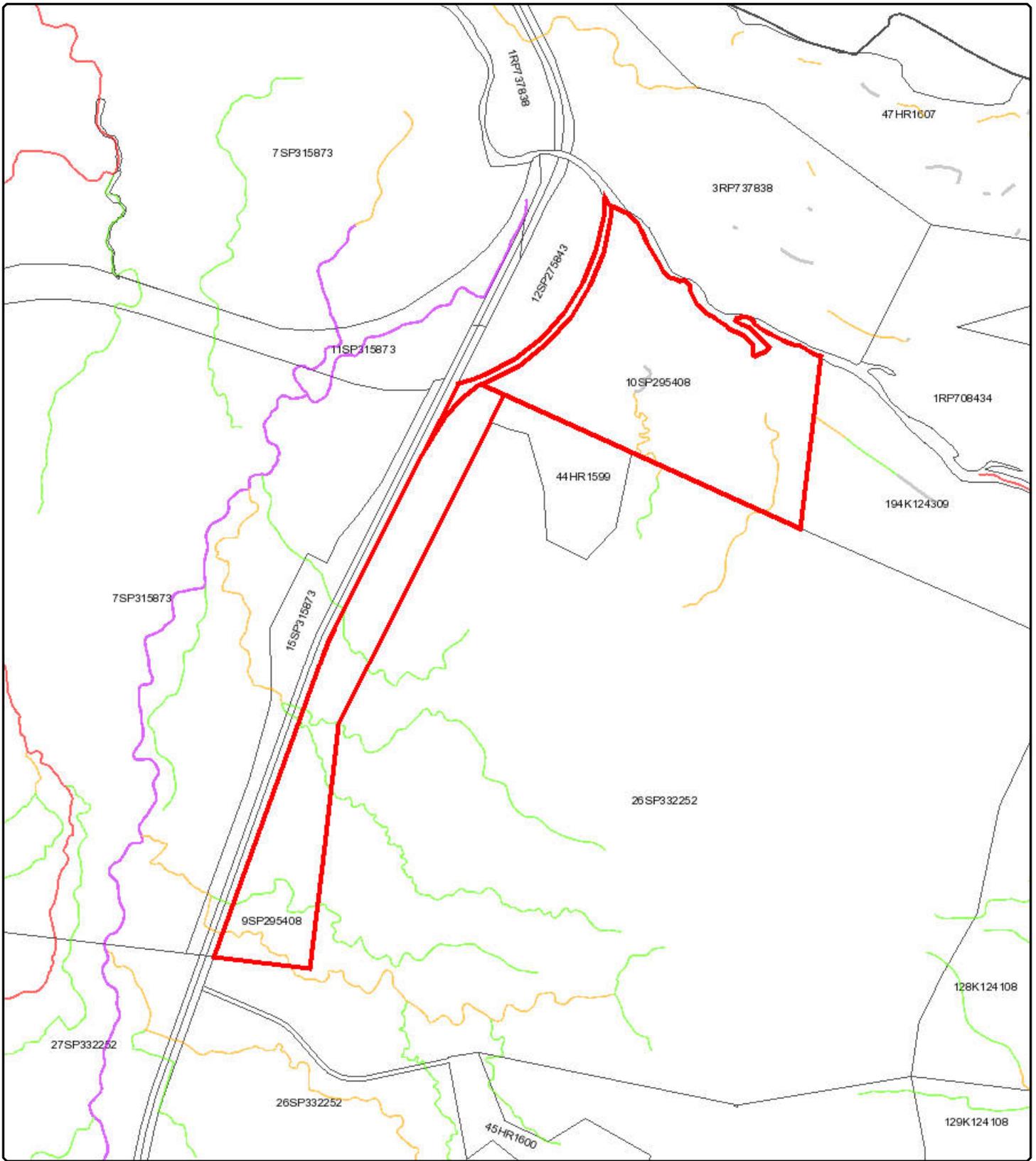
Queensland waterways for waterway barrier works

Major (tidal)

Wetland protection area trigger area

Wetland protection area wetland

Regulated vegetation management map (Category A and B extract)



State Assessment and Referral Agency

Date: 10/04/2024



Queensland Government

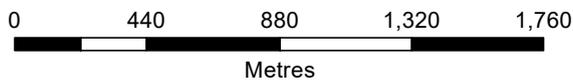
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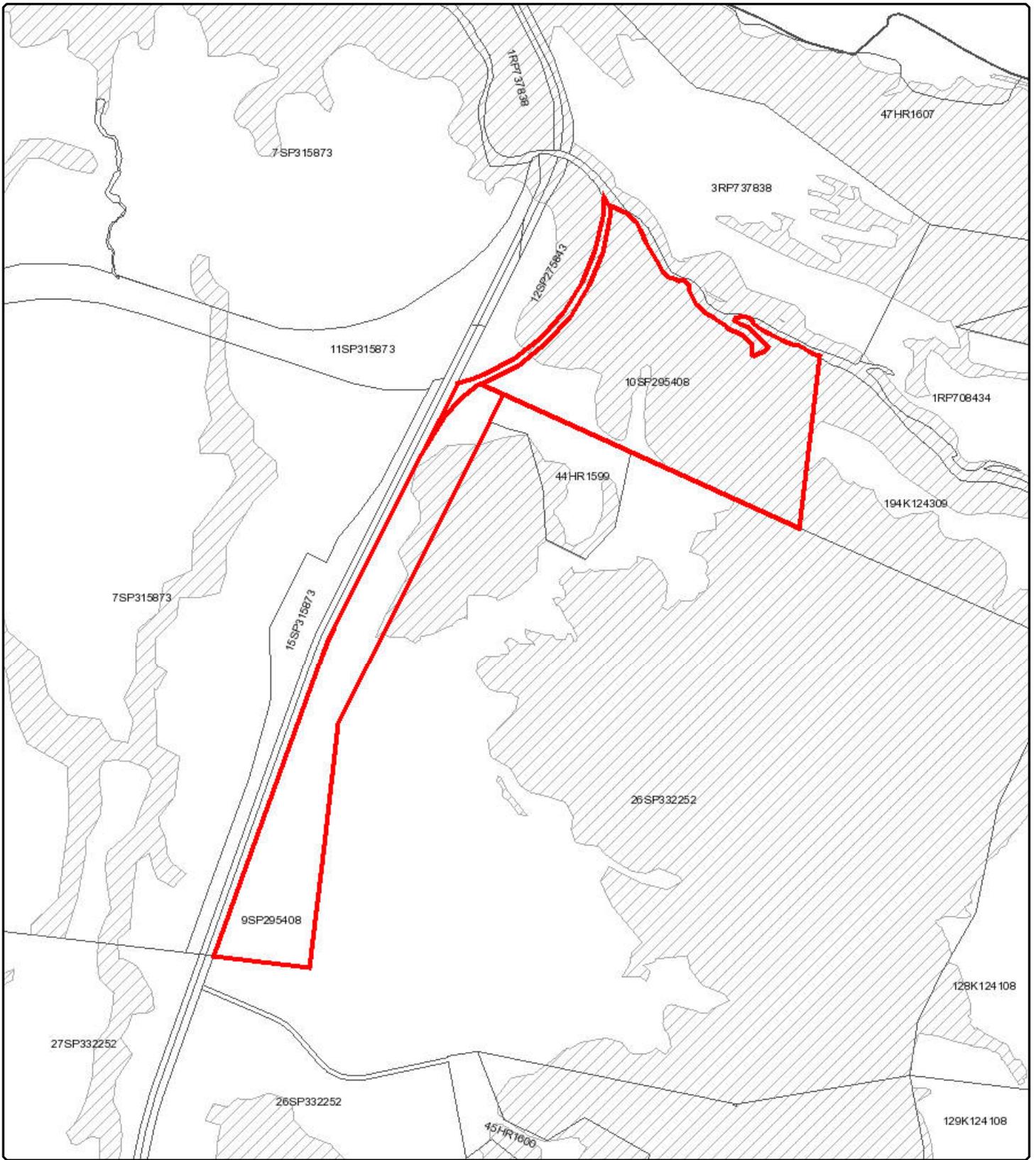
Queensland waterways for waterway barrier works

- Low
- Moderate
- High
- Major
- Major (tidal)



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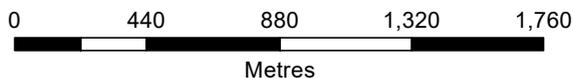
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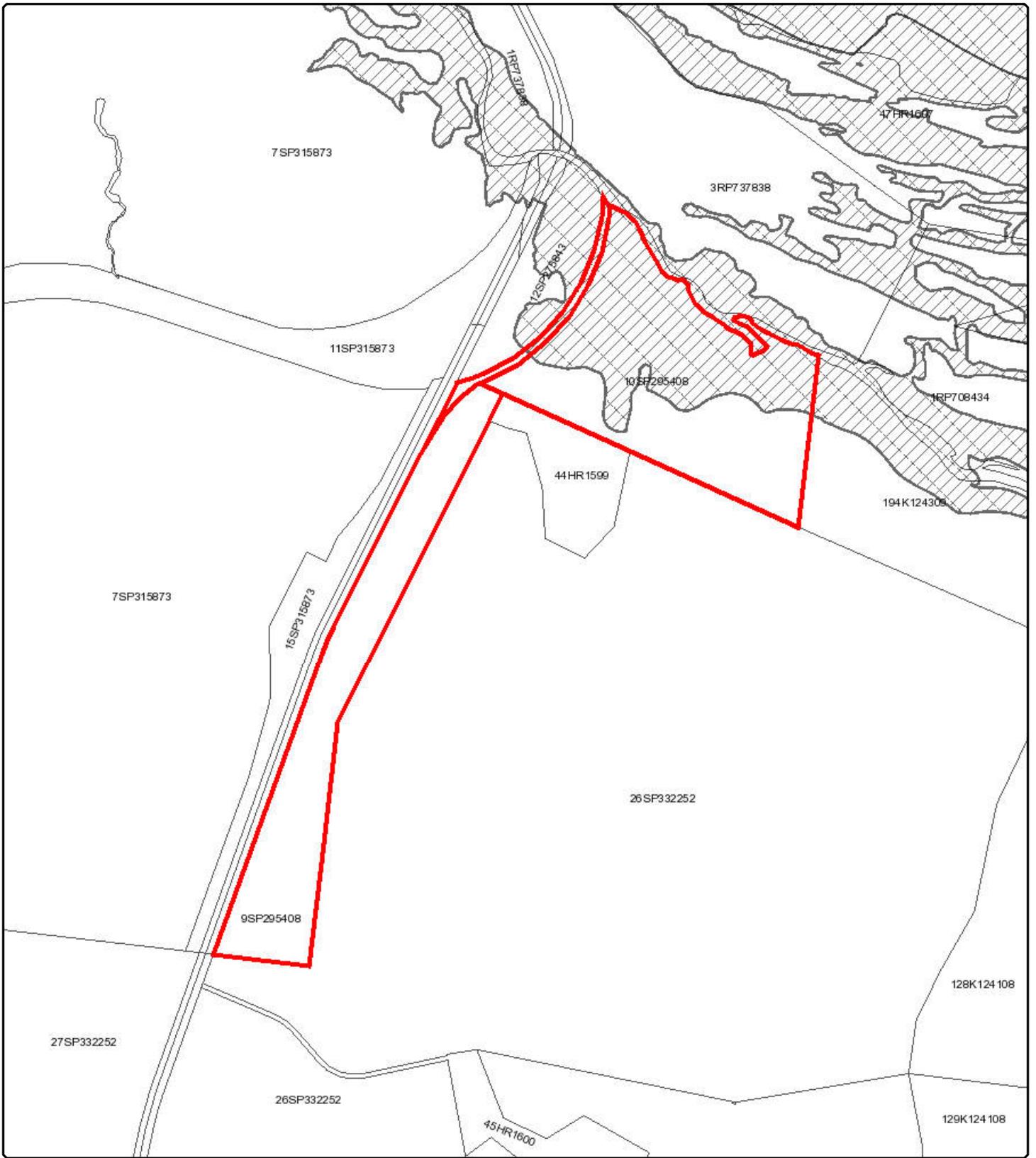
Regulated vegetation management map
(Category A and B extract)

-  Category A on the regulated vegetation management map
-  Category B on the regulated vegetation management map



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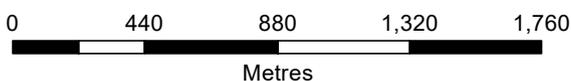
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Major (tidal)

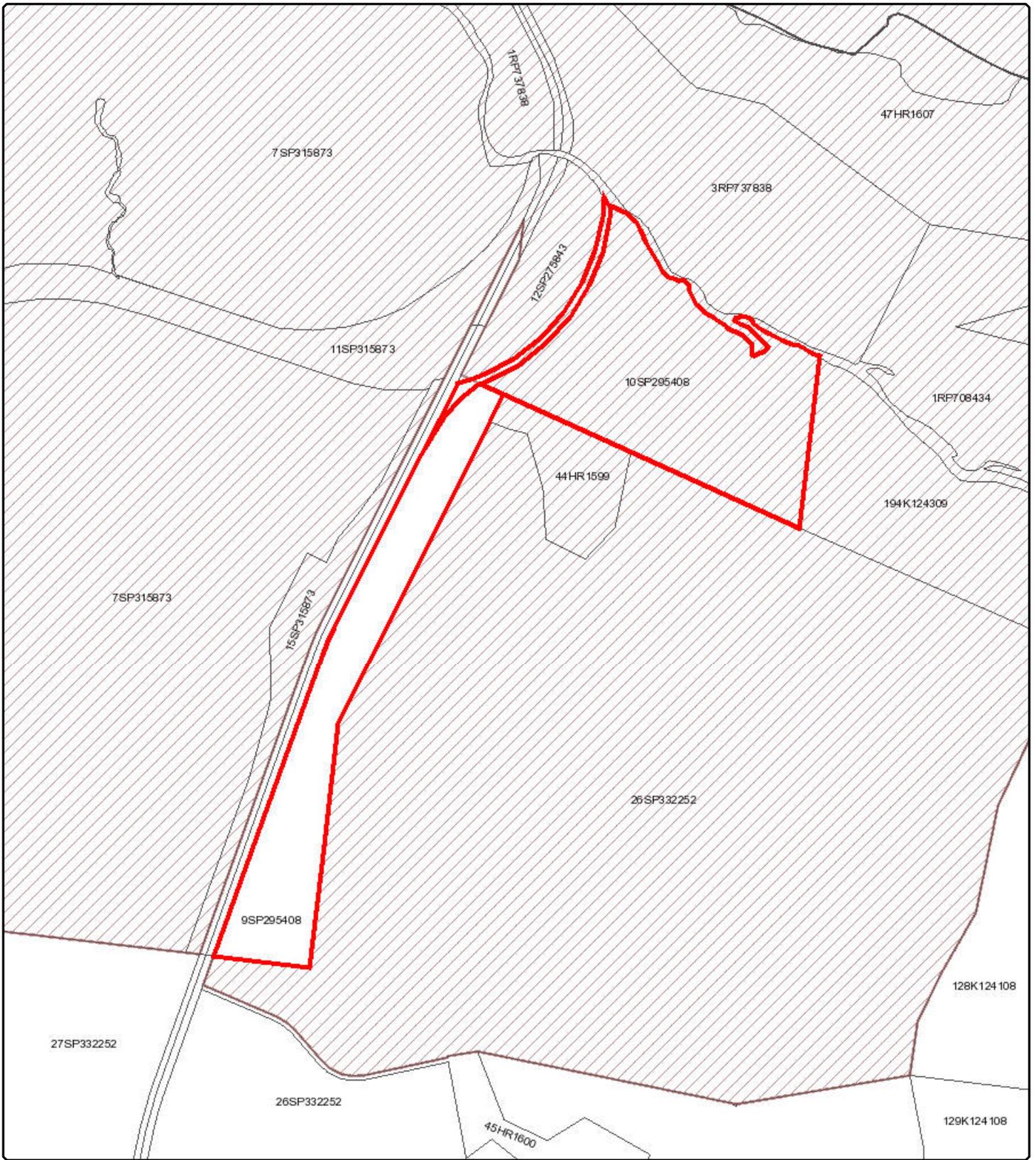


Major (tidal)



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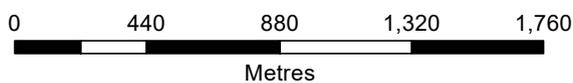
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Coastal management district

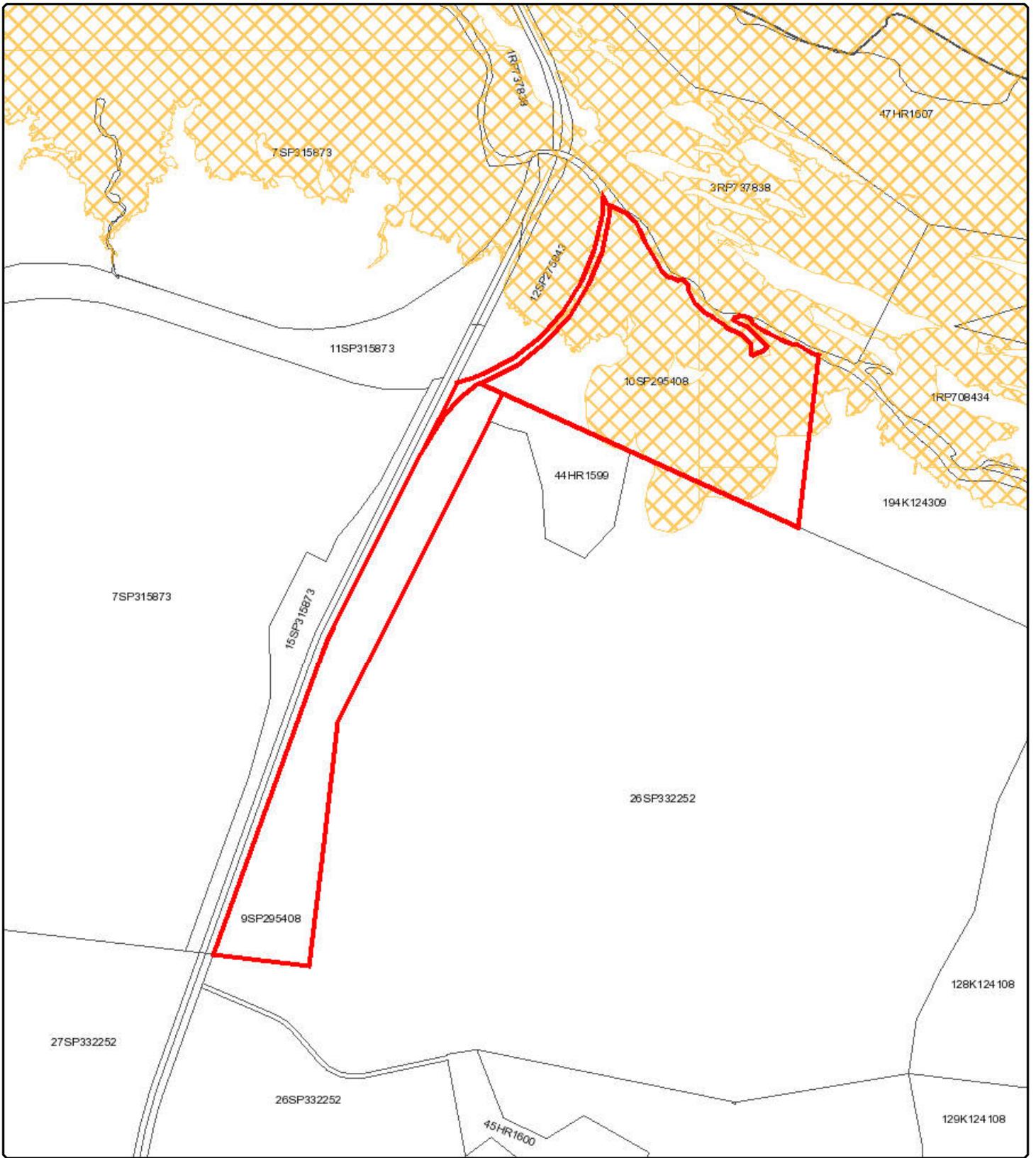


Coastal management district



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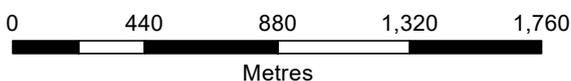
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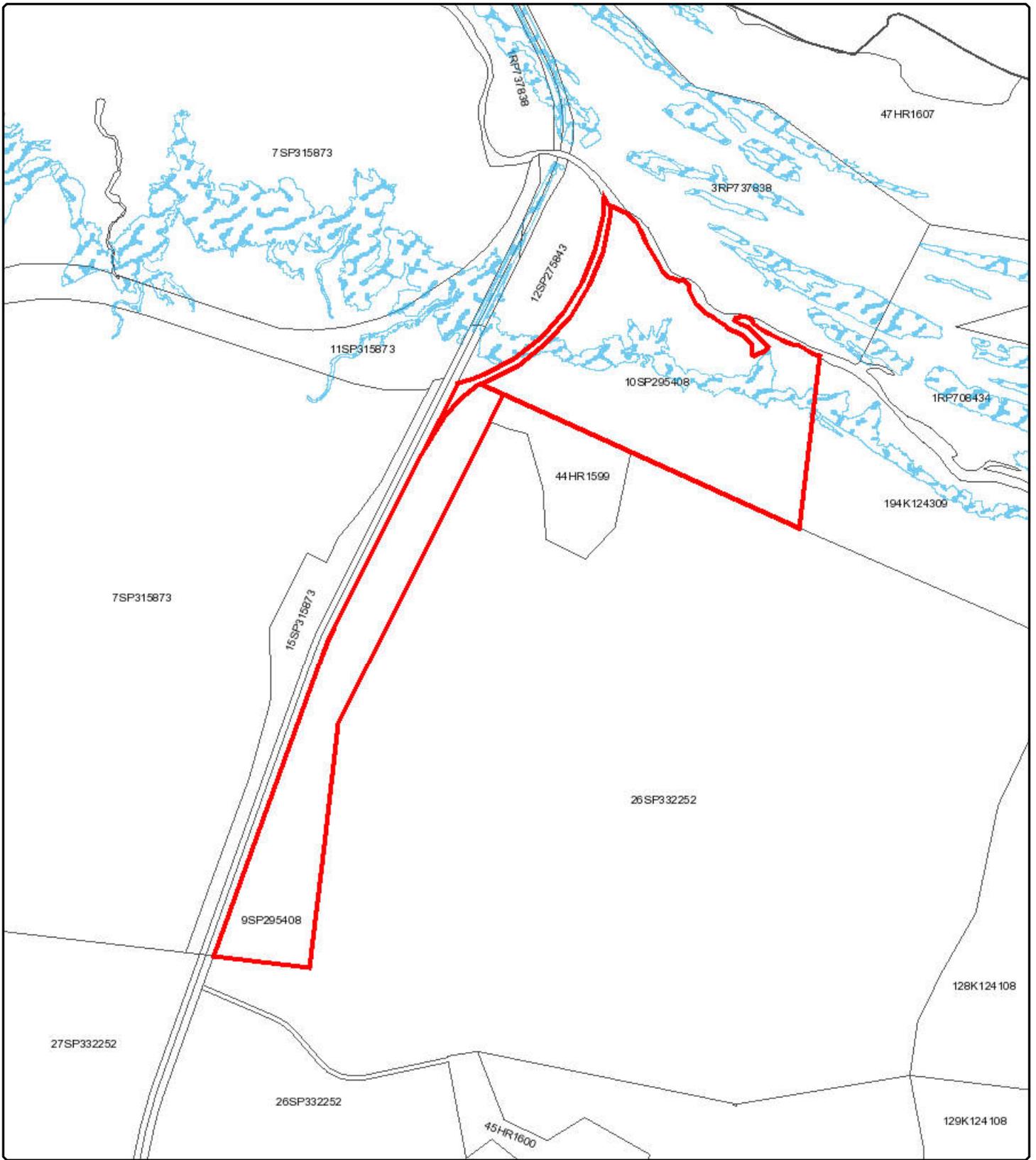
Coastal area - erosion prone area

 Coastal area - erosion prone area



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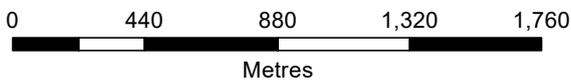
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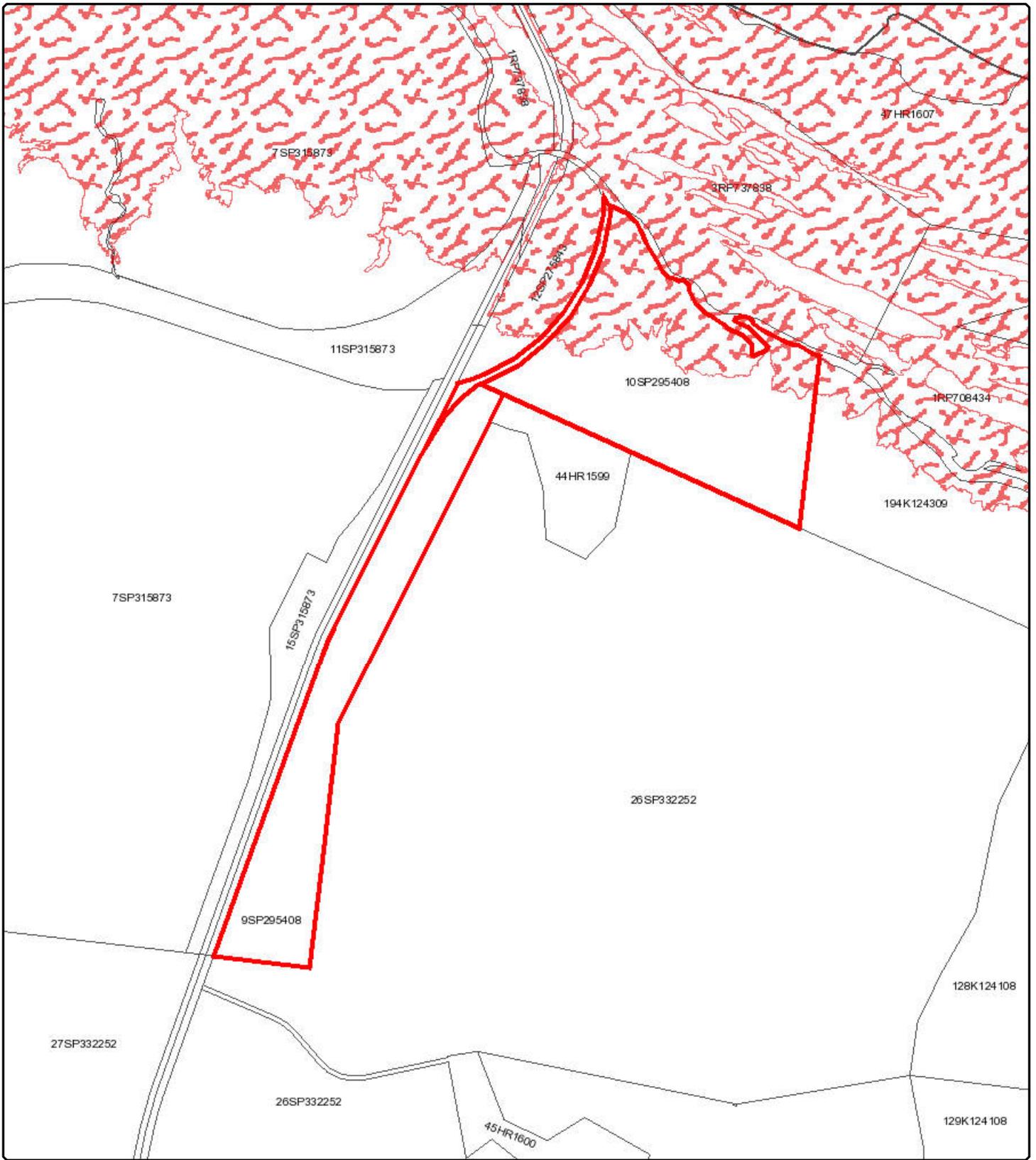
Coastal area - medium storm tide inundation area

 Coastal area - medium storm tide inundation area



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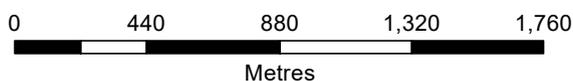


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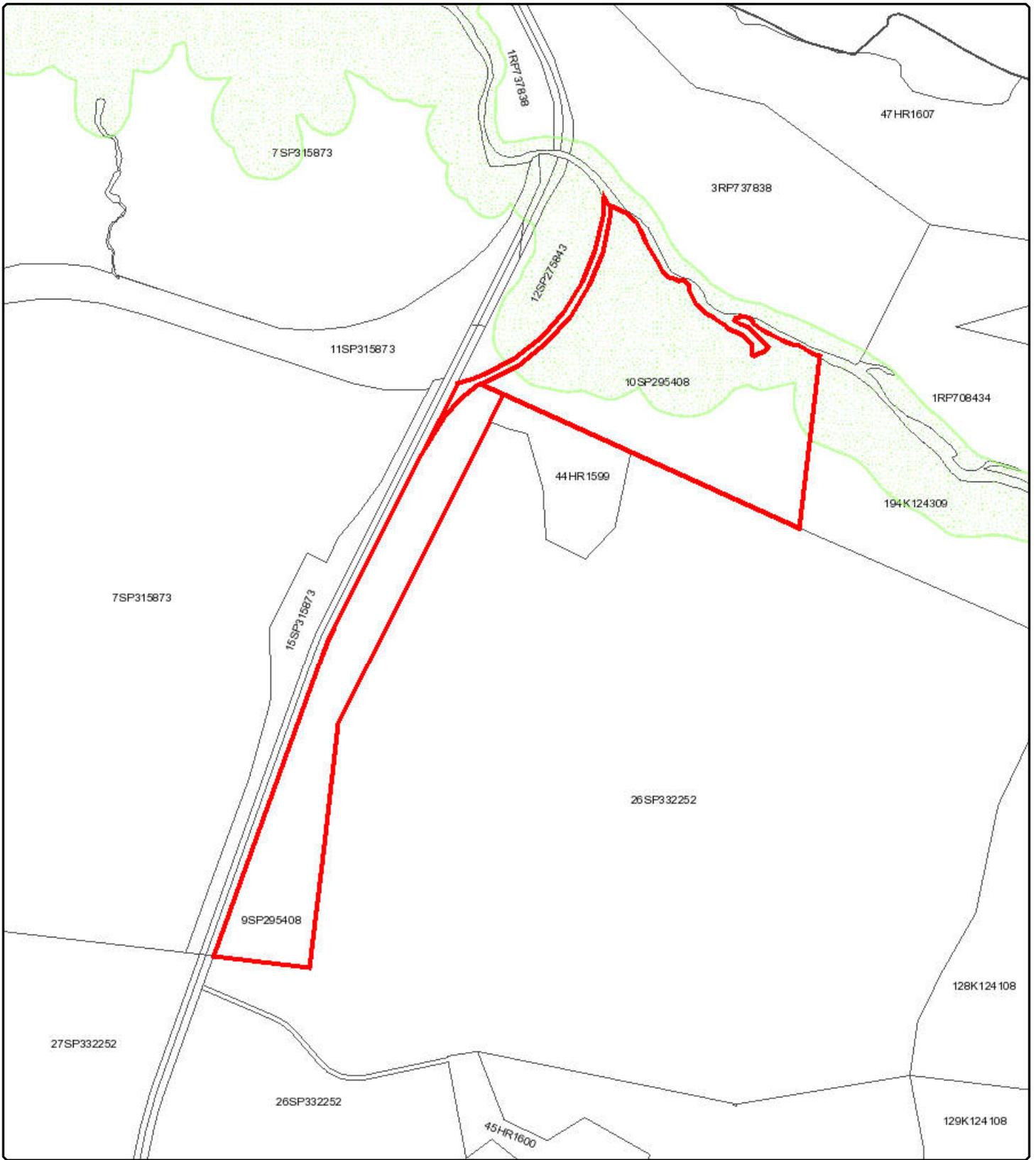
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- Coastal area - high storm tide inundation area
-  Coastal area - high storm tide inundation area



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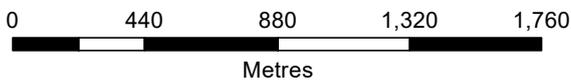
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Legend

Wetland protection area trigger area

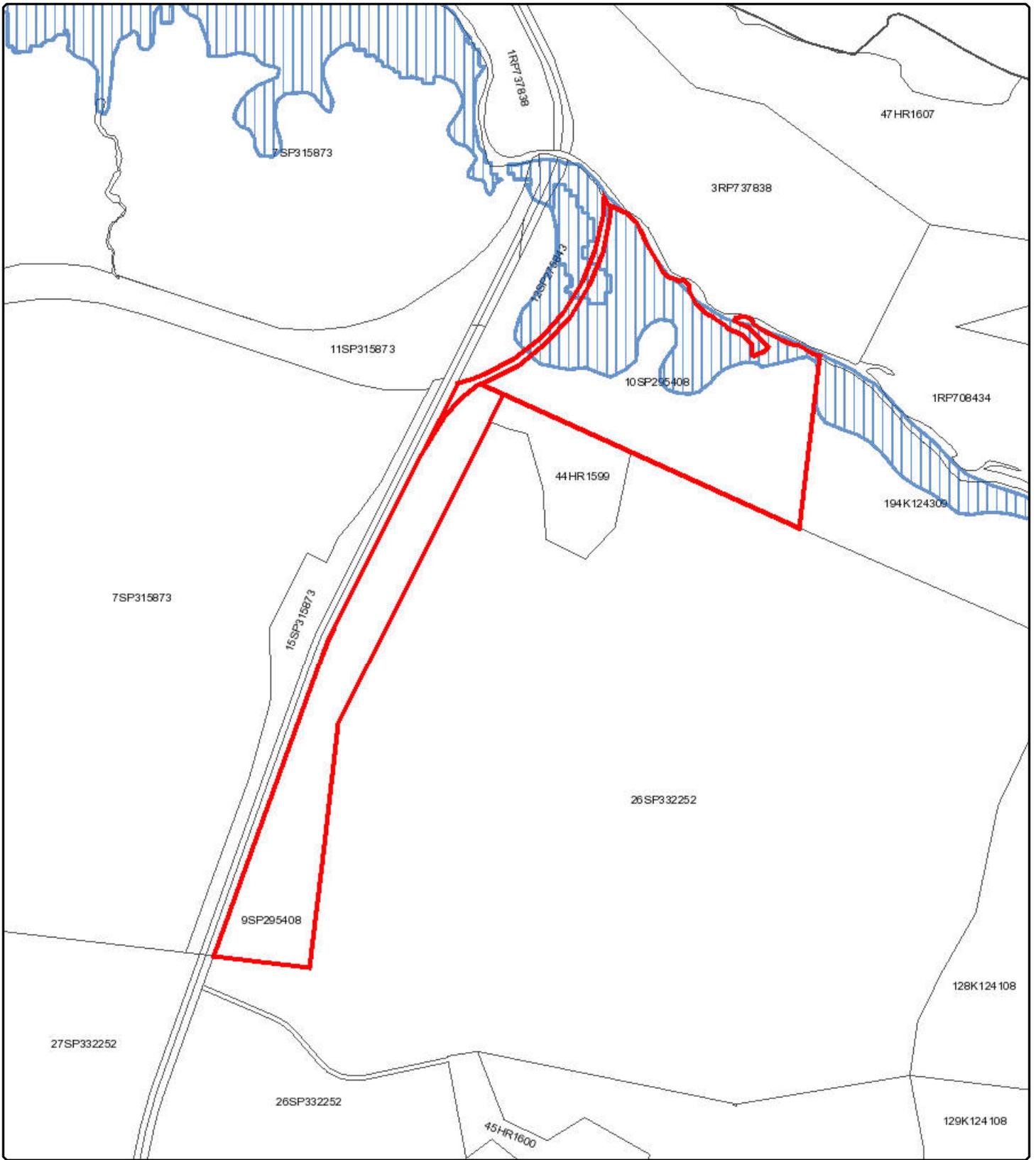


Wetland protection area trigger area



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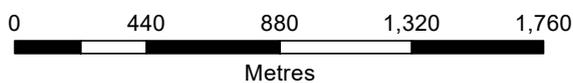


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Legend

- Wetland protection area wetland
-  Wetland protection area wetland



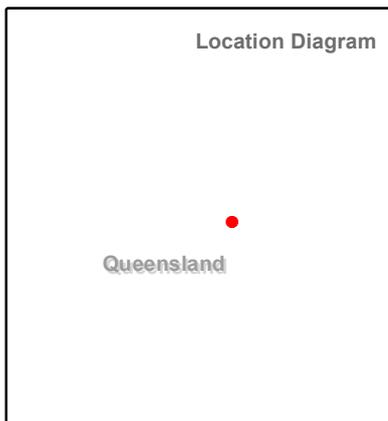
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Appendix 4

State Planning Policy - Lot Plan Search

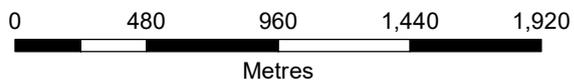
Making or amending a local planning instrument
and designating land for community infrastructure

Date: 09/04/2024



Queensland Government

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State Planning Policy mapping layers - consolidated list for all selected Lot Plans

(Note: Please refer to following pages for State Interests listed for each selected Lot Plan)

AGRICULTURE

- Important agricultural areas
- Agricultural land classification - class A and B

DEVELOPMENT AND CONSTRUCTION

- State development area

BIODIVERSITY

- MSES - Wildlife habitat (endangered or vulnerable)
- MSES - Wildlife habitat (special least concern animal)
- MSES - Regulated vegetation (category R)
- MSES - Regulated vegetation (intersecting a watercourse)
- MSES - High ecological significance wetlands

COASTAL ENVIRONMENT

- Coastal management district

NATURAL HAZARDS RISK AND RESILIENCE

- Flood hazard area - Level 1 - Queensland floodplain assessment overlay*
- Flood hazard area - Local Government flood mapping area*
- Bushfire prone area
- Erosion prone area
- Medium storm tide inundation area
- High storm tide inundation area

STRATEGIC PORTS

- Strategic ports



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State Planning Policy
Making or amending a local planning instrument
and designating land for community infrastructure

Date: 09/04/2024

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State Planning Policy mapping layers for each selected Lot Plan

Lot Plan: 8SP295408 (Area: 45650 m²)

AGRICULTURE

- Important agricultural areas
- Agricultural land classification - class A and B

DEVELOPMENT AND CONSTRUCTION

- State development area

BIODIVERSITY

- MSES - Wildlife habitat (endangered or vulnerable)
- MSES - Wildlife habitat (special least concern animal)
- MSES - Regulated vegetation (intersecting a watercourse)
- MSES - High ecological significance wetlands

COASTAL ENVIRONMENT

- Coastal management district

NATURAL HAZARDS RISK AND RESILIENCE

- Flood hazard area - Level 1 - Queensland floodplain assessment overlay*
- Flood hazard area - Local Government flood mapping area*
- Bushfire prone area
- Erosion prone area
- Medium storm tide inundation area
- High storm tide inundation area

STRATEGIC PORTS

- Strategic ports

Lot Plan: 9SP295408 (Area: 645700 m²)

AGRICULTURE

- Important agricultural areas
- Agricultural land classification - class A and B

DEVELOPMENT AND CONSTRUCTION

- State development area

BIODIVERSITY

- MSES - Wildlife habitat (special least concern animal)
- MSES - Regulated vegetation (category R)
- MSES - Regulated vegetation (intersecting a watercourse)

COASTAL ENVIRONMENT

- Coastal management district

NATURAL HAZARDS RISK AND RESILIENCE

- Flood hazard area - Level 1 - Queensland floodplain assessment overlay*
- Flood hazard area - Local Government flood mapping area*
- Bushfire prone area

STRATEGIC PORTS

- Strategic ports

Lot Plan: 10SP295408 (Area: 940000 m²)

AGRICULTURE

- Important agricultural areas
- Agricultural land classification - class A and B

DEVELOPMENT AND CONSTRUCTION



Queensland Government

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State Planning Policy

Making or amending a local planning instrument
and designating land for community infrastructure

Date: 09/04/2024

Disclaimer: This map has been prepared with due care based on the best available information at the time of publication. However, the State of Queensland (acting through the department) makes no representations, either express or implied, that the map is free from errors, inconsistencies or omissions. Reliance on information contained in this map is the sole responsibility of the user. The State disclaims responsibility for any loss, damage or inconvenience caused as a result of reliance on information or data contained in this map.

State Planning Policy mapping layers for each selected Lot Plan

...Continued from previous page

- State development area

BIODIVERSITY

- MSES - Wildlife habitat (endangered or vulnerable)

- MSES - Wildlife habitat (special least concern animal)

- MSES - Regulated vegetation (category R)

- MSES - Regulated vegetation (intersecting a watercourse)

- MSES - High ecological significance wetlands

COASTAL ENVIRONMENT

- Coastal management district

NATURAL HAZARDS RISK AND RESILIENCE

- Flood hazard area - Level 1 - Queensland floodplain assessment overlay*

- Flood hazard area - Local Government flood mapping area*

- Bushfire prone area

- Erosion prone area

- Medium storm tide inundation area

- High storm tide inundation area



Queensland Government

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State Planning Policy
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Date: 09/04/2024

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Appendix 5

BULK EARTHWORKS LEGEND

LINE	DESCRIPTION
—————	FINISHED PAD LEVEL
- - - - -	EXISTING SURFACE CONTOURS
- - -12.00- - -	EXISTING SURFACE CONTOUR LABEL
12.00	BULK EARTHWORKS SPOT ELEVATIONS

- NOTES:**
- BULK EARTHWORKS ARE TO BE GRADED LINEARLY BETWEEN EARTHWORKS POINTS.
 - REFER SEDIMENT AND EROSION CONTROL NOTES AND DETAILS.
 - REFER EARTHWORKS PLAN FOR PAVEMENT ALLOWANCES.
 - TOLERANCES REFER CONTRACT DOCUMENTATION
 - SITE BOUNDARIES TO BE CONFIRMED BY SURVEY
 - SITE SERVICES PROVIDED BY SUBDIVISION DOCUMENTATION ONLY AND IT IS THE CONTRACTORS RESPONSIBILITY TO CONFIRM ALL LOCATIONS AND HEIGHTS BEFORE COMMENCING WORK

LRE LAUNCH PAD EARTHWORK VOLUMES	
STRIP	166.0 cub.m
CUT	123.9 cub.m
TYPE 2.5 GRAVEL	854.5 cub.m
TYPE 2.3 GRAVEL	106.3 cub.m

A	PRELIMINARY	03.03.2023	L.K.
REV	DESCRIPTION	DATE	BY

Status
PRELIMINARY
 NOT TO BE USED FOR CONSTRUCTION

Project
**BOWEN ORBITAL SPACE PORT
 BOWEN QUEENSLAND**

for
GILMORE SPACE TECH

Title
**LRE LAUNCH PAD
 EARTHWORKS PLAN**

Drawn	Date	Chkd	Date
L.K.	03.03.2023	T.J.S	
Design	Date	Apprd	Date
L.K.		T.J.S	
Scale	A1	Certif	Date
As indicated		T.J.S	
Project No.	Dwg. No.	Rev	
21-307	C00	A	

BULK EARTHWORKS NOTES

- THE CONTRACTOR SHALL CARRY OUT FIELD DENSITY TESTING OF BULK FILLED AREAS INCLUDING BUILDING PLATFORMS AND REPLACED INSITU MATERIAL AS PER THE FOLLOWING REQUIREMENTS:
- WORKS TO BE IN ACCORDANCE WITH AS 3798 - 2007.
 - TESTING TO BE IN ACCORDANCE WITH AS 1289 (RELEVANT PORTIONS).
 - SPECIFIC TESTING REQUIREMENTS
 - LEVEL ONE TESTING TO BE PROVIDED BY GEOTECHNICAL TESTING AUTHORITY (GTA).
 - A DAILY GEOTECHNICAL SITE RECORD IS TO BE KEPT, REFER AS 3798, APPENDIX C
 - QUANTITY OF TESTING TO BE NOT LESS THAN ANY OF THE FOLLOWING
 - 1 TEST PER LAYER PER 2500sqm
 - 1 TEST PER 500cub.m DISTRIBUTED EVENLY THROUGHOUT THE DEPTH AND AREA OF OF THE FILLING
 - 3 TESTS PER VISIT BY THE GEOTECHNICAL TESTING AUTHORITY (GTA)
 - DEGREE OF COMPACTION TO BE AS FOLLOWS
 - NSL TO 500mm BELOW FSL = 95% STANDARD COMPACTION
 - 500mm BELOW FSL TO FSL OR FPL = 100% STANDARD COMPACTION
 - MATERIAL MOISTURE CONTENT TO BE IN THE RANGE OF 85% TO 115% OF OPTIMAL MOISTURE CONTENT (OMC)
 - COMPACT SUBGRADE SURFACES IN CUT AREAS OF THE PLATFORM SHALL HAVE DRY DENSITY TESTING PERFORMED AT INTERVALS NOT LESS THAN 1 PER 2000sq.m
 - THE EXPENSE OF THE TESTING IS THE RESPONSIBILITY OF THE CONTRACTOR.

PAVEMENT NOTES

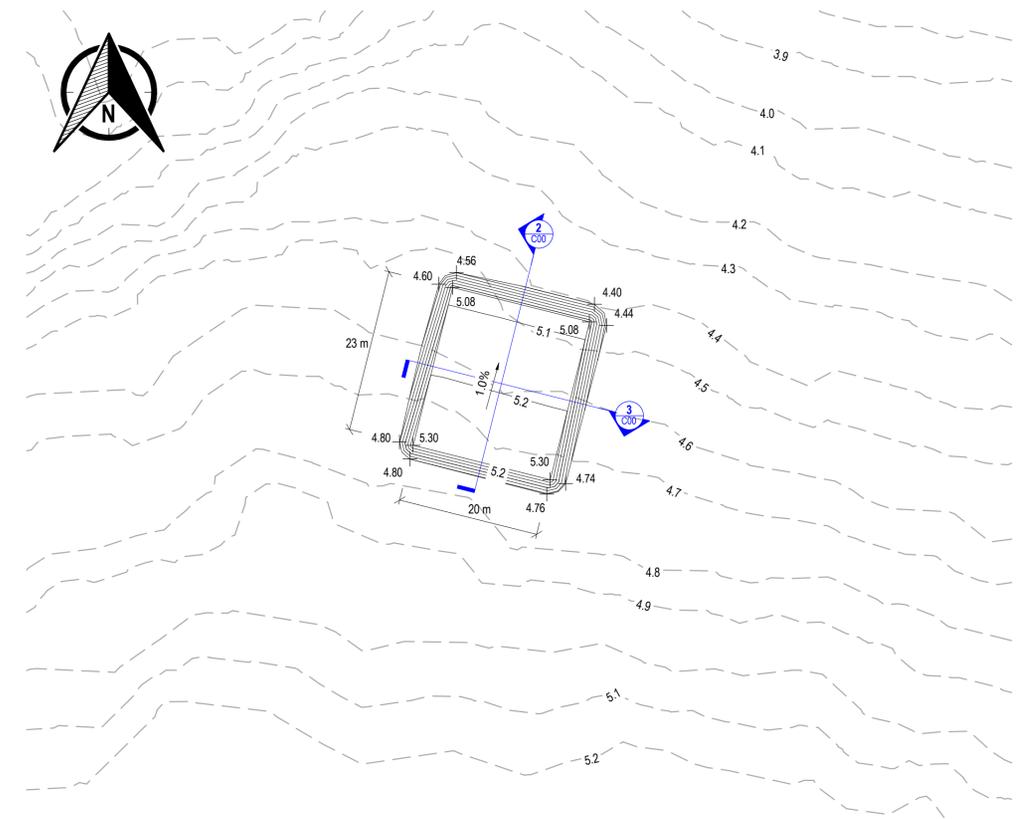
- ALL PAVEMENTS ARE BASED ON A SOUND AND TRAFFICABLE SUBGRADE.
- WET AND/OR SOFT AREAS FAILING THE SUBGRADE PROOF ROLL TEST MAY REQUIRE SOME FORM OF SUBGRADE IMPROVEMENT.
- THE DESIGN ENGINEER SHALL BE CONSULTED TO ASSESS OPTIONS SUCH AS:
 - LIME STABILISATION
 - GEOTEXTILE STRENGTHENING
 - COARSE ROCKFILL STRENGTHENING
 - SUBGRADE REPLACEMENT
 OR A COMBINATION OF ALL THESE OPTIONS.

GENERAL NOTES

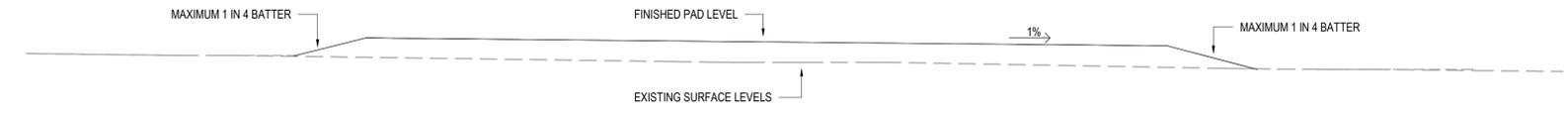
- THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL OTHER CONSULTANTS DRAWINGS AND SPECIFICATIONS. THE PROJECT SPECIFICATION SHALL TAKE PRECEDENCE OVER THESE GENERAL NOTES.
- BEFORE PROCEEDING WITH THE WORK ANY DISCREPANCIES IN THE CONTRACT DOCUMENTS SHALL BE REFERRED FOR DECISION TO THE DESIGN ENGINEER.
- ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE CURRENT EDITIONS INCLUDING AMENDMENTS OF THE RELEVANT GLADSTONE REGIONAL COUNCIL STANDARDS, TMR STANDARDS, QLD CODES OF PRACTICE.
- PROVIDE AS-CONSTRUCTED SURVEY FOR ALL WORKS.
- THE SURVEY OF EXISTING SURFACE LEVELS HAS BEEN DERIVED FROM PUBLICLY AVAILABLE LIDAR AND MAY NOT BE 100% ACCURATE. CONFIRM EXISTING SURFACE LEVELS PRIOR TO CONSTRUCTION.
- ACCESS RAMPS TO THE LAUNCH PAD TO BE DESIGNED BY OTHERS
- AS PER GEOTECHNICAL REPORT GE_2211.1150, ACID SULPHATE HAS BEEN IDENTIFIED AND NEEDS TO BE TREATED APPROPRIATELY. REFER TO ACID SULPHATE TREATMENT PLAN.
- CONCRETE SLAB DESIGNS FOR THE STORAGE TANKS ARE TO BE DESIGNED BY OTHERS.

HOLD POINT:
 PROOF ROLL TO BE CONDUCTED ON THE SUBGRADE. CONTACT ENGINEER FOR AN INSPECTION 24 HOURS PRIOR TO THE REQUIRED INSPECTION TIME.

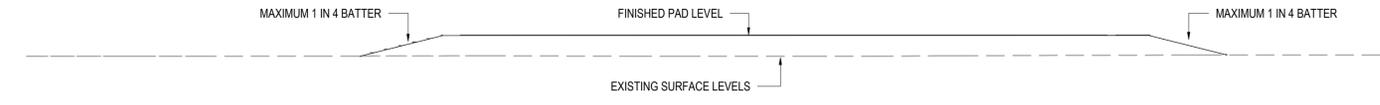
- FOR A SUCCESSFUL PROOF ROLL INSPECTION:
- NO SOFT SPOTS ARE TO BE FOUND - CONTRACTOR TO CONDUCT A PROOF ROLL ON SITE PRIOR TO CONTACTING ENGINEER TO ENSURE PAVEMENT WILL PASS.
 - THE PROOF ROLL IS ASSUMED TO BE CONDUCTED IN A SINGLE STAGE. IF A DIFFERENT APPROACH IS NEEDED, CONTACT THE ENGINEER.



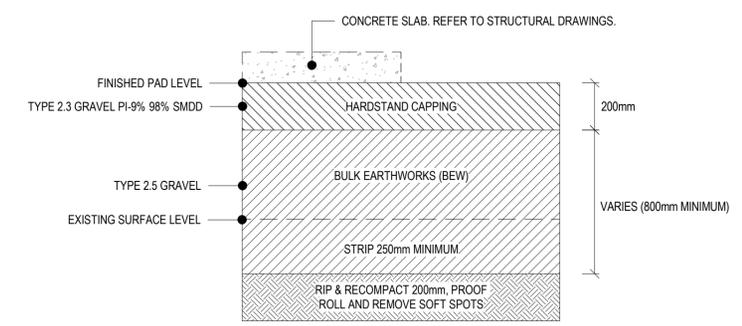
1 LAYOUT PLAN
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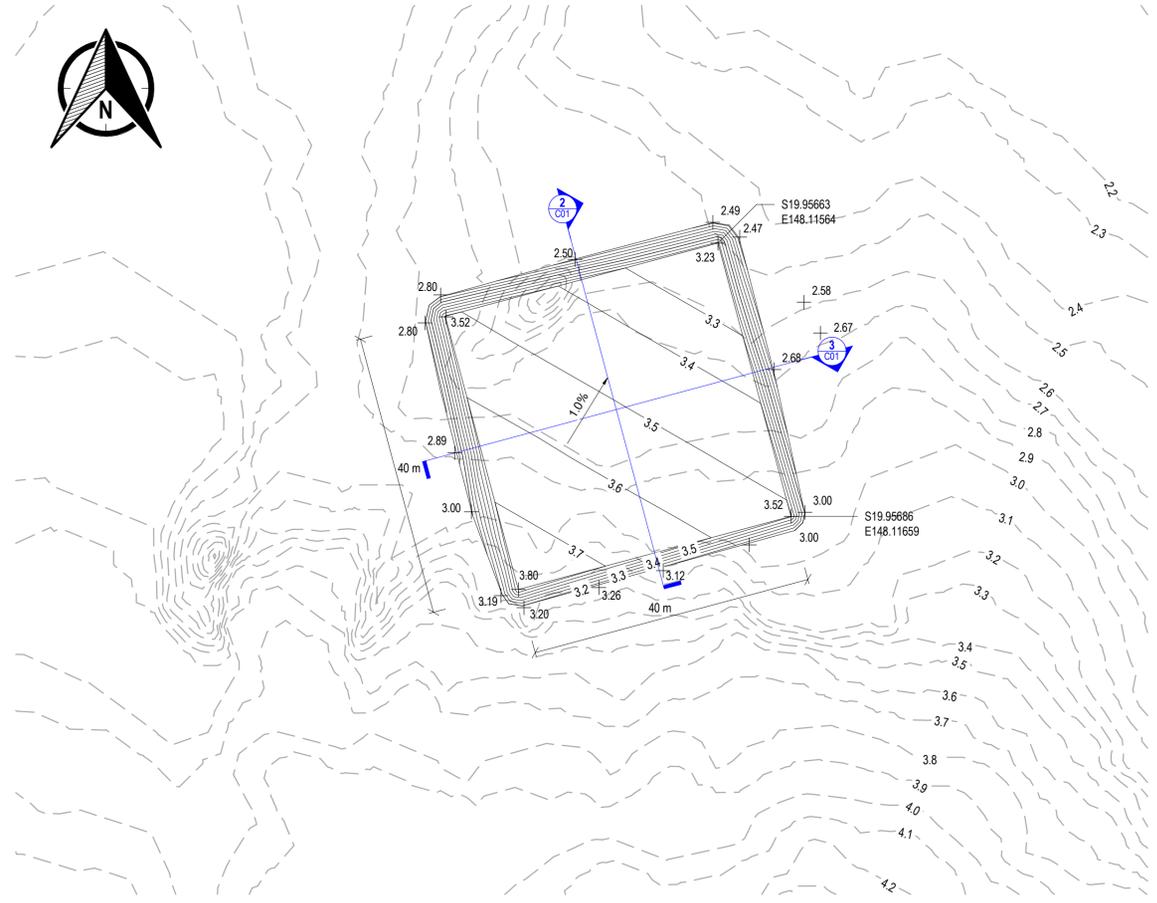
2 BULK EARTHWORKS SECTION 1
 C00 1: 100



3 BULK EARTHWORKS SECTION 2
 C00 1: 100



4 TYPICAL PAD PAVEMENT DETAILS
 1: 150



GENERAL NOTES

- THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL OTHER CONSULTANTS DRAWINGS AND SPECIFICATIONS. THE PROJECT SPECIFICATION SHALL TAKE PRECEDENCE OVER THESE GENERAL NOTES.
- BEFORE PROCEEDING WITH THE WORK ANY DISCREPANCIES IN THE CONTRACT DOCUMENTS SHALL BE REFERRED FOR DECISION TO THE DESIGN ENGINEER.
- ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE CURRENT EDITIONS INCLUDING AMENDMENTS OF THE RELEVANT GLADSTONE REGIONAL COUNCIL STANDARDS, TMR STANDARDS, QLD CODES OF PRACTICE.
- PROVIDE AS-CONSTRUCTED SURVEY FOR ALL WORKS.
- THE SURVEY OF EXISTING SURFACE LEVELS HAS BEEN DERIVED FROM PUBLICLY AVAILABLE LIDAR AND MAY NOT BE 100% ACCURATE. CONFIRM EXISTING SURFACE LEVELS PRIOR TO CONSTRUCTION.
- ACCESS RAMPS TO THE LAUNCH PAD TO BE DESIGNED BY OTHERS
- AS PER GEOTECHNICAL REPORT GE 2211.1150, ACID SULPHATE HAS BEEN IDENTIFIED AND NEEDS TO BE TREATED APPROPRIATELY. REFER TO ACID SULPHATE TREATMENT PLAN.
- CONCRETE SLAB DESIGNS FOR THE STORAGE TANKS ARE TO BE DESIGNED BY OTHERS.

PAVEMENT NOTES

- ALL PAVEMENTS ARE BASED ON A SOUND AND TRAFFICABLE SUBGRADE.
- WET AND/ OR SOFT AREAS FAILING THE SUBGRADE PROOF ROLL TEST MAY REQUIRE SOME FORM OF SUBGRADE IMPROVEMENT.
- THE DESIGN ENGINEER SHALL BE CONSULTED TO ASSESS OPTIONS SUCH AS:
 - LIME STABILISATION
 - GEOTEXTILE STRENGTHENING
 - COARSE ROCKFILL STRENGTHENING
 - SUBGRADE REPLACEMENT
 - OR A COMBINATION OF ALL THESE OPTIONS.

BULK EARTHWORKS NOTES

- WORKS SHALL BE EXECUTED BY THE CONTRACTOR IN ACCORDANCE WITH AS3798 - 2007, 'GUIDELINES FOR COMMERCIAL AND RESIDENTIAL DEVELOPMENTS' AND SHALL BE SUPERVISED BY AN APPROVED GEOTECHNICAL TESTING AUTHORITY, (GTA) AS DEFINED IN THE CODE TO A LEVEL 2 STANDARD.
- FOLLOWING INITIAL MOBILISATION AND PRIOR TO STRIPPING OF THE SITE, THE CONTRACTOR SHALL IMMEDIATELY UNDERTAKE THE EROSION AND SEDIMENT RUNOFF PREVENTION MEASURES.
- FOLLOWING THE STRIPPING OF THE UPPER ORGANIC SOIL, THE SITE SHALL BE PROOF ROLLED TO IDENTIFY ANY SOFT SPOTS OR FURTHER SIGNS OF UNSUITABLE MATERIAL. ANY SUCH AREAS SHALL BE RECTIFIED PRIOR TO COMMENCEMENT OF FILLING OPERATIONS.
- FILLING SHALL BE COMPLETED IN ACCORDANCE WITH THE FOLLOWING REQUIREMENTS
 - WORKS TO BE IN ACCORDANCE WITH AS3798 - 2007
 - DEGREE OF COMPACTION TO BE AS FOLLOWS
 - SUBGRADE COURSES LESS THAN 300mm BELOW DESIGN SURFACE LEVEL 95% SMDD.
 - SUBGRADE COURSES 300mm OR MORE BELOW DESIGN SURFACE LEVEL 98% SMDD
 - SUBBASE COURSES 98% SMDD
 - BASE COURSES 98% SMDD
 - MATERIAL MOISTURE CONTENT TO BE IN THE RANGE OF ±3% OF OPTIMAL MOISTURE CONTENT (OMC)
 - THE EXPENSE OF TESTING IS ON THE CONTRACTOR
- IT IS THE CONTRACTORS RESPONSIBILITY TO PROTECT THE SITE AND SURROUNDING AREAS FROM DAMAGE RESULTING FROM STORMWATER RUNOFF. TEMPORARY DIVERSION DRAINS AND OR OTHER DRAINAGE CONTROL DEVICES ARE TO BE IMPLEMENTED BY THE CONTRACTOR DURING CONSTRUCTION TO MINIMISE THE EFFECTS OF WEATHER. NO EXTENSIONS OF TIME WILL BE GRANTED SHOULD DAMAGE TO THE WORK AND SURROUNDING AREAS RESULT FROM THE CONTRACTORS NEGLIGENCE IN NOT PROVIDING ADEQUATE PROTECTION.
- EXCESS SPOIL MATERIAL GENERATED DURING CONSTRUCTION SHALL BE REMOVED FROM THE SITE BY THE CONTRACTOR.

HOLD POINT:
PROOF ROLL TO BE CONDUCTED ON THE SUBGRADE. CONTACT ENGINEER FOR AN INSPECTION 24 HOURS PRIOR TO THE REQUIRED INSPECTION TIME.

FOR A SUCCESSFUL PROOF ROLL INSPECTION:
1. NO SOFT SPOTS ARE TO BE FOUND - CONTRACTOR TO CONDUCT A PROOF ROLL ON SITE PRIOR TO CONTACTING ENGINEER TO ENSURE PAVEMENT WILL PASS.
2. THE PROOF ROLL IS ASSUMED TO BE CONDUCTED IN A SINGLE STAGE. IF A DIFFERENT APPROACH IS NEEDED, CONTACT THE ENGINEER.

BULK EARTHWORKS LEGEND

LINE	DESCRIPTION
—————	FINISHED PAD LEVEL
- - - - -	EXISTING SURFACE CONTOURS
- - - 12.00 - - -	EXISTING SURFACE CONTOUR LABEL
12.00	BULK EARTHWORKS SPOT ELEVATIONS

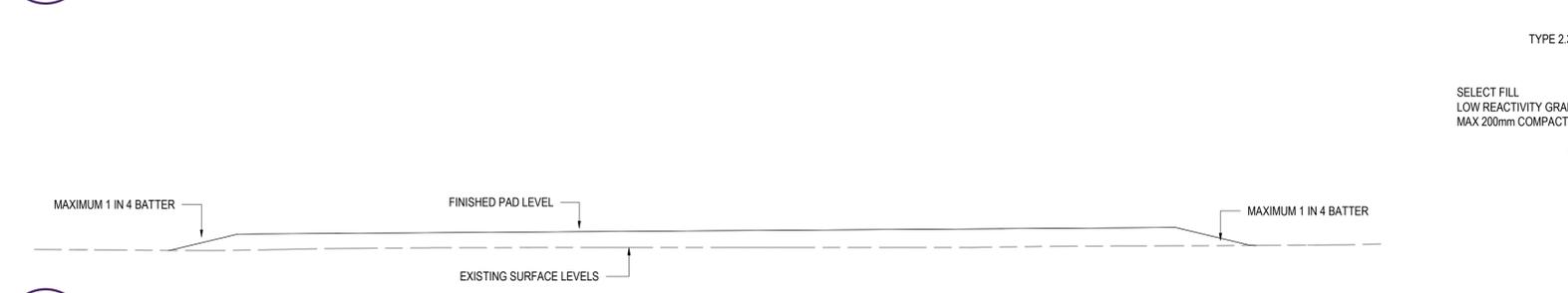
- NOTES:**
- BULK EARTHWORKS ARE TO BE GRADED LINEARLY BETWEEN EARTHWORKS POINTS.
 - REFER SEDIMENT AND EROSION CONTROL NOTES AND DETAILS.
 - REFER EARTHWORKS PLAN FOR PAVEMENT ALLOWANCES.
 - TOLERANCES REFER CONTRACT DOCUMENTATION
 - SITE BOUNDARIES TO BE CONFIRMED BY SURVEY
 - SITE SERVICES PROVIDED BY SUBDIVISION DOCUMENTATION ONLY AND IT IS THE CONTRACTORS RESPONSIBILITY TO CONFIRM ALL LOCATIONS AND HEIGHTS BEFORE COMMENCING WORK

SIRIUS LAUNCH PAD EARTHWORK VOLUMES	
STRIP	525.9 cub.m
CUT	0 cub.m
SELECT FILL	1478 cub.m
TYPE 2.3 GRAVEL	346.112 cub.m

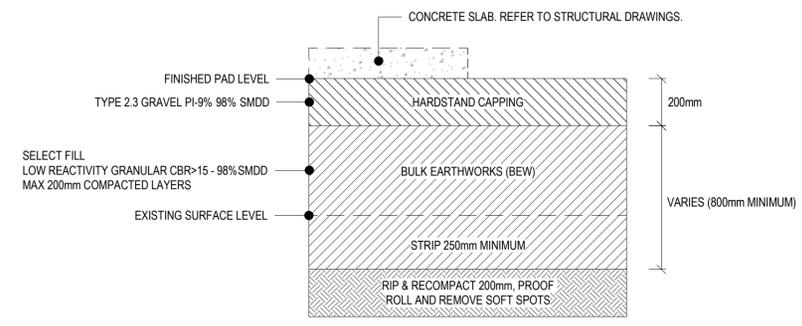
1 LAYOUT PLAN
1 : 500



2 BULK EARTHWORKS SECTION 3
C01 1 : 150



3 BULK EARTHWORKS SECTION 4
C01 1 : 150



4 TYPICAL PAD PAVEMENT DETAILS
1 : 150

REV	DESCRIPTION	DATE	BY
1	PAD AMENDED	29.02.2024	T.J.S.
0	FOR CONSTRUCTION	21.04.2023	P.J.M.
A	PRELIMINARY	03.03.2023	L.K.

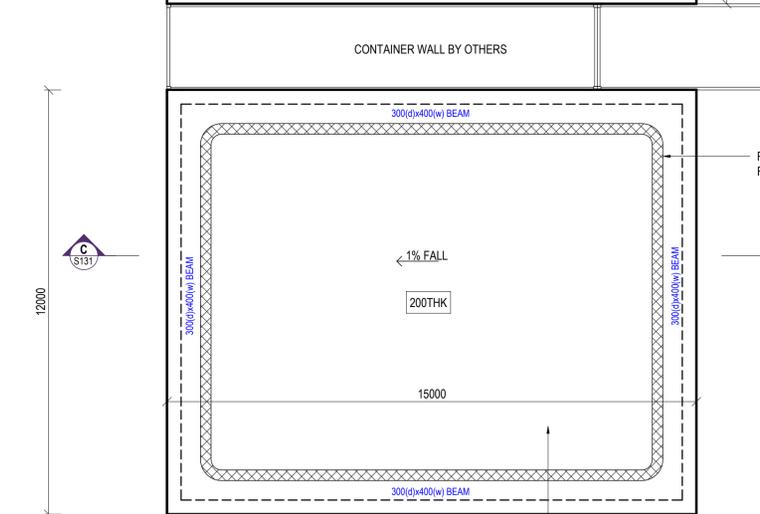
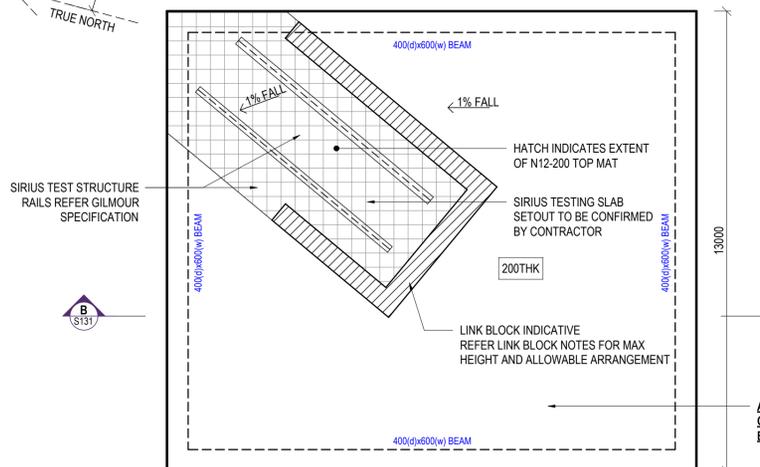
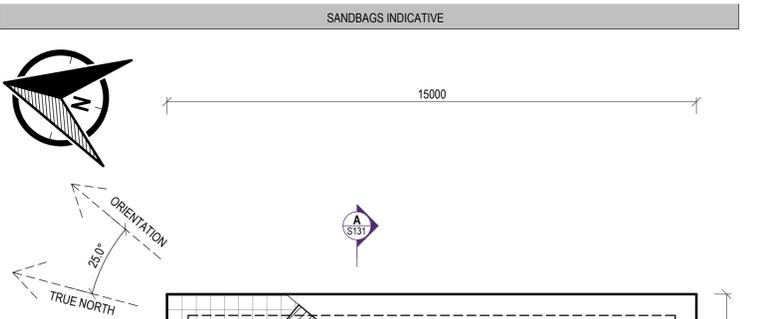
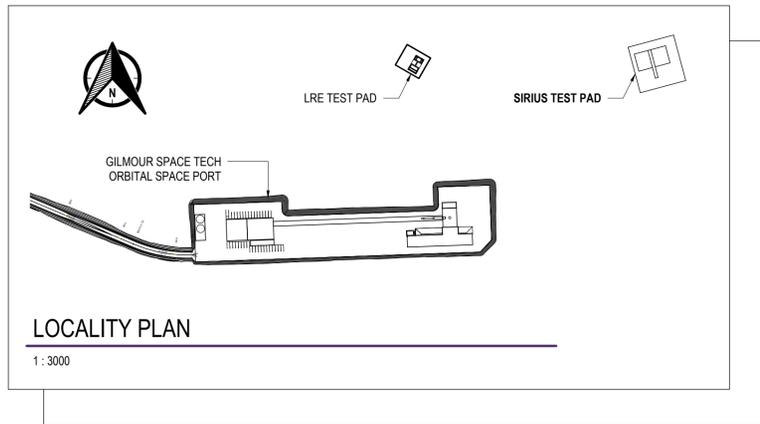
FOR CONSTRUCTION

Project
**BOWEN ORBITAL SPACE PORT
BOWEN QUEENSLAND**

for
GILMOUR SPACE TECH

Title
**SIRIUS LAUNCH PAD
EARTHWORKS PLAN**

Drawn	Date	Chkd	Date
L.K.	03.03.2023	T.J.S.	
Design	Date	Apprd	Date
L.K.		T.J.S.	
Scale	A1	Certif	Date
As indicated		T.J.S.	
Project No.	Dwg. No.	Rev	
21-307	C01	1	



ONLY FORKLIFT VEHICLE LOAD HAS BEEN ALLOWED ON SLAB.

DESIGN CRITERIA

- GENERAL PRINCIPLES HAVE BEEN ASSESSED IN ACCORDANCE WITH AS1170.0:

IMPORTANCE LEVEL	IL2
DESIGN LIFE	50 YEARS
- PERMANENT ACTIONS HAVE BEEN ASSESSED IN ACCORDANCE WITH AS1170.1:

LINK BLOCK	3m HIGH SELF-WEIGHT
20,000L ISO TANK	5t DRY, 30t WET
HTP BUND	26KL STORAGE
CYLINDER MAN PACK	16kN POINT LOAD
VARIOUS STORAGE TANKS	MAX 5t
- IMPOSED ACTIONS HAVE BEEN ASSESSED IN ACCORDANCE WITH AS1170.1:

SIRIUS THRUST LOAD	5t SELF WEIGHT 180kN THRUST DIRECTION 15kN LATERAL SHOCK 45kN OVERTURN SHOCK
VEHICLE LOADING	2.5t FORKLIFT
FOOT TRAFFIC	5kPa
- WIND LOADS HAVE BEEN ASSESSED IN ACCORDANCE WITH AS1170.2:

REGION	C
TERRAIN CATEGORY	TC2
WIND DIRECTION MULTIPLIER	0.9
SHIELDING MULTIPLIER	1.0
TOPOGRAPHICAL MULTIPLIER	1.0

FOUNDATION NOTES

- FOOTINGS SHALL BE PLACED CENTRALLY UNDER COLUMNS UNLESS NOTED OTHERWISE.
- EXCAVATIONS SHALL BE KEPT FREE OF PONDED WATER BEFORE PLACING CONCRETE.
- FOOTINGS HAVE BEEN DESIGNED BASED ON THE FOLLOWING GEOTECHNICAL REPORT:

GEOTECHNICAL DETAILS	
GEOTECHNICAL REPORT BY	GROUND ENVIRONMENTS PTY LTD
REPORT JOB NUMBER	GE_2211.1150
REPORT DATE	11.01.2023
SITE CLASSIFICATION	H1
MIN. BEARING CAPACITY (ULS)	200kPa
MIN PILE SKIN FRICTION (ULS)	N/A
EXPECTED FOUNDING MATERIAL	CONTROLLED FILL
- GEOTECHNICAL ENGINEER TO CONFIRM FOUNDATION DESIGN PARAMETERS PRIOR TO PLACING CONCRETE.
- PLACE BLINDING CONCRETE TO BASE OF FOOTING EXCAVATION TO ACHIEVE DESIGN AND / OR UNIFORM BEARING MATERIAL.

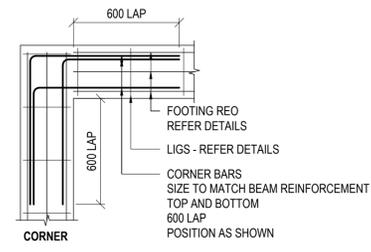
LINK BLOCK NOTES

- LINK BLOCK MAX HEIGHT DURING WIND EVENTS:

MAXIMUM WIND GUST SPEED	MAX WALL HEIGHT
44.5m/s	1.8m (DURING SERVICE)
56.0m/s	1.2m
- LINK BLOCK WALLS SHALL BE UNSTACKED PRIOR TO STORM EVENTS AND OUT OF SERVICE.
- LINK BLOCK WALLS CAN BE RELOCATED AND ARRANGED TO SUIT SERVICE OPERATIONS. DO NOT ARRANGE LINK BLOCK WALLS IN PARALLEL ROWS AT LESS THAN 1m CENTRES.

SLAB ON GROUND NOTES

- SUBGRADE TO BE CONSTRUCTED AS PER EARTHWORKS NOTES.
- SLAB TO BE PLACED ON 50mm BEDDING SAND WITH WATERPROOF MEMBRANE AS PER CONCRETE NOTES.
- PROVIDE 2N12 TRIMMER BARS 1000 LONG TO ALL RE-ENTRANT CORNERS.
- SLAB TO HAVE A NOMINAL 1% FALL FOR SURFACE DRAINAGE OF SLAB.



STRIP FOOTING WITH REINFORCEMENT BARS
TYPICAL FOOTING CORNER DETAIL
FOOTING CORNER DETAILS
NTS

CONCRETE NOTES

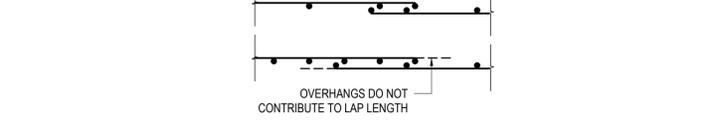
- ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 3600 & AS 1379.
- CONCRETE QUALITY AND CLEAR CONCRETE COVER TO REINFORCEMENT (OUTSIDE OF STIRRUPS AND TIES) SHALL BE AS FOLLOWS UNLESS NOTED OTHERWISE:

ELEMENT	CONCRETE GRADE	CLEAR COVER	SLUMP
BEAMS	N32	30 TOP COVER 50 BTM COVER 50 SIDE COVER	SLUMP 90 PLUS 20 MINUS 20
SLABS	REFER SLAB ON GROUND SCHEDULE ON DRAWINGS	30 TOP COVER 50 BTM COVER 50 SIDE COVER	SLUMP 90 PLUS 20 MINUS 20
- CONCRETE MIX TO HAVE A MAXIMUM AGGREGATE SIZE OF 20mm.
- SPECIFIED STRUCTURAL THICKNESSES FOR CONCRETE ELEMENTS DO NOT INCLUDE THICKNESS OF APPLIED FINISHES.
- CONSTRUCTION JOINTS OR POUR BREAKS WHERE NOT SHOWN ON PLANS OR DETAILS SHALL BE LOCATED AND FORMED TO THE APPROVAL OF THE ENGINEER.
- NO PENETRATIONS, RECESSES OR CHASES OTHER THAN THOSE SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE MADE IN CONCRETE MEMBERS WITHOUT APPROVAL OF THE ENGINEER.
- AT PENETRATIONS IN SLABS UNLESS OTHERWISE DETAILED REINFORCEMENT MUST NOT BE CUT BUT SHALL BE GATHERED EQUALLY TO EACH SIDE OF PENETRATION AND EXTRA REINFORCEMENT PROVIDED BETWEEN THE PENETRATIONS AS DIRECTED BY THE ENGINEER.
- REINFORCEMENT IS REPRESENTED DIAGRAMMATICALLY. IT IS NOT NECESSARILY SHOWN IN TRUE PROJECTION.
- PROVIDE THE ENGINEER WITH 48 HOURS NOTICE OF REINFORCEMENT BEING READY FOR INSPECTION. NO CONCRETE IS TO BE POURED WITHOUT THE APPROVAL OF THE ENGINEER. THIS IS TO BE CONFIRMED AT A LATER DATE.
- SPLICES IN REINFORCEMENT SHALL BE MADE ONLY IN THE POSITIONS SHOWN. WHERE LAP LENGTH IS NOT SHOWN IT SHALL BE SUFFICIENT TO DEVELOP THE FULL STRENGTH OF THE REINFORCEMENT. THE FOLLOWING MINIMUM SPLICE LENGTHS SHALL BE USED UNLESS NOTED OTHERWISE:

THE FOLLOWING MINIMUM BAR SPLICE LENGTHS ARE APPLICABLE FOR $f_c \geq 25\text{MPa}$ TO 65MPa .			
A - FOR VERTICAL OR HORIZONTAL BARS WITH LESS THAN 300mm OF CONCRETE CAST BELOW			
BAR DIAMETER	LAP LENGTH (mm)	BAR DIAMETER	LAP LENGTH (mm)
N10	360	N24	1165
N12	440	N28	1485
N16	605	N32	1835
N20	865	N36	2210

B - FOR HORIZONTAL BARS GREATER THAN OR EQUAL TO 300mm OF CONCRETE CAST BELOW

BAR DIAMETER	LAP LENGTH (mm)	BAR DIAMETER	LAP LENGTH (mm)
N10	470	N24	1550
N12	570	N28	1960
N16	785	N32	2385
N20	1125	N36	2870



- MAINTAIN 30 MIN. COVER TO REINFORCEMENT AT SERVICES AND CAST IN ITEMS THROUGH SLABS AND FOOTINGS. ALL SERVICES THROUGH FOOTING TO BE WRAPPED WITH COMPRESSIBLE MATERIAL MINIMUM 10mm ABLEFLEX OR SIMILAR.
- WELDING OF REINFORCEMENT WILL ONLY BE PERMITTED WITH THE PRIOR APPROVAL OF THE ENGINEER.
- REINFORCEMENT MUST NOT BE CONTINUOUS THROUGH CONTRACTION JOINTS.
- PLACE SUFFICIENT SUPPORT HURDLES/CHAIRS UNDER MAIN BOTTOM REINFORCING BARS AND TOP CROSS BARS IN SLABS AND FOOTINGS TO ALLOW THEM TO BE SUPPORTED IN THEIR CORRECT POSITIONS AND ALIGNMENT DURING CONCRETING (NOT GREATER THAN 900mm CENTRES UNLESS SHOWN OTHERWISE).
- REINFORCEMENT SYMBOLS:

SYMBOL	SPECIFICATION
N	GRADE D500N DEFORMED BAR
R	STRUCTURAL GRADE ROUND BAR
RF AND SL	HARD DRAWN SHEET RIBBED WIRE REINFORCING FABRIC

 THE NUMBER FOLLOWING THESE SYMBOLS IS THE BAR DIAMETER IN MILLIMETERS.
- SLABS TO BE CURED BY COVERING WITH 0.20mm BLACK POLYETHYLENE SHEETING AND KEPT MOIST FOR 7 DAYS MINIMUM OR APPROVED ALTERNATIVE CURING METHOD.
- NO CONCRETE TO BE POURED WHEN SITE TEMPERATURE EXCEEDS 35°C OR FALLS BELOW 5°C.

STRUCTURAL GROUT NOTES

- GROUT IS TO BE HIGH STRENGTH AND NON-SHRINK.
- ALL GROUT TO BE CEMENTITIOUS UNLESS NOTED OTHERWISE.
- MINIMUM 20MPa COMPRESSIVE STRENGTH FLOWABLE GROUT TO BE APPROVED BY ICUBED
- WHERE ALTERNATIVE GROUT PRODUCTS ARE USED THE FOLLOWING PROPERTIES ARE TO BE ACHIEVED:

COMPRESSIVE STRENGTH (AS1478.2:2005)	55MPa AT 1 DAYS 80MPa AT 7 DAYS
FLEXURAL STRENGTH (MODULUS OF RUPTURE AS1012.2.11:2000)	11.4MPa AT 7 DAYS
INDIRECT TENSILE STRENGTH (AS1012.2.10:2000)	5.1MPa AT 7 DAYS
- TOP OF CONCRETE TO HAVE A CONCRETE SURFACE PROFILE (CSP) OF MIN 2.0 (GRIND AND WATER BLAST SURFACE) IN ACCORDANCE WITH ICRI TECHNICAL GUIDELINE NO. 310.2R2013.
- ALL GROUT PRODUCTS ARE TO BE STORED, HANDLED AND PLACED STRICTLY IN ACCORDANCE WITH MANUFACTURERS CURRENT TECHNICAL DATA SHEET AND INSTRUCTIONS.

COATING NOTES

- THE FOLLOWING COATING REQUIREMENTS HAVE BEEN DETERMINED BY AS4312.
- ALL FABRICATED STRUCTURAL STEELWORK TO BE PREPARED WITH ABRASIVE BLAST CLEANING CLASS 2.5.
- SURFACES REQUIRING ONSITE TREATMENT ARE TO BE PRIMED IN ACCORDANCE WITH SURFACE TREATMENT MANUFACTURERS REQUIREMENTS.
- COATINGS HAVE BEEN SPECIFIED BASED ON THE FOLLOWING:

CORROSION CATEGORY	C3
STEEL CORROSION RATE $\mu\text{m/y}$	25 - 50
TYPICAL ENVIRONMENT	COASTAL/INDUSTRIAL
DURABILITY CLASS	LONG TERM
LIFE TO FIRST MAINTENANCE	10 YEARS TBC BY GILMOUR SPACE TECH
- SURFACE TREATMENT:

EXPOSED STRUCTURAL STEEL	HDG390/ILG100/ZB100
INTERNAL STRUCTURAL STEEL	HDG390/ILG100/ZB100

PROJECT TEAM

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CONSTRUCTION NOTES:

- REFER GENERAL CONSTRUCTION NOTES ON DWG S01
- REFER DRAWING ABBREVIATIONS ON S01
- REFER EARTHWORKS NOTES ON DWG S01

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FOR CONSTRUCTION

Project
**BOWEN ORBITAL SPACE PORT
SIRIUS TEST PAD
BOWEN QUEENSLAND**

for
GILMOUR SPACE TECH

Title
SIRIUS TEST PAD SLAB PLAN

Drawn	Date	Chkd	Date
JAW		RM	
Design	Date	Apprd	Date
LV		RM	
Scale	A1	Certif	Date
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Project No.	Dwg. No.	Rev	
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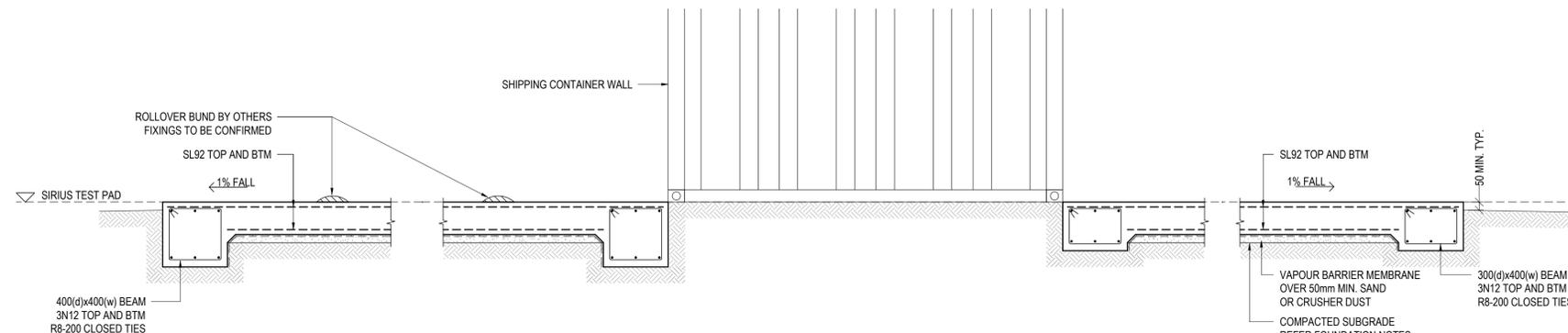
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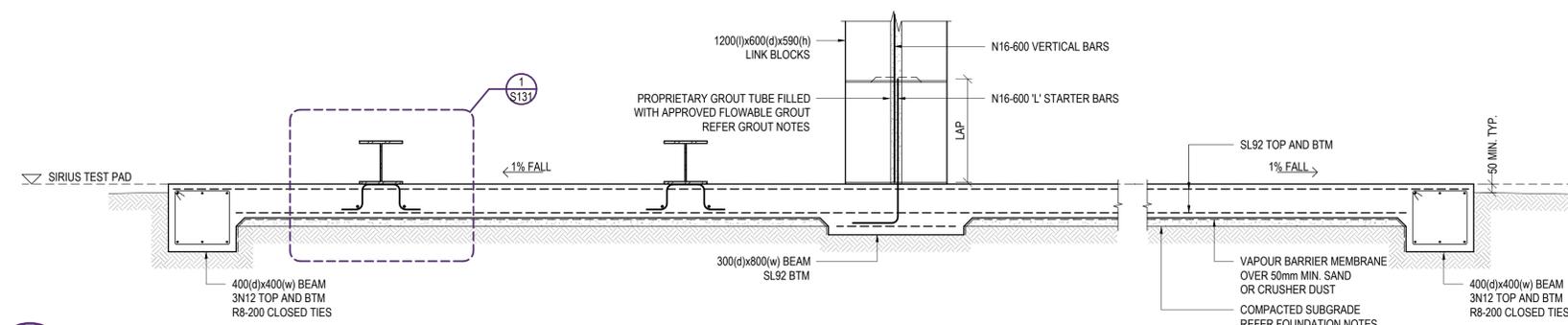
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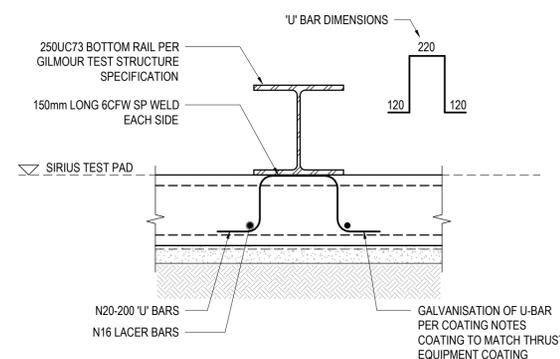
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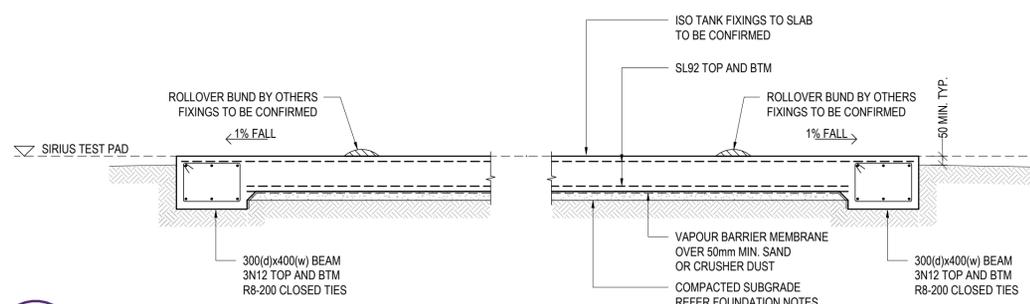
A SECTION A
S130 1:20



B SECTION B
S130 1:20



1 RAIL DETAIL
S131 1:10



C SECTION C
S130 1:20

REV	FOR COMMENT	DESCRIPTION	DATE	BY
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Status

FOR COMMENT
 NOT TO BE USED FOR CONSTRUCTION

Project
BOWEN ORBITAL SPACE PORT
SIRIUS TEST PAD
BOWEN QUEENSLAND

for
GILMOUR SPACE TECH

Title
SIRIUS TEST PAD CONCRETE
DETAILS

Drawn	Date	Chkd	Date
JAW		RM	
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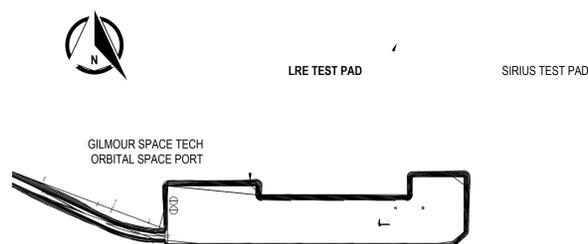
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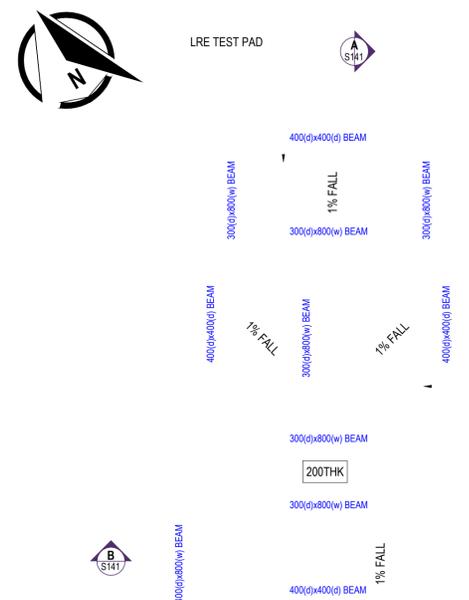
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- REFER EARTHWORKS NOTES ON DWG S01



LOCALITY PLAN

1: 3000



SIRIUS PAD SLAB PLAN

1: 100

DESIGN CRITERIA

- GENERAL PRINCIPLES HAVE BEEN ASSESSED IN ACCORDANCE WITH AS1170.0:
 - IMPORTANCE LEVEL IL2
 - DESIGN LIFE 50 YEARS
- PERMANENT ACTIONS HAVE BEEN ASSESSED IN ACCORDANCE WITH AS1170.1:
 - LINK BLOCK 3m HIGH SELF-WEIGHT
 - CYLINDER MAN PACK 16kN POINT LOAD
 - VARIOUS STORAGE TANKS 26kL STORAGE
 - HTP STORAGE TANK 7L EMPTY, 13L FULL
- IMPOSED ACTIONS HAVE BEEN ASSESSED IN ACCORDANCE WITH AS1170.1:
 - LRE THRUST LOAD 1.5L SELF WEIGHT
60kN THRUST DIRECTION
 - VEHICLE LOADING 2.5L FORKLIFT
 - FOOT TRAFFIC 5kPa
- WIND LOADS HAVE BEEN ASSESSED IN ACCORDANCE WITH AS1170.2:
 - REGION C
 - TERRAIN CATEGORY TC2
 - WIND DIRECTION MULTIPLIER 0.9
 - SHIELDING MULTIPLIER 1.0
 - TOPOGRAPHICAL MULTIPLIER 1.0
 - DESIGN WIND SPEED (ULS) 55.90m/s
 - DESIGN WIND PRESSURE (ULS) 1.875kPa

FOUNDATION NOTES

- FOOTINGS SHALL BE PLACED CENTRALLY UNDER COLUMNS UNLESS NOTED OTHERWISE.
- EXCAVATIONS SHALL BE KEPT FREE OF PONDED WATER BEFORE PLACING CONCRETE.
- FOOTINGS HAVE BEEN DESIGNED BASED ON THE FOLLOWING GEOTECHNICAL REPORT:
 - GEOTECHNICAL DETAILS
 - GEOTECHNICAL REPORT BY GROUND ENVIRONMENTS PTY LTD
 - REPORT JOB NUMBER GE_2211.1150
 - REPORT DATE 11.01.2023
 - SITE CLASSIFICATION H1
 - MIN. BEARING CAPACITY (ULS) 200kPa
 - MIN PILE SKIN FRICTION (ULS) N/A
 - EXPECTED FOUNDING MATERIAL CONTROLLED FILL
- GEOTECHNICAL ENGINEER TO CONFIRM FOUNDATION DESIGN PARAMETERS PRIOR TO PLACING CONCRETE.
- PLACE BLINDING CONCRETE TO BASE OF FOOTING EXCAVATION TO ACHIEVE DESIGN AND / OR UNIFORM BEARING MATERIAL.

ONLY FORKLIFT VEHICLE LOAD HAS BEEN ALLOWED ON SLAB

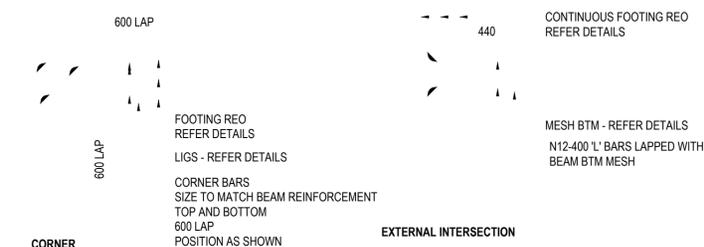
ALL FIXINGS TO SLAB TO BE CONFIRMED AND APPROVED BY ENGINEER PRIOR TO POUR

ALLOWED FIXINGS:

- HTP STORAGE TANK HOLD DOWN - 1M16 CHEMSET ANCHOR EACH LEG (4 TOTAL)
 - 100 MIN. EMBEDMENT
 - 150 MIN. EDGE DISTANCE
- LRE BASE ANCHORS - 2M16 CHEMSET ANCHOR EACH LEG (6 TOTAL)
 - 100 MIN. EMBEDMENT
 - 150 MIN. EDGE DISTANCE

SLAB ON GROUND NOTES

- SUBGRADE TO BE CONSTRUCTED AS PER EARTHWORKS NOTES.
- SLAB TO BE PLACED ON 50mm BEDDING SAND WITH WATERPROOF MEMBRANE AS PER CONCRETE NOTES.
- PROVIDE 2N12 TRIMMER BARS 1000 LONG TO ALL RE-ENTRANT CORNERS.
- SLAB TO HAVE A NOMINAL 1% FALL FOR SURFACE DRAINAGE OF SLAB.



STRIP FOOTING WITH REINFORCEMENT BARS
 TYPICAL FOOTING CORNER DETAIL

STRIP FOOTING WITH REINFORCEMENT BARS
 TYPICAL FOOTING INTERSECTION DETAIL

FOOTING CORNER DETAILS

NTS

CONCRETE NOTES

- ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 3600 & AS 1379.
- CONCRETE QUALITY AND CLEAR CONCRETE COVER TO REINFORCEMENT (OUTSIDE OF STIRRUPS AND TIES) SHALL BE AS FOLLOWS UNLESS NOTED OTHERWISE:

ELEMENT	CONCRETE GRADE	CLEAR COVER	SLUMP
BEAMS	N32	30 TOP COVER	SLUMP 90
		50 BTM COVER	PLUS 20
		50 SIDE COVER	MINUS 20
SLABS	REFER SLAB ON GROUND SCHEDULE ON DRAWINGS	30 TOP COVER	SLUMP 90
		50 BTM COVER	PLUS 20
		50 SIDE COVER	MINUS 20
- CONCRETE MIX TO HAVE A MAXIMUM AGGREGATE SIZE OF 20mm.
- SPECIFIED STRUCTURAL THICKNESSES FOR CONCRETE ELEMENTS DO NOT INCLUDE THICKNESS OF APPLIED FINISHES.
- CONSTRUCTION JOINTS OR POUR BREAKS WHERE NOT SHOWN ON PLANS OR DETAILS SHALL BE LOCATED AND FORMED TO THE APPROVAL OF THE ENGINEER.
- NO PENETRATIONS, RECESSES OR CHASES OTHER THAN THOSE SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE MADE IN CONCRETE MEMBERS WITHOUT APPROVAL OF THE ENGINEER.
- AT PENETRATIONS IN SLABS UNLESS OTHERWISE DETAILED REINFORCEMENT MUST NOT BE CUT BUT SHALL BE GATHERED EQUALLY TO EACH SIDE OF PENETRATION AND EXTRA REINFORCEMENT PROVIDED BETWEEN THE PENETRATIONS AS DIRECTED BY THE ENGINEER.
- REINFORCEMENT IS REPRESENTED DIAGMATICALLY. IT IS NOT NECESSARILY SHOWN IN TRUE PROJECTION.
- PROVIDE THE ENGINEER WITH 48 HOURS NOTICE OF REINFORCEMENT BEING READY FOR INSPECTION. NO CONCRETE IS TO BE POURED WITHOUT THE APPROVAL OF THE ENGINEER. THIS IS TO BE CONFIRMED AT A LATER DATE.
- SPLICES IN REINFORCEMENT SHALL BE MADE ONLY IN THE POSITIONS SHOWN. WHERE LAP LENGTH IS NOT SHOWN IT SHALL BE SUFFICIENT TO DEVELOP THE FULL STRENGTH OF THE REINFORCEMENT. THE FOLLOWING MINIMUM SPLICE LENGTHS SHALL BE USED UNLESS NOTED OTHERWISE:

THE FOLLOWING MINIMUM BAR SPLICE LENGTHS ARE APPLICABLE FOR $f_c \geq 25MPa$ TO 65MPa.			
A - FOR VERTICAL OR HORIZONTAL BARS WITH LESS THAN 300mm OF CONCRETE CAST BELOW			
BAR DIAMETER	LAP LENGTH (mm)	BAR DIAMETER	LAP LENGTH (mm)
N10	360	N24	1165
N12	440	N28	1485
N16	605	N32	1835
N20	865	N36	2210

B - FOR HORIZONTAL BARS GREATER THAN OR EQUAL TO 300mm OF CONCRETE CAST BELOW			
BAR DIAMETER	LAP LENGTH (mm)	BAR DIAMETER	LAP LENGTH (mm)
N10	470	N24	1550
N12	570	N28	1960
N16	785	N32	2385
N20	1125	N36	2870
- SUPPLY AND LAY FABRIC IN FLAT SHEETS AT SPLICES. FABRIC SHALL BE LAPPED AS SPECIFIED IN AS 3600. STEEL MESH SHOULD BE LAPPED AS SHOWN BELOW IE THE TWO OUTERMOST CROSS-WIRES OF ONE SHEET SHOULD OVERLAP THE TWO OUTERMOST WIRES AT THE OTHER.
 

OVERHANGS DO NOT CONTRIBUTE TO LAP LENGTH

- MAINTAIN 30 MIN. COVER TO REINFORCEMENT AT SERVICES AND CAST IN ITEMS THROUGH SLABS AND FOOTINGS. ALL SERVICES THROUGH FOOTING TO BE WRAPPED WITH COMPRESSIBLE MATERIAL MINIMUM 10mm ABLEFLEX OR SIMILAR.
- WELDING OF REINFORCEMENT WILL ONLY BE PERMITTED WITH THE PRIOR APPROVAL OF THE ENGINEER.
- REINFORCEMENT MUST NOT BE CONTINUOUS THROUGH CONTRACTION JOINTS.
- PLACE SUFFICIENT SUPPORT HURDLES/CHAIRS UNDER MAIN BOTTOM REINFORCING BARS AND TOP CROSS BARS IN SLABS AND FOOTINGS TO ALLOW THEM TO BE SUPPORTED IN THEIR CORRECT POSITIONS AND ALIGNMENT DURING CONCRETING (NOT GREATER THAN 900mm CENTRES UNLESS SHOWN OTHERWISE).
- REINFORCEMENT SYMBOLS:

SYMBOL	SPECIFICATION
N	GRADE D500N DEFORMED BAR
R	STRUCTURAL GRADE ROUND BAR
RF AND SL	HARD DRAWN SHEET RIBBED WIRE REINFORCING FABRIC

THE NUMBER FOLLOWING THESE SYMBOLS IS THE BAR DIAMETER IN MILLIMETERS.
- SLABS TO BE CURED BY COVERING WITH 0.20mm BLACK POLYETHYLENE SHEETING AND KEPT MOIST FOR 7 DAYS MINIMUM OR APPROVED ALTERNATIVE CURING METHOD.
- NO CONCRETE TO BE POURED WHEN SITE TEMPERATURE EXCEEDS 35°C OR FALLS BELOW 5°C.

STRUCTURAL GROUT NOTES

- GROUT IS TO BE HIGH STRENGTH AND NON-SHRINK.
- ALL GROUT TO BE CEMENTITIOUS UNLESS NOTED OTHERWISE.
- THE FOLLOWING GROUT PRODUCT IS TO BE USED UNLESS NOTED OTHERWISE:
 - CEMENTITIOUS FLOWABLE GROUT
- WHERE ALTERNATIVE GROUT PRODUCTS ARE USED THE FOLLOWING PROPERTIES ARE TO BE ACHIEVED:

PROPERTY	REQUIREMENT
COMPRESSIVE STRENGTH (AS1478.2:2005)	55MPa AT 1 DAYS 80MPa AT 7 DAYS
FLEXURAL STRENGTH (MODULUS OF RUPTURE AS1012.2.11:2000)	11.4MPa AT 7 DAYS
INDIRECT TENSILE STRENGTH (AS1012.2.10:2000)	5.1MPa AT 7 DAYS
- TOP OF CONCRETE TO HAVE A CONCRETE SURFACE PROFILE (CSP) OF MIN 2.0 (GRIND AND WATER BLAST SURFACE) IN ACCORDANCE WITH ICRI TECHNICAL GUIDELINE NO. 310.2R2013.
- ALL GROUT PRODUCTS ARE TO BE STORED, HANDLED AND PLACED STRICTLY IN ACCORDANCE WITH MANUFACTURERS CURRENT TECHNICAL DATA SHEET AND INSTRUCTIONS.

REV	DESCRIPTION	DATE	BY
A	FOR COMMENT	10.03.2023	J.A.W.

FOR COMMENT

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Project
BOWEN ORBITAL SPACE PORT
LRE TEST PAD
BOWEN QUEENSLAND

for
GILMOUR SPACE TECH

LRE TEST PAD SLAB PLAN

Drawn	Date	Chkd	Date
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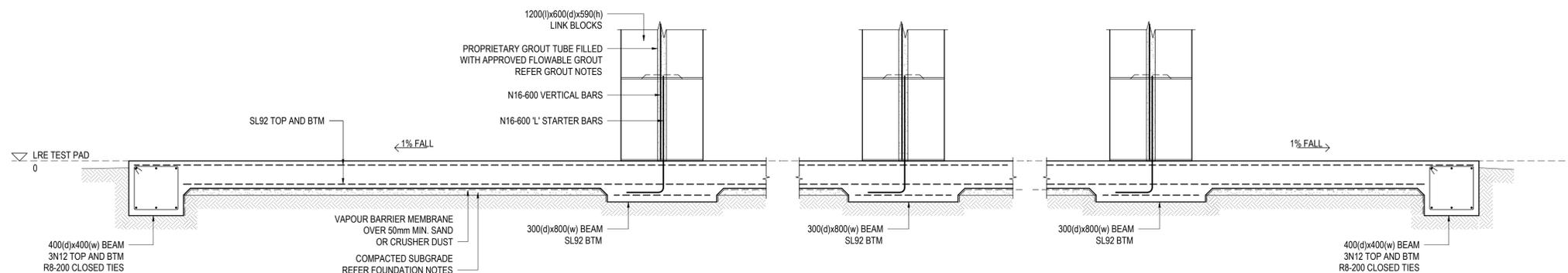
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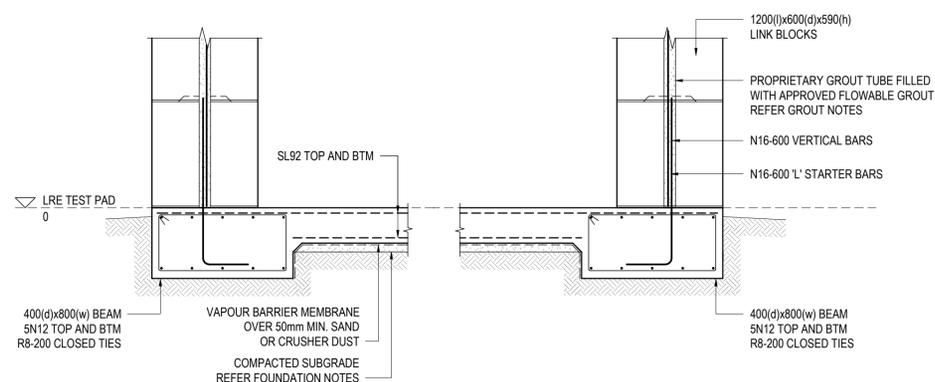


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GILMOUR SPACE



A SECTION A
S140 1:20



B SECTION B
S140 1:20

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A	FOR COMMENT	10.03.2023	J.A.W.

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Project
BOWEN ORBITAL SPACE PORT
LRE TEST PAD
BOWEN QUEENSLAND
 for
GILMOUR SPACE TECH

Title
LRE TEST PAD CONCRETE
DETAILS

Drawn	Date	Chkd	Date
JAW		RM	
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Appendix 6



Bowen Orbital Spaceport

Environmental Management Plan

Version: 5.0

Published: 18 January 2024

Table of Contents

1	Introduction	6
1.1	Existing Approvals	6
1.2	Purpose	6
1.3	Objectives.....	6
1.4	Outline of the EMP.....	6
1.5	Application.....	7
1.6	Legislative and Policy Framework.....	7
1.7	Suitably Qualified Person Statement.....	8
2	Description of the Bowen Orbital Spaceport.....	9
2.1	BOS Location	9
2.2	BOS Layout and Design	11
3	Site Activities.....	15
3.1	Launch Activities	15
3.2	Testing Activities	19
4	Description of the Environment.....	21
4.1	Surrounding land use	21
4.2	Caley Valley Wetlands.....	21
4.3	Great Barrier Reef Marine Park	22
4.4	Coral Sea Marine Park.....	23
4.5	Culturally Significant Sites	23
5	Environmental Management System.....	24
5.1	Environmental Commitments	24
5.2	Environmental Responsibilities.....	25
5.3	Site Contacts.....	26
5.4	Risk Management.....	26
5.5	Training Requirements.....	27
6	Environmental Impact Management	28
6.1	Air Quality (Dust and Emissions).....	29
6.2	Noise and Vibration.....	33
6.3	Water Quality	40
6.4	Waste Management.....	44
6.5	Hazardous and Dangerous Goods.....	48
6.6	Soil and Land Management	51
6.7	GBRMP and CSMP.....	54



6.8	Flora and Fauna Management	57
6.9	Weed and Pest Management	61
6.10	Energy and Natural Resources (Climate Change).....	65
6.11	Cultural Heritage	68
6.12	Community Stakeholder Engagement	71
7	Environmental Monitoring Summary	74
8	Monitoring, Auditing and Documentation	78
8.1	Monitoring and Auditing.....	78
8.2	Reporting.....	78
8.3	Records Management and Document Control.....	78
8.4	Document Review and Improvement	78
8.5	Continual Improvement	79
8.6	Confidentiality	79
8.7	Precedence	79
9	Incidents, Emergencies and Complaints	80
9.1	Incident Types	80
9.2	Incident Reporting and Notification	80
9.3	Incident Response.....	81
9.4	Incident Investigation.....	81
9.5	Complaint Management.....	82
	Abbreviations.....	83
Appendix A	Gilmour Space’s Environmental Policy	85
Appendix B	Ambient Air Quality Management Plan	86
Appendix C	Noise and Vibration Management Plan	87
Appendix D	Stormwater Management Plan	88
Appendix E	Waste Management Plan.....	89
Appendix F	Hazardous and Dangerous Goods Management Plan.....	90
Appendix G	Site-based Land and Pest Management Plan.....	91
Appendix H	Decommissioning and Rehabilitation Plan	92
Appendix I	Bushfire Management Plan.....	93
Appendix J	Flora and Fauna Management Plan	94
Appendix K	Cultural Heritage Management Agreement	95
Appendix L	Environmental Inspection Checklist.....	96



List of Tables

Table 1 – Outline of EMP.....	7
Table 2 – Applicable Legislation and Policy.....	7
Table 3 – Engine Test Location.....	12
Table 4 – Estimate of Material Masses of a Typical Eris 001 Rocket for Context.....	15
Table 5 – Typical Launch Campaign Activity.....	17
Table 6 – Engine Test Plans.....	19
Table 7 – Meteorological Modelling Cases.....	20
Table 8 – Site Reporting Structure and Environmental Responsibilities.....	25
Table 9 – Site Contact Details.....	26
Table 10 – Detailed management plans.....	28
Table 11 – Air Quality Management Activities.....	30
Table 12 - Big HRE testing maximum noise output.....	35
Table 13 – Noise and Vibration Management Activities.....	37
Table 14 – Water Quality Management Activities.....	41
Table 15 – Waste Management Activities.....	45
Table 16 – Hazardous and Dangerous Goods Management Activities.....	49
Table 17 – Soil and Land Management Activities.....	52
Table 18 – GBRMP and CSMP Management Activities.....	55
Table 19 – Flora and Fauna Management Activities.....	58
Table 20 – Weed and Pest Management Activities.....	62
Table 21 – Energy and Natural Resources Management Activities.....	66
Table 22 – Cultural Heritage Management Activities.....	69
Table 23 – Community Stakeholder Management Activities.....	72
Table 24 – Summary of Air Quality Monitoring Program.....	74
Table 25 – Summary of Noise and Vibration Monitoring Program.....	75
Table 26 – Summary of Stormwater Monitoring Program.....	75
Table 27 – Summary of Fauna Monitoring Program.....	76

List of Figures

Figure 1 – Bowen Orbital Spaceport Location.....	9
Figure 2- Site location.....	10
Figure 3 – Launch Facility Layout.....	11
Figure 4 – Test Pad 1 Showing Engine Stands, Container Wall, and 20 m Long Sandbag Wall.....	13
Figure 5 – Link Block Walls Test Stand 1A.....	14
Figure 6 – Test Pad 2 Showing Test Stand and Link Block Walls.....	14



Figure 7 – Test Pad 2 Link Block Walls Description 14

Figure 8 – Eris Launch Vehicle..... 15

Figure 9 – BOS Nominal Launch Trajectory for 57° Azimuth Launch and Bounding Azimuths 16

Figure 10 – Location of Wetland Zones (BMT WBM, 2012) 22

Figure 11 – AS/NZS ISO 14001 Environmental Management System..... 24

Figure 12 - Sensitive receptors 34

Figure 13 - Monitoring locations..... 77

Figure 14 – Complaints Procedure 82



1 Introduction

Gilmour Space has developed this Environmental Management Plan (EMP) to describe the environmental issues to be managed during operation of the Bowen Orbital Spaceport (BOS).

Whilst the launch operations and associated activity do not trigger any Environmentally Relevant Activity (ERA) thresholds, Gilmour recognises and understands the impacts that operations may have on the natural environment and are committed to environmental sustainability in our business activities.

This EMP is relevant to all launch operations and associated infrastructure at the BOS.

1.1 Existing Approvals

Gilmour Space has received a Material Change of Use (MCU) for a high impact industry (launch facility) in accordance with section 84E of the *State Development and Public Works Organisation Act 1971* issued by the Office of the Coordinator General (OCG).

The MCU provides this approval from the date of obtaining Commonwealth approval pursuant to the *Space (Launches and Returns) Act 2018*, to operate a launch facility on the site. Specifically, the approval is a maximum of twelve (12) launch events per calendar year for the launch of their ERIS small class orbital launch vehicle.

1.2 Purpose

This EMP has been prepared to provide a structured approach to environmental management associated with the operation of the BOS. It provides a summary of the operational activities planned for the BOS.

1.3 Objectives

The primary objective of the EMP is to minimise the risk of environmental harm as far as practicable during normal and abnormal operations by providing planning and management systems to:

- Meet environmental standards and the conditions stipulated in approvals to undertake the specified activities.
- Prevent and mitigate environmental harm which may occur from the operations.
- Facilitate appropriate and timely responses to equipment failure, emergencies or other unusual conditions that may cause environmental harm.
- Facilitate documentation, communication, and implementation of contingency plans.
- Ensure that all personnel responsible for operations are aware of their environmental responsibilities.
- Ensure that environmental monitoring and review occurs to manage operations and to ensure continual improvement in this EMP.
- Ensure that relevant information is retained and is communicated throughout the organisation and with the Department of Environment and Science (DES), Whitsunday Regional Council or other authority as required by legislation.

1.4 Outline of the EMP

The EMP will provide management strategies that address potentially adverse environmental impacts arising from equipment handling, storage, logistics operations and launch activities. The EMP defines site-specific tasks, control measures, reporting and corrective mechanisms for issues identified.



This manages the risks associated with potential environmental issues while also providing a procedure in the event of a problem occurring. The main components of the EMP are shown in Table 1.

Table 1 – Outline of EMP

Section of Report	Description
Section 1.0 – Introduction	Contains a brief introduction, identifies purpose and objectives, and lists relevant government regulations.
Section 2.0 – Description	Contains a description of BOS operations.
Section 3.0 - Environmental Values	Contains a description of the BOS site and existing environment.
Section 4.0 – Environmental Management System	Outlines management arrangement for Project, site reporting structure and responsibilities, site contact details, risk assessment and training requirements.
Section 5.0 – Environmental Impact Management	Provides the environmental context of the operations, describing environmental objectives, potential impacts, and management actions.
Section 6.0 – Inspections, Monitoring, Auditing and Documentation	Discusses non-compliance and corrective actions, audit, review and reporting, and records and document management.
Section 7.0 – Incidents, Emergencies and Complaints	Contains incident and emergency procedures, relevant contacts, and the complaints procedure.

1.5 Application

This EMP applies to all personnel and activities associated with equipment handling, storage, logistics operations, launch and test activities associated with the BOS.

1.6 Legislative and Policy Framework

Environmental legislation relevant to the Project is contained within Table 2.

Table 2 – Applicable Legislation and Policy

Relevant Legislation	Objectives
<i>Aboriginal Cultural Heritage Act 2003 (ACH Act)</i>	The ACH Act recognises and protects significant Indigenous cultural heritage in Queensland. The Aboriginal Cultural Heritage Act sets out requirements for the protection and management of Indigenous cultural heritage.
<i>Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)</i>	The EPBC Act governs the protection of Matters of National Environmental Significance (MNES), including habitat for listed threatened species and threatened ecological communities.
<i>Environmental Protection Act 1994 (EP Act)</i>	The EP Act protects environmental values through development and implementation of environmental protection policies and regulates environmentally relevant activities as prescribed in the <i>Environmental Protection Regulation 2019 (EP Regulation)</i> .



Relevant Legislation	Objectives
<i>Environmental Protection (Air) Policy 2019 (EPP Air)</i>	The EPP Air governs the protection of ambient air quality and specifies indicators and air quality goals for the control of the release of airborne contaminants that are regulated through issued permits.
<i>Environmental Protection (Noise) Policy 2019 (EPP Noise)</i>	The EPP Noise specifies an acoustic quality objective for the protection of the well-being and amenity of individuals and the community in surrounding residential areas.
<i>Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (EPP Water & Wetlands)</i>	The EPP Water & Wetlands specifies environmental values for waters and wetlands and management goals, water quality guidelines for water to be enhanced or protected.
<i>Nature Conservation Act 1992 (NC Act)</i>	The Nature Conservation Act 1992 (the Act) provides the legislative basis for the conservation of nature through the dedication, declaration and management of protected areas and the protection of native wildlife and its habitat prescribed in the <i>Nature Conservation (Animals) Regulation 2020</i> and the <i>Nature Conservation (Plants) Regulation 2020</i> .
<i>State Development and Public Works Organisation Act 1971</i>	The SDP Act provides the basis for the environmental conditions applied via the development approval (MCU) by the Office of the Coordinator General
<i>Waste Reduction and Recycling Act 2011 (Waste Act)</i>	The Waste Act contains a suite of measures to reduce waste generation and landfill disposal and encourage recycling.
<i>Agricultural Chemicals Distribution Control Act (ACDC act)</i>	The ACDC Act regulates distribution and the licensing for the distribution of agricultural chemicals in Queensland. The purpose of the act is to ensure that agricultural chemicals are distributed responsibly to avoid harm to human health, agriculture, livestock or the environment.

1.7 Suitably Qualified Person Statement

This OEMP was prepared by Gilmour Space Technologies and has been reviewed, adapted, and certified by Anton Fitzgerald and Laurence Liessmann of Terra Solutions Pty Ltd.

Anton Fitzgerald is a degree qualified scientist with 11 years of environmental consultancy experience within Queensland, presides as Company Director at Terra Solutions and is a member of the Environmental Institute of Australian and New Zealand. Anton has undertaken environmental studies, monitoring programs and impact assessments for clients in mining, urban development, renewables, utilities, and defence and developed an array of monitoring and management plans over this time.

Laurence Liessmann is a degree qualified scientist with over 19 years of environmental consultancy within Queensland and is a member of the Environmental Institute of Australian and New Zealand. He is experienced in project management, client relations, interpreting environmental legislation, preparing and co-ordinating environmental approval documentation, environmental research, assessment, and reporting.

Both parties possess an in-depth knowledge and understanding of all applicable State and Federal environmental legislation which has been considered along with current best practice environmental management strategies in the development of this OEMP.



2 Description of the Bowen Orbital Spaceport

The BOS is Australia's first purpose built orbital launch facility, unlocking access to low earth orbit (LEO) for small payloads from Australian soil. Small launch vehicles are classified as those capable of lifting less than 2000kg payloads into orbit. Bowen is suited to this classification of launch vehicles due to its geography and its proximity to a regional industrial base. The low latitude takes advantage of the earth's rotation for launch efficiency and the proximity to the coast for eastward launches, remote location with limited population centres and relatively sparse air and maritime traffic downrange, allow for inherent levels of safety for launch.

2.1 BOS Location

BOS site is located within the Whitsunday Regional Council Local Government Area and Abbot Point State Development Area (APSDA).

The closest major population centre to the BOS is the Bowen township which is approximately 15 km east of the launch site and has a population of 10,337 people according to the 2016 census of population.

The BOS complex comprises three smaller facilities; a Launch Control Centre (LCC) co-located within the North Queensland Bulk Ports (NQBP) facilities, a Vehicle Assembly Building (VAB), a Launch Pad (PAD) with associated fuel and oxidiser storage pads along with two test pads within the Industry Precinct, Environmental Management/Materials Transportation Precinct of the APSDA Development Scheme.



Figure 1 – Bowen Orbital Spaceport Location



Figure 2- Site location



2.2 BOS Layout and Design

The BOS design incorporates features to contain, mitigate and control nominal and anomolous conditions of small class orbital launch vehicles. The design also incorporates elements to ensure the safety of the public by isolating the facilities that will store quantities of hazardous goods.

The BOS launch infrastructure, VAB and site access route is spread over three allotments with all launch infrastructure located on Lot 10 on SP295408 (Lot 10) and site access tracks traversing Lot 8 on SP295408 (Lot 8) and Lot 9 on SP295408 (Lot 9) (Figure 2). The general layout of site infrastructure is presented in Figure 3 with a description of each element in the following sections.



Figure 3 – Launch Facility Layout

2.2.1 Launch Control Centre

The LCC is the location from which launch activities are managed. The LCC is situated approximately 7 km away in an administration facility on NQBP land. The facility has all amenities required for the establishment of communication and control equipment and a direct line of site to the launch location enabling the safe installation of telemetry hardware for mission monitoring.

2.2.2 Vehicle Assembly Building

The VAB is the primary location of operations for the site. It facilitates the final assembly steps of a launch vehicle including the delivery, receipt, upgrade or repair, assembly, integration and testing of launch vehicle parts, stages, and payloads in a clean and secure environment in preparation for a launch activity.

The VAB is approximately 40 m x 18 m x 7 m with large roller doors at the north and south ends of the building. Internal facilities include clean rooms, cribbing and ablution, open plan office, tooling and equipment and a material storage room.

The VAB is an intrusion resistant facility with features including securable internal spaces and security surveillance systems.

2.2.3 Launch Pad

The launch pad (PAD) is a 20 x 20 m self-bunded concrete pad to support the transport and erection infrastructure for Gilmour Space Eris launch vehicles. Operation and management of activities on the PAD will be managed by detailed launch operation procedures which are developed and maintained for each launch mission.

2.2.4 Launch Fluids and Utilities Storage

Adjacent to the PAD is the launch fluids and utility pads. These service the PAD with power, fluids, and local control for launch vehicle filling and launch operations. This will be the principal location at the launch facility for the management of hazardous and dangerous goods. The generation, storage, usage, and disposal management of hazardous and dangerous goods is detailed in the Hazardous and Dangerous Goods Management Plan.

The pad will store quantities of hydrogen peroxide, de-ionised water, kerosene, liquid oxygen, liquid nitrogen, gaseous oxygen, gaseous helium and non-potable water and their distribution systems. The pad will also host power and data distribution infrastructure.

2.2.5 Test Pads

The BOS test facility comprises two propulsion test pads (Test Pad 1 and Test Pad 2). The test pads are located on Lot 10, adjacent to the BOS fire trail on the northern side of the PAD. The test pads are used for the isolated conduct of engine and propulsive component testing and verification activity. The engine type and test pad are shown in Table 3.

Table 3 – Engine Test Location

Engine Type	Test Pad
Catpack	1
Small HRE	1



Big HRE	1
Small RCS	1
Big RCS	1
Small LRE	2
Big LRE	2

The test pads comprise a central concrete slab surrounded by a gravel surface, with block walls constructed adjacent to the primary engine test stand. Each pad includes thrust structures, power supply, fluids supply networks including temporary storage facilities for kerosene and liquid oxygen; control instrumentation and data acquisition equipment; kinetic capture and armouring structures; and emergency stop apparatus. Each pad is contained within a designated fenced area and incorporates a raised hardstand, vehicle access ramp and thrust structure. Each test pad is configurable to support a variety of tests. Test engines are fired horizontally.

2.2.5.1 Test Pad 1

Test Pad 1 is situated at Latitude: 19°57'24.57" S and Longitude: 148° 6'54.96" E (Figure 4). Test Pad 1 will contain container wall comprises two rows of 40 ft containers. The sandbag wall is 3 m high and 20 m long.

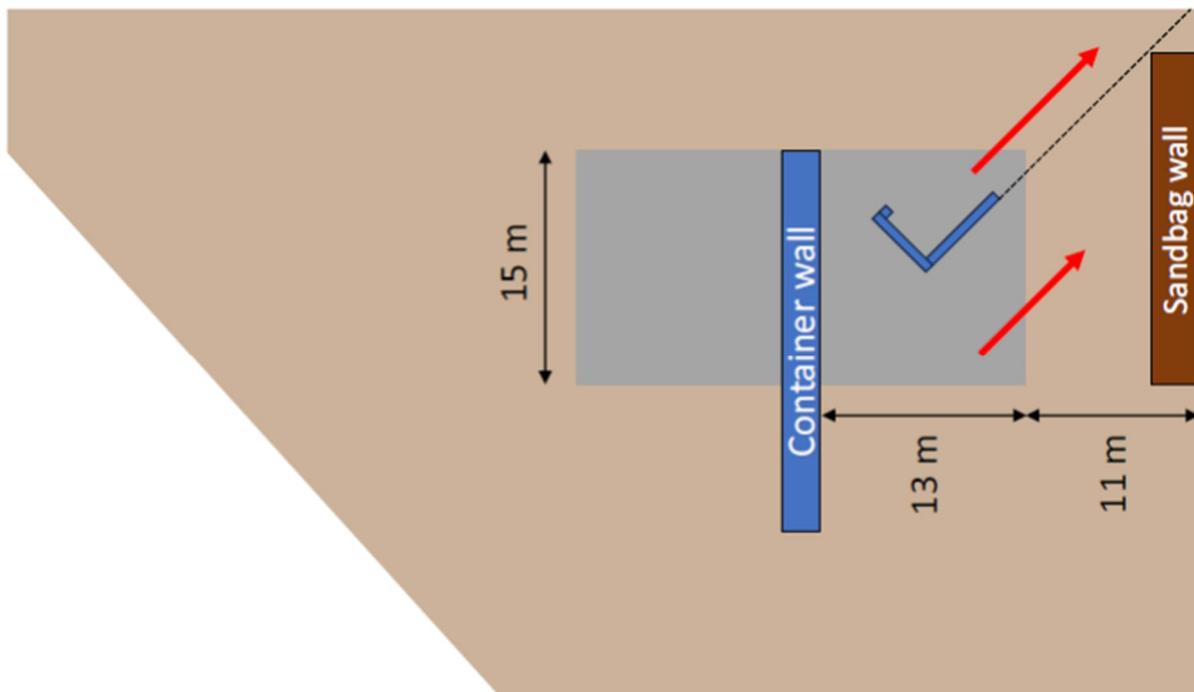


Figure 4 – Test Pad 1 Showing Engine Stands, Container Wall, and 20 m Long Sandbag Wall

Test Pad 1 is further divided into Test Stand 1A and Test Stand 1B. The link block walls around Test Stand 1A are shown in Figure 5.



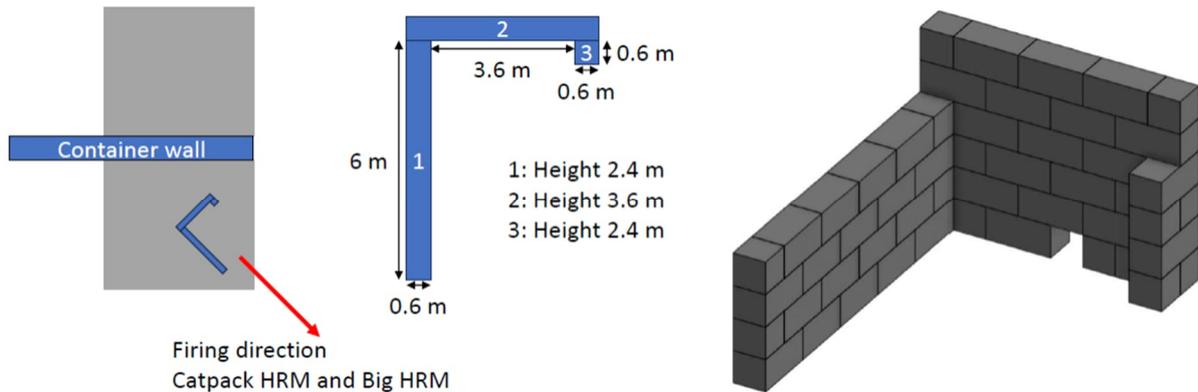


Figure 5 – Link Block Walls Test Stand 1A

2.2.5.2 Test Pad 2

Test Pad 2 is situated at Latitude: 19°57'25.23" S Longitude: 148° 6'45.70" E and is shown in Figure 6. The Link block walls are shown in Figure 7. Test Pad 2 will contain temporary storage provided for hydrogen

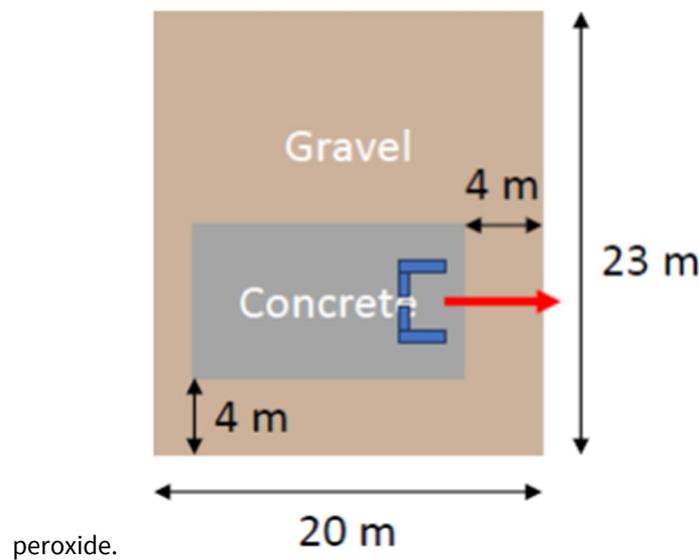


Figure 6 – Test Pad 2 Showing Test Stand and Link Block Walls

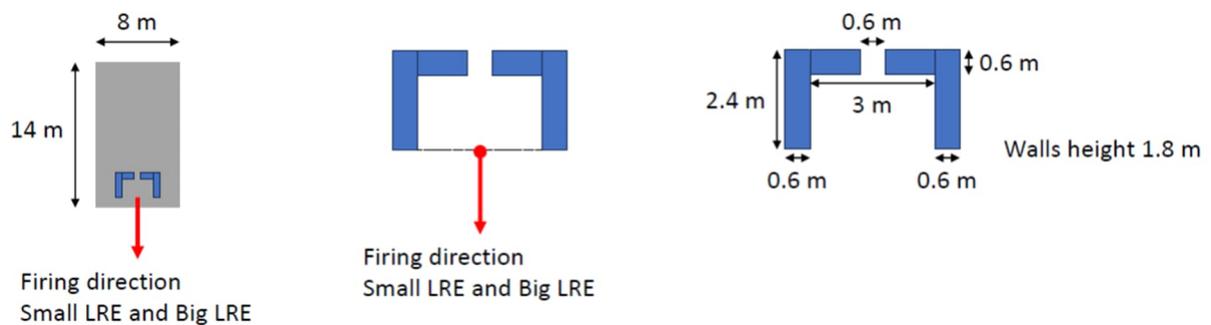


Figure 7 – Test Pad 2 Link Block Walls Description



3 Site Activities

3.1 Launch Activities

3.1.1 Eris Launch Vehicle

Gilmour Space intends for launch at the BOS to be achieved with an Eris launch vehicle matching the data used in this plan, performance and trajectory is necessarily representative of many similar small class orbital launch vehicles.

The Eris is a 3-stage small class orbital launch vehicle and is shown in Figure 8. The vehicle uses a mix of innovative hybrid rocket systems (using a stabilised high concentration Hydrogen Peroxide (H₂O₂) which is a non-cryogenic fluid, in combination with a solid polymer fuel grain) and traditional liquid oxygen and kerosene propulsion system.

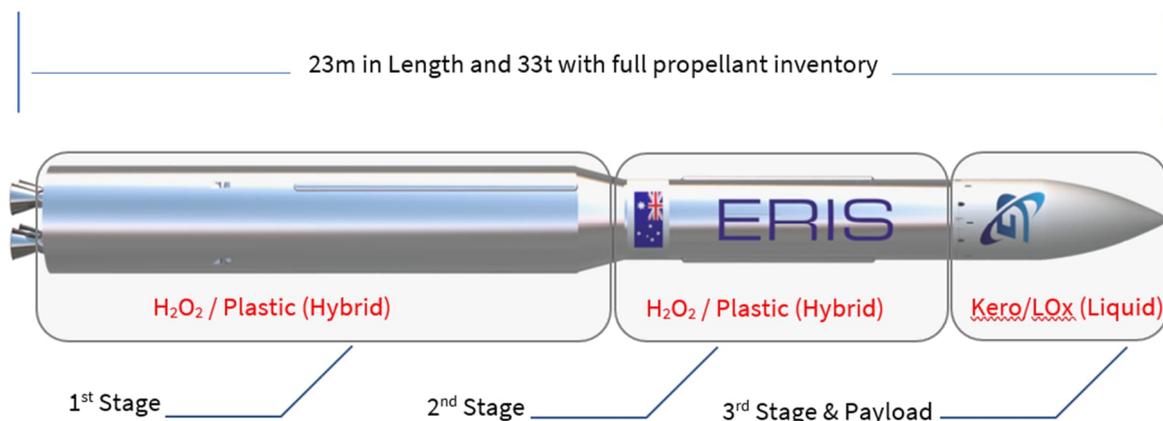


Figure 8 – Eris Launch Vehicle

Eris launch vehicles are approximately 23 m tall, and the main body section of the rocket is approximately 2 m in diameter. Most materials on the launch vehicle are aerospace grade aluminium, stainless steel, and carbon fibre. The constituent components of Eris rockets and spent booster stages are presented in Table 4.

Table 4 – Estimate of Material Masses of a Typical Eris 001 Rocket for Context

Material		Mass, kg	Mass %	Risk in Environment
Liquids	Hydrogen Peroxide	25,000	-	Rapidly Decomposes to H ₂ O & O ₂ , fire or burn hazard if contacted.
	Liquid Oxygen	500	-	Rapidly evaporates to O ₂ , fire or burn hazard if contacted.
	Kerosene	200	-	Combustible liquid. Will ignite if temperature is above flash temp (~60 C) and ignition source present.
Solid Launch Vehicle	Aerospace Grade Aluminium (Fuselage and structure)	3,000	44%	Stable and inert in all environments.
	PE Polymer (Solid fuel grain)	2,500	37%	Stable and inert in all environments.



Material	Mass, kg	Mass %	Risk in Environment
Lithium-Ion Batteries	400	6%	Fire hazard in some circumstances.
Electric Motors (Copper/Steel)	300	4%	Stable and inert in all environments.
Stainless Steel	300	4%	Stable and inert in all environments.
Carbon Fibre & Resin	300	4%	Stable and inert in all environments.
Total	32,500		

3.1.2 Launch Frequency

Gilmour Space intends to conduct 2 launches in calendar year 2023, 4 launches in 2024 and then accelerate launch frequency to as high as 12 launches per year by 2025, dependent upon the availability of launch customers and production rate of vehicles. Launch campaigns involve a significant period of preparation including assembly, verification, and testing, culminating in approximately a day of launch activities. The timeline shown below in Table 5 is indicative of Gilmour Space’s early launch timelines.

3.1.3 Launch Azimuths and Orbit

Figure 9 presents a typical launch trajectory for the 57° azimuth and shows the range of viable trajectories and the downrange areas for return of spent first stage rockets. The safety of each individual trajectory for launch will be approved by the Australian Space Agency. Gilmour Space assesses that a range of launch trajectories are achievable from the Bowen Orbital Spaceport between 25° to 71° (azimuth from true north).

The 1st stage impact point is modelled during the preliminary phase of launch planning to avoid sensitive receptors.

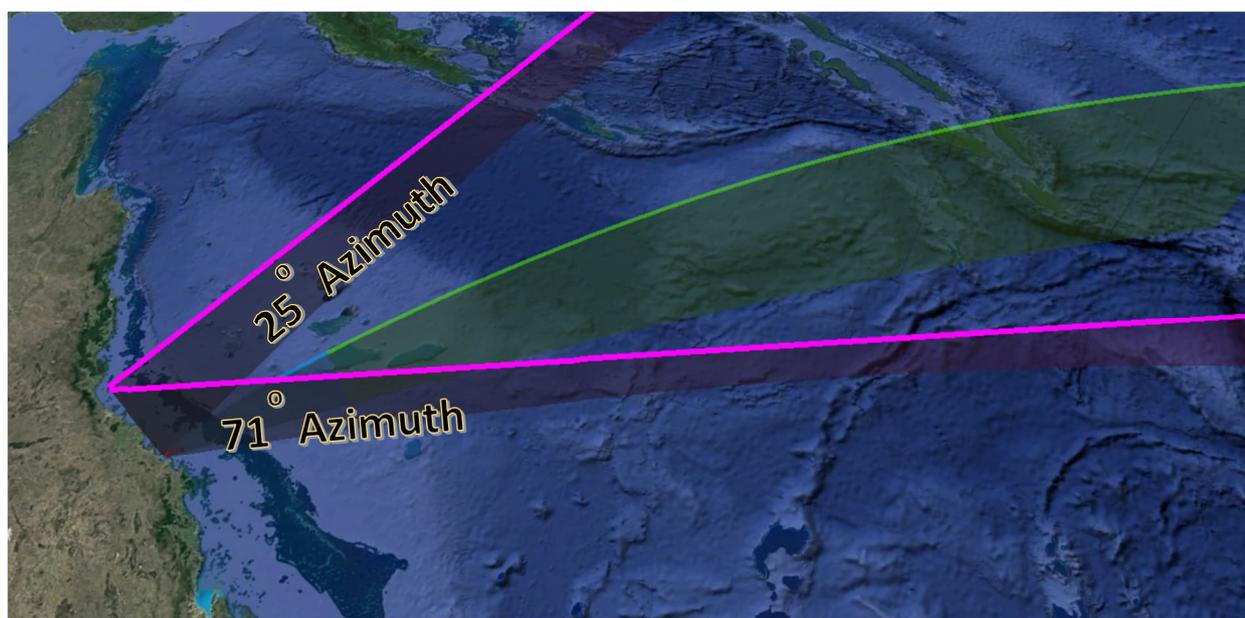


Figure 9 – BOS Nominal Launch Trajectory for 57° Azimuth Launch and Bounding Azimuths



3.1.4 Launch Campaign

Launch operations are campaign activities that will begin with the delivery of launch vehicle components and culminate some 60-90 days later with the launch of a vehicle followed by up to 10 days of post launch activity to remediate and return the site to readiness for a new launch campaign.

During an active launch campaign several phases of activity will occur, with a variable workforce at the BOS. Table 5 illustrates the typical launch campaign activity.

Table 5 – Typical Launch Campaign Activity

Approximate Timing	Typical Activities
T-90 days Launch Readiness Activities	Launch vehicle components begin arriving at the BOS from Gilmour's manufacturing facility located in Helensvale, Queensland. Assembly of the launch vehicle begins.
T-45 days Client Payload and Launch Approvals	Client payload is received at the BOS, where assembly and integration of the payload begins. Permits for launch activity must be approved by the Australian Space Agency on this date.
T-10 days Launch Pad Configuration	Launch pad preparation and testing activities. Launch support and recovery services established at the launch control centre.
T-24 hours Weather monitoring and Final Checks	Anemometry and weather monitoring begins to confirm forecast weather conditions for launch. The launch vehicle is fully integrated into the launch erector and fluid systems are connected.
T-4 hours Exclusion zone implementation	Public safety barriers and controls, airspace notifications, and marine exclusion zones are implemented.
T-2 hours Launch Sequence Commence	Launch vehicle communications are confirmed, rocket is pressurised, final manual checkouts are performed, Gilmour space begins monitoring exclusion zones. Rocket filling and launch procedures to begin.
T- 30 Minutes Launch Countdown	T- 30 minutes downrange exclusion zone and all GO/NO GO criteria confirmed clear for launch. Flight computers confirm final flight readiness checks T-2 Rocket booster stage ignition begins
T = 0	Rocket hold downs released – Launch

3.1.5 Launch Readiness Checks

The final readiness checks occur once the vehicle rolls out of the VAB, and they include integration of the launch vehicle onto the transporter / erector. The PAD incorporates a set of mechanical clamps that will



ensure the launch vehicle is only released if all four main engines start successfully. Once the final readiness checks have been completed all personnel will clear the PAD and surrounds for filling of the vehicle, which is completed remotely.

3.1.6 Filling

After the final readiness checks are completed and the Launch Pad area is cleared, remote systems initiate the pumping of launch fluids including hydrogen peroxide, liquid oxygen, high pressure helium, and low-pressure nitrogen into the launch vehicle through umbilical connections. Filling takes 3-4 hours and in this time the launch team continues with launch readiness checks including confirmation that the launch range is clear and commencement of the launch countdown.

3.1.7 Ignition / Launch

In the final stage of countdown (the last 2-3 seconds) the vehicle starts its 4 first stage engines and, after verification that all four are functioning properly, the mechanical clamps release, and the vehicle commences its flight. Initially the vehicle climbs slowly, accelerating at only 5 meters per second, and disconnecting the strongback umbilicals as it pulls away. During the early stages of the launch, the sound energy from the four rocket engines will be intense and to protect the Launch Pad and the vehicle itself from reflected soundwaves, high volumes of water will be sprayed into the rocket exhaust, absorbing sound energy and heat from the early stages of launch. This activity produces a large cloud of steam mixed with the rocket exhaust (which is comprised of steam and carbon dioxide).

3.1.8 Flight

Once the launch vehicle clears the PAD, it continues to accelerate almost vertically to 10km by 60 seconds into its flight (by which time it will be supersonic). The vehicle tilts towards its intended trajectory and climbs until, after about 2 minutes, the first stage engines will have expended their fuel. At this point the first stage will separate from the vehicle and complete a ballistic path back to Earth impacting the ocean beyond the Great Barrier Reef Marine Park, in the Coral Sea. The second stage engine will then commence its burn for almost two minutes, and the vehicle will, now well clear of most of the atmosphere, detach the protective fairings covering the third stage and the delicate payload, these will also return to Earth. At almost four minutes after launch, the vehicle will be about 350 kilometres from the Launch Pad and 160 kilometres in altitude. The second stage will have expended all its fuel and will separate from the vehicle, completing its ballistic path towards Earth (most of this stage will burn up on re-entry) with what remains impacting oceanic water far distant from the Australian mainland. The third stage will coast for a period before igniting to accelerate the vehicle to its final orbital path where it will shut down, releasing its satellite payload to commence operations.

3.1.9 Post Launch Actions

Following the launch the teams will return to the PAD, secure the filling and storage systems, repair any damage to the launch infrastructure and prepare the site for either a period of inactivity or the next launch.

3.1.10 Decommissioning

The lease term for the BOS land is 5 years with an option for a further 5 years. The conditions of the lease specify that at termination, the tenant will remove all tanks, the launch tower, and any free-standing structures. The terms also agree that any concrete or other in-land developments revert to landlord's ownership.



As a condition of the lease, Gilmour Space has commissioned and shared with the Queensland government a baseline condition report and baseline environmental audit report. These independent reports concluded that the lands were degraded from long term grazing and were free from contamination. These reports are to be used by the landowner to assess if Gilmour Space may have caused contamination or damage to the land which Gilmour Space is bound to make good at its own costs upon termination of the lease.

3.2 Testing Activities

The BOS test facility supports testing of rocket engines at Test Pad 1 and Test Pad 2. Testing of rocket engines is necessary for verification of production or flight articles including liquid bi-propellant rocket engines (ERIS 3rd stage), hybrid rocket engines (ERIS 1st and 2nd stages) and mono-propellant engines (ERIS vernier engines) as well as product development and characterisation.

Test Pad 1 is primarily a Liquid Rocket Engine test pad. Test stand 1A is for firing engine types Catpack and Big HRE while Test stand 1B is for firing engine types Small HRE, Small RCS and Big RCS. The firing direction is 25°, i.e. to the NE.

Test Pad 2 is primarily intended for Liquid Rocket Engine tests (Small LRE and Big LRE). The firing direction is 17°, i.e. to the NE.

3.2.1 Test Duration

Test activity may be conducted for very short durations of 1-3 seconds or full burn durations of up to 2-4 minutes. These activities are nested within test campaigns that may last from days to weeks, as small (3-5 person) teams prepare the test articles and supporting test infrastructure, conduct the test, gather the test data, and demobilise the test articles and supporting infrastructure from the pad. Typical maximum testing regimes are contained in Table 6. These engine test plans define the maximum likely use of the site. All engine tests are carried out during the day, 7am to 6pm.

Table 6 – Engine Test Plans

Test Day Options	Engine Tests
Option 1	1 Big HRE test for 120 sec
Option 2a	3 Catpack tests for 30 sec each + 1 Small LRE test for 240 sec
Option 2b	3 Catpack tests for 30 sec each + 2 Big RCS tests for 60 sec each
Option 3a	2 Small HRE tests for 120 sec each + 1 Small LRE test for 240 sec
Option 3b	2 Small HRE tests for 120 sec each + 2 Big RCS tests for 60 sec each
Option 4a	4 Big RCS tests for 60 sec each + 1 Small LRE test for 240 sec
Option 4b	4 Big RCS tests for 60 sec each + 2 Big LRE tests for 5 sec each

3.2.2 Test Frequency

Engine test activities are shorter than launch operations (60-90 days) and are focussed activities varying in length from a few days to several weeks. Engine tests may be performed as a part of a verification / qualification activity in support of a launch campaign or as a separate experimental or developmental activity.



3.2.3 Meteorology

Noise modelling for engine tests has considered 4 meteorological cases, refer to Table 7. The most common meteorological case for engine testing would be a sunny day with or without wind. The most adverse meteorological case (i.e., leading to the highest environmental noise levels) would be neutral conditions, with or without winds.

Table 7 – Meteorological Modelling Cases

Modelling case	Lapse Rate	Temperature	Wind	Comment
Day with wind	-3°/100m	30°C	3m/s from SE	Typical sunny day with light wind
Day no wind	-3°/100m	30°C	No wind	Typical sunny day without wind
Neutral	0°/100m	20°C	No wind	Cloudy or early morning prior to significant solar heating
Neutral with wind	0°/100m	20°C	1m/s from SE	Cloudy or early morning prior to significant solar heating



4 Description of the Environment

4.1 Surrounding land use

The areas subject to this EMP are located within the APSDA Industry Precinct Zone which is intended to provide for the establishment of industrial development that is of State, regional, or national significance, including for high impact and special industry uses. Currently much of the Industry Precinct Zone remains undeveloped and is utilised for agricultural purposes, primarily cattle grazing.

Adjacent land uses include Abbot Point Quarry to the south of the site (Lot 44 on HR1599) and the Abbot Point Road and the Newlands System Rail Line which run parallel to the western boundary of Lot 12. Further north is the Port of Abbot Point which comprises rail in-loading facilities, coal handling and stockpiling areas and a single trestle jetty and conveyor connecting to offshore berths and ship loaders.

Current industrial activities within the APSDA include:

- Industrial and port activities
- Coal bulk haulage
- Existing quarrying
- Proposed future uses including possible green hydrogen production.

The site at its highest point is approximately 10m Australian Height Datum along the south-eastern boundary and slopes downward to <5m Australian Height Datum along the northern and western boundary.

Sensitive receptors near the site include the Abbot Point Quarry located approximately 600 m from the launch facility and the site office located approximately 1 km from the launch facility. Several residential dwellings are located along Euri Creek to the southeast of the launch facility. The closest of these residences is approximately 3.6 km away.

Ecologically sensitive receptors include Eastern Beach which is located approximately 1.8 km north of the launch site, Saltwater Creek which is located 500 m north of the launch site and Caley Valley wetland area located approximately 3 km northwest of the site. Collectively these areas provide habitat for migratory waders, terns and other marine birds, wetland bird species, turtle nesting areas and estuarine crocodile habitat.

Within the APSDA footprint exist several culturally significant locations as described in subsequent sections.

4.2 Caley Valley Wetlands

The Caley Valley Wetlands cover an area of approximately 5,154 ha and provide valuable habitat for threatened fauna species. The Wetlands are a modified wetland system comprising estuarine, lacustrine, palustrine, and riverine habitats. Most of the Caley Valley Wetlands are located on the western side of Abbot Point Road and the Newlands Rail System.

The catchment of the wetland is roughly 83,000 ha. Saltwater Creek is the largest body which at times flows into the wetland. All other streams that drain into the wetland are semi-permanent during the dry season. The lower reaches of these creeks are tidal, with mangroves fringing channels and inter-tidal overbank areas.

The BOS is situated on the eastern side of Abbot Point Road and Saltwater Creek runs along its northern boundary. Saltwater Creek is a perennial freshwater system. There are no reports of Saltwater Creek completely drying, although depths of <0.5 m have been observed during drought conditions in November 2014.



Mount Little is directly southwest of the site. The eastern side of Mount Little has several overland dry creek beds which during large rain events flow into Saltwater creek which drains to the Caley valley wetlands. Drainage from the site is via two first order watercourses which enter the site at the southern boundary and drain into Saltwater Creek on the site’s northern boundary. No dams or other constructed waterbodies are present on the site, however there is a large dam located within the nearby Abbot Point Quarry.

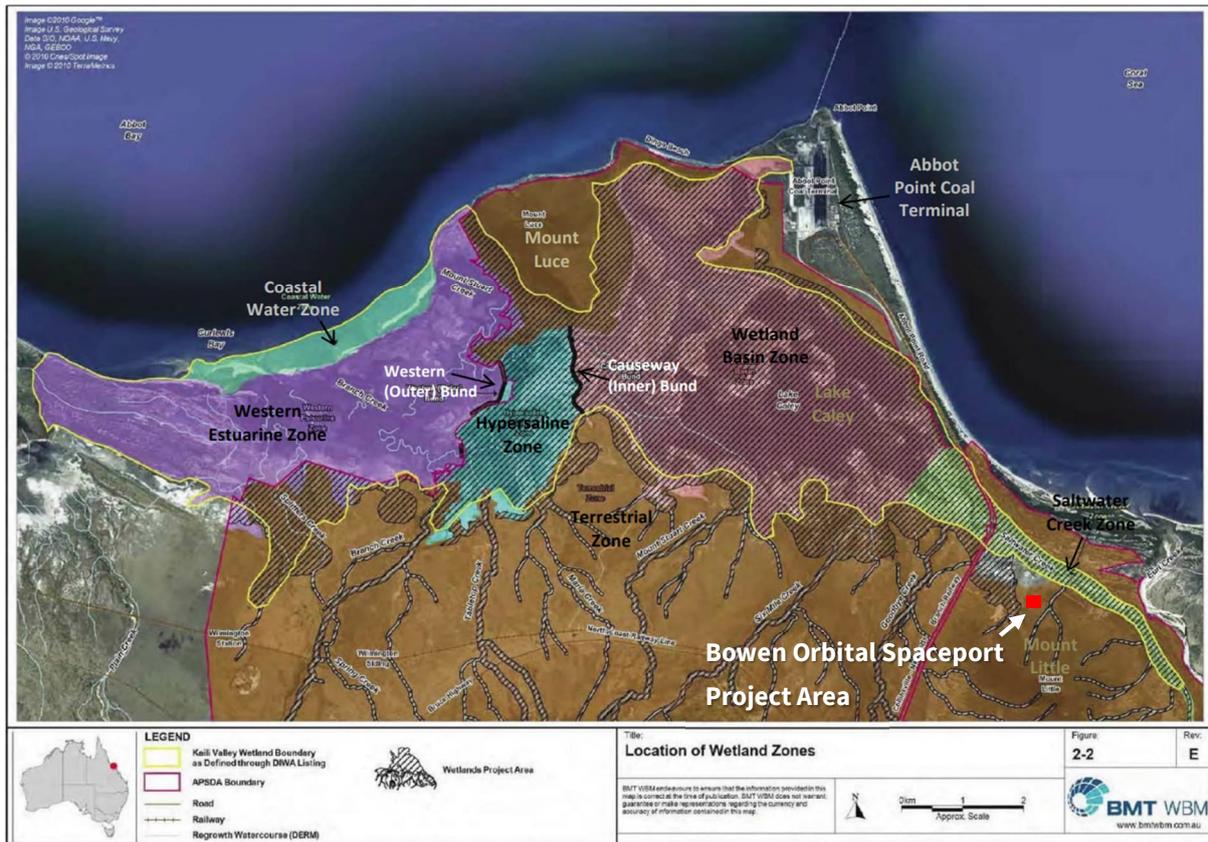


Figure 10 – Location of Wetland Zones (BMT WBM, 2012)

4.3 Great Barrier Reef Marine Park

Coastal waters to the north and north-east of the site are a General Use Zone under the Great Barrier Reef Marine Park Zoning. Flight trajectories to LEO from the BOS are east over the Great Barrier Reef Marine Park (GBRMP) and Great Barrier Reef World Heritage Area (GBRWA).

Sensitive marine ecosystems, communities and species occur within the GBRMP and include:

- Seagrass meadows, mangrove and intertidal soft sediments, rocky foreshores, and coral reefs.
- Transient habitat for important and threatened species including dugong, humpback whale, the Australian snubfin dolphin, Indo-Pacific humpback dolphin, loggerhead turtle, green turtle and flatback turtle.
- Permanent water, a wide range of wetland habitats, very rich food resources and sheltered roosting and breeding sites, which are exceptionally important for waterbirds.

Eris vehicles will have approximately a 180 second flight over the Great Barrier Reef, with the lowest altitude along that path being 10km above sea level and reaching approximately 103km above sea level by the end of this leg.



4.4 Coral Sea Marine Park

The Coral Sea Marine Park (CSMP) sits beyond the GBRMP and is a commonwealth marine reserve.

Scheduled return of the first stage of the rocket has a nominal impact point within the CSMP International Union for Conservation of Nature (IUCN) zone IV area, which is an area where vessels and structures may be conditionally approved for sea dumping.

4.5 Culturally Significant Sites

The Juru People are the traditional owners of the land and waters within the APSDA. Kyburra Munda Yalga Aboriginal Corporation holds the native title rights and interests on trust for the Juru People under the *Native Title Act 1993*.

All Aboriginal cultural heritage items, places, areas, or archaeological sites in Queensland are protected by the *Aboriginal Cultural Heritage Act 2003* (ACH Act). There are several registered Aboriginal cultural heritage sites and areas within the APSDA including shell middens and scatters at Dingo Beach, fish traps at Dingo Beach and at Shark Bay, shell middens and hearths at Dingo Beach and a camp on the western edge of the Caley Valley Wetlands basin.

European cultural heritage includes the Catalina plane wreck located a significant distance (24 km to the east).



5 Environmental Management System

Gilmour Space aims to implement an Environmental Management System (EMS) to support operation of its launch vehicle test and launch operation sites. This is achieved through general adherence to the principles of AS/NZS ISO 14001 requirements as detailed in Figure 11.



Figure 11 – AS/NZS ISO 14001 Environmental Management System

5.1 Environmental Commitments

Gilmour Space recognises and understands the impact their operations may have on the natural environment and are committed to minimising that impact. Gilmour Space’s Environmental Policy Statement (Appendix A) is outlined below:

Commitment

With a growing concern for our environment Gilmour Space Technologies will implement a systematic approach to controlling pollution of the environment. Consideration for our environment is of utmost importance. Resources in line with the importance attached to our environment will be made available to comply with all relevant Acts and Regulations and to ensure that the workplace is safe and without risks to health and the environment.

Responsibilities

The promotion and maintenance of the environment in which we work is mainly the responsibility of management. Management at all levels of the organisation is required to contribute to the overall environmental conditions at our place of work.



- Each manager is required to ensure that this policy and the associated environmental management plans are effectively implemented in their areas of control and to support supervisors and hold them accountable for their specific responsibilities
- Each supervisor is responsible and will be held accountable for taking all practical measures to ensure that:

The workplace under their control is free from polluting the environment and all legislative requirements are being met.

- Any refuse or waste product is to be removed, controlled, or treated to prevent pollution of the environment

5.2 Environmental Responsibilities

The BOS site and launch operations are owned and operated by Gilmour Space. The basic responsibility for environmental protection rests with employees and sub-contractors of Gilmour Space. Responsibilities pertaining to this EMP are broadly outlined in Table 8.

Table 8 – Site Reporting Structure and Environmental Responsibilities

Organisational Hierarchy	Responsibilities
Launch Operations Manager	Maintain knowledge of legislation and best practice in environmental issues/matters Ensure an appropriate level of resources and financial support is available for the management team Record and report significant environmental incidents and non-conformances to regulatory authorities and maintain a log of such incidents and complaints Approve EMP Delegate environmental responsibilities Reports Environmental Risk to Board of Directors
Launch Operations Supervisor	Maintain knowledge of legislation and best practice in environmental issues/matters Provide advice to management on environmental issues pertaining to operations and activities on site Undertake regular environmental audits to identify non-conformances and any other environmental risks Ensure all staff are inducted into the requirements of the EMP Identify and co-ordinate training on environmental matters for all site personnel including contractors Instruct Operations and employees in appropriate environmental management procedures and practices



Organisational Hierarchy	Responsibilities
Launch Operations Team members	Maintain appropriate knowledge of environmental requirements and legislation as applicable to each individual business unit Record and report environmental incidents and complaints Assist the Supervisor in reviewing environmental policy and procedures associated with daily activities

5.3 Site Contacts

Relevant site contacts are detailed in Table 9.

Table 9 – Site Contact Details

Issue	Organisation	Position	Name	Contact details
Implementation and management of the EMP	Gilmour Space	Launch Operations Manager	TBC	TBC
Reporting and auditing	Gilmour Space	Launch Operations Manager	TBC	TBC
Receipt of the following reports: <ul style="list-style-type: none"> • Monitoring • Remedial action • Environmental complaints • Emergencies 	Gilmour Space	Launch Operations Supervisor	TBC	TBC
Ensuring that measures and action plans are implemented	Gilmour Space	Launch Operations Supervisor	TBC	TBC

5.4 Risk Management

Gilmour Space conducted a risk review to characterise and quantify the attendant and residual risks that arise from the operation of the BOS to inform interested parties regarding the treatment of risks and regulatory compliance. The activity of a spaceport in Australia is governed by several regulatory requirements including the Space Act and the EPBC Act. Gilmour Space has conducted a risk assessment under its risk framework to examine the attendant and residual risks to safety and environment to examine its ability to construct and operate the facility within the regulatory requirements.

Risks to the environment have been identified for operation of the facility and treatments identified to control exposure or mitigate the impacts as far as reasonably practicable. Gilmour identified measures to reduce the environmental impact of activity to endemic species and environmental values.



While diligent engineering and innovative design will seek to eliminate risk much as they do in the commercial aviation industry, the real possibility of off-nominal events persists. Risks were assessed and treatments identified to control exposure of sensitive environments to impacts from chemical contamination, blast effects and debris including careful selection of nominal flight paths.

Independent experts were engaged to conduct an environmental analysis quantifying the potential effects of nominal and off nominal launches and informed these mitigations which are assess to comply with the requirement to avoid significant impact to environmental matters of national or state significance.

The full Risk and Hazard Review is maintained and updated annually by Gilmour Space (refer to BOS-0002 Hazard and Risk).

5.5 Training Requirements

5.5.1 Site-specific Induction

It will be responsibility of the Launch Operations Supervisor to ensure all staff are inducted into the EMP. A staff training register is included and will be maintained within the Gilmour Space EMS.

Inductions will cover the following as a minimum:

- The EMP requirements
- The general duty of environmental care.

5.5.2 Site-specific Training

All persons engaged in activities on-site, including (but not limited to) employees and contract staff, must:

- Be trained in the procedures and practices necessary to:
 - Comply with the conditions of this EMP, and
 - Prevent environmental harm during normal operation and emergencies; or
- Operate under the close supervision of such a trained person.

Other personnel (including contractors) that are engaged to undertake activities on behalf of Gilmour Space will comply with the requirements of this EMP. The site induction process will ensure all personnel are inducted and trained in the requirements of this EMP.



6 Environmental Impact Management

This section identifies the general environmental management commitments to manage the potential risks associated with the environmental issues identified. The following tables identify tasks/actions, monitoring, reporting and corrective actions that are relevant to each environmental aspect.

The general environmental management commitments are to be considered in conjunction with the detailed management plans in Table 10.

Table 10 – Detailed management plans

Environmental Aspect	Document	Appendix
Air Quality (Emissions and Dust)	Ambient Air Quality Monitoring Plan	Appendix B
Noise and Vibration	Voise and Vibration Management Plan.	Appendix C
Water Quality	Stormwater Management Plan	Appendix D
Waste Management	Waste Management Plan.	Appendix E
Hazardous and Dangerous Goods	Hazardous and Dangerous Goods Management Plan.	Appendix F
Soil and Land Management	Site-based Land and Pest Management Plan	Appendix G
	Decommissioning and Rehabilitation Plan	Appendix H
	Stormwater Management Plan	Appendix D
	Bushfire Management Plan	Appendix I
Protection of Flora and Fauna	Flora and Fauna Management Plan	Appendix J
Weed and Pest Management	Site-based Land and Pest Management Plan	Appendix G
Energy and Natural Resources (Climate Change)	Ambient Air Quality Management Plan	Appendix B
Cultural Heritage	Cultural Heritage Management Agreement	Appendix K



6.1 Air Quality (Dust and Emissions)

6.1.1 Environmental Values

Local air quality in the project area is typically that of a coastal environment, and is influenced by a range of local and industrial sources such as:

- Dust and emissions from the Abbot Point Road, Newlands Rail Line and from cattle stock movements.
- Possible coal particulate dust and emissions from nearby bulk coal transport and processing facilities.
- Dust and emissions from adjacent Quarry operations.
- Environmental factors (including wind-borne dust, seed, pollen, and smoke).

Schedule 1 of the EPP Air lists air quality objectives for sensitive receptors. To limit continuing increase in air emission levels, the maximum air emissions within an area from industrial air sources should not normally exceed acceptable air quality objectives.

6.1.2 Impacts

Air quality impacts will be generated on the site by:

- Use of heavy machinery and power generators
- Plume from launches
- Rocket exhaust emissions.

Fugitive emissions from vehicles, machinery and power generators used during launch activities are anticipated to be minor due to the small scale and short duration of these activities.

Operations on the site are predominantly performed indoors at the VAB, where there is limited potential for dust or emissions generation. However, dust and or debris may be generated from high velocity rocket exhaust emissions during launch.

Levels of dust or debris generated during a launch event are unlikely to be significant due to an acoustic suppression water deluge system used to minimise noise and vibration during each launch. The deluge system will drench the launch pad under the launch vehicle with water. On ignition, the launch vehicle motors will mix with water droplets around the launch pad which reduces the noise, vibration, dust, and debris generated by the launch.

Dust and debris generated during testing is expected to be negligible due to the horizontal orientation of the engine and the sealed surface in the test pads.

Dust and debris generation for launches and tests are localised and should not present a health hazard.

Atmospheric emissions from Eris Hybrid rockets are composed of:

- H₂O – 65.8 wt%
- CO₂ – 33.7 wt%
- CO – 0.4 wt%
- H₂, OH, Other – 0.1 wt%

An Eris launch vehicle will generate approximately 8.4t of CO₂ emissions into the atmosphere per launch. This is approximately the emissions of a quarter of a Brisbane to Sydney domestic flight.



6.1.3 Management

This EMP has considered the environmental objectives and performance outcomes for noise emissions in Queensland under Schedule 8, Part 3, Division 1 of the EP Regulation in relation to Air. Detailed management and monitoring requirements are included in the – Ambient Air Quality Management Plan (Appendix B). Key management activities are shown below in Table 11:

Table 11 – Air Quality Management Activities

Objectives	<ul style="list-style-type: none"> - Gas contaminants and particulates from launch activities are effectively controlled so that air quality is sustained. Primary and secondary pollutants are minimised by propellant selection and motor design. - No environmental nuisance is caused by the release of noxious or offensive airborne odours or contaminants – such as smoke and fumes from faulty equipment and fugitive dust emissions from operations - Aesthetics and amenity of the local environment is maintained - Health of surrounding ecosystems and species is protected - Human health and wellbeing are protected. 			
Performance Indicators	<ol style="list-style-type: none"> 1. No complaints from adjacent properties and businesses are received. 2. Fugitive emissions of contaminants from storage, handling and processing of materials and transporting materials within the site are prevented or minimised 3. Contingency measures prevent or minimise adverse effects on the environment from of contaminants to air 			
Aspect	Actions	Responsibility	Evidence	Timing
Tasks / Actions	Dust Suppression (as required) <ul style="list-style-type: none"> - Wet tracks and disturbed areas using water trucks. - Apply mulch to disturbed surface soils - Adhere to on site speed limits of 20 km/h - Cover loads on trucks carrying easily dispersible material. - Restrict vehicle movements to defined areas. - Use water suppression within the exhaust radius of rockets prior to launch. - Use acoustic suppression deluge for launch. 	Launch / Test Operations Supervisor	Activity records	During operation
	Emissions Management <ul style="list-style-type: none"> - Ensure power generation is situated in suitable locations away from amenity areas. 			



	<ul style="list-style-type: none"> - Maintain and operate all plant and equipment in accordance with Australian Design Rules and manufacturer’s specifications. - Ensure machinery or plant is not left running idle when not in use. - Maintain all bushfire setbacks to infrastructure and designated fire trails in accordance with the Bushfire Management Plan. 			
	<p>Complaints</p> <ul style="list-style-type: none"> - Investigate any complaint of environmental nuisance caused by air emissions in a timely manner. - Where required undertake additional monitoring at an appropriate location near the origin of the complaint in accordance with the Australian Standards stipulated in the AAQMP. 	Launch / Test Operations Supervisor	Complaint Register	As required
Training	Ensure that all personnel are aware of the potential for dust emissions and operate as per the requirements of this EMP.	Launch / Test Operations Supervisor	Induction records	At all times
Monitoring & Auditing	Conduct regular reviews of the implementation of the dust management practices.	Launch / Test Operations Supervisor	Activity Records	As scheduled
	<p>Implement emissions and particulate monitoring in accordance with the Ambient Air Quality Management Plan for the following contaminants:</p> <ul style="list-style-type: none"> - Carbon monoxide - Carbon dioxide - Nitrogen dioxide - Particulates (PM₁₀ and PM_{2.5}) - Dust deposition 	Launch / Test Operations Supervisor	Monitoring records	At all times
	Compile monitoring records and prepare air quality event summaries, annual reports and trigger level exceedance reports in accordance with AAQMP reporting requirements.	Launch / Test Operations Supervisor	Monitoring reports	As scheduled



	Operational monitoring reports to be made available to the relevant administrating authority on request.	Launch / Test Operations Supervisor	Monitoring reports	As required
Reporting & Recording	Report any malfunctioning equipment to the Launch Operations Supervisor.	All personnel	Activity records	As required
	Report any complaints to the Launch Operations Supervisor and record in the Complaint Register. As a minimum, the details to be recorded are: <ul style="list-style-type: none"> - Details of the complainant - The reason for the complaint - The time of the complaint and the duration of the offending event - Record of the activities undertaken at the site at the time the complaint was received - The measures undertaken to address the issues in the complaint. 	All personnel	Complaint Register	As required
	The Complaint Register will be always kept on the Gilmour SharePoint site and will be available for inspection by the regulatory authorities on request.	Launch / Test Operations Supervisor	Complaint Register	At all times
Corrective Actions	If a non-compliance occurs because of poor practices, personnel on site will be made aware of the problem and informed of acceptable work practices.	Launch / Test Operations Supervisor	Incident reports Training records	As required
	In the event performance criteria are not met, corrective actions may include: <ul style="list-style-type: none"> - Review air quality control strategies. - Investigate feasible additional air controls for plant or equipment. 	Launch / Test Operations Supervisor	CARs	As required



6.2 Noise and Vibration

6.2.1 Environmental Values

The noise environment is typical of a rural and coastal area, with low levels of background noise by natural sources and industrial activities from the adjacent quarry and bulk coal transport and processing industries within the APSDA. The noise sources include those from road transport vehicles and rail bulk haulage trains along Abbot Point Road as well as large heavy machinery and occasional blasting for quarrying activities.

Local sensitive receptors (



Figure 12) include the Caley Valley Wetlands to the west side of Abbot Point Road, Saltwater Creek approximately 500 m to the north of the launch pad and intertidal beach and foreshore areas approximately 1.8 km north/north-east of the launch pad. The Caley Valley Wetlands and beach/foreshore is habitat for threatened and migratory bird species.

The marine environment off the coast from the BOS is part of the Great Barrier Reef Marine Park, and has the potential to include mammal species, marine turtles, and fish species, some of which are migratory. The near coastal marine environment forms part of a shipping channel which is frequented by various types of bulk haulage vessels. These noise sources dominate the non-natural additions to the background noise environment.

Several residential sensitive receptors are located along Euri Creek to the southeast of the launch facility. These dwellings are sensitive receptors, the closest of these residences is approximately 3.6 km away.

Schedule 1 of the EPP Noise lists acoustic quality objectives for residential and commercial sensitive receptors. To limit the continuing increase in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed acceptable noise levels.



Figure 12 - Sensitive receptors

6.2.2 Impacts

Noise will be generated on the site by:

- Use of heavy machinery
- Rocket noise and vibration during launch
- Engine noise and vibration during testing

Noise generated during a launch event will contribute significantly to the immediate noise environment for a period of approximately 60 seconds depending on weather and wind conditions. Saltwater Creek site is the nearest sensitive environmental receptor. Launch noise at this location will be clearly audible at up to 120 dB at this distance for as long as 30 seconds.

Noise generated during testing will contribute significantly to the immediate noise environment but will readily comply with license conditions at residential and commercial sensitive receptors. The likely highest values and the relevant compliance limits are presented in Table 12. The highest noise level at R1 (~ 3 km ESE of the test pad) is likely to be an L_{Amax} of 62 dB(A) during neutral meteorology for the Big HRM. This engine is usually tested over 120 seconds, where the modelled output of this period is a SEL of 83 dB(A), readily complying with the residential SEL limit of 110 dB(A). The highest noise level at commercial receptor R11 (quarry office) is likely to be an L_{Amax} of 91 dB(A) during neutral with wind meteorology for the Big HRM. This engine is usually tested over 120 seconds. Assuming a constant sound output over 120 seconds, the SEL would be 21 dB(A) higher, i.e. an SEL of 103 dB(A), readily complying with the commercial premises SEL limit of 115 dB(A).

The highest noise level at environmental sensitive receptor R9 (site boundary north) is likely to be an L_{Amax} of 121 dB(A) during the day with wind meteorology for the Big HRE. Assuming a constant sound output over



120 seconds, the SEL would be 21 dB(A) higher, i.e. an SEL of 142 dB(A). The highest noise level at environmental sensitive receptor R10 (beach north) is likely to be an L_{Amax} of 106 dB(A) during the day with wind meteorology for the Big HRE. Assuming a constant sound output over 120 seconds, the SEL would be 21 dB(A) higher, i.e. an SEL of 127 dB(A). While a SEL limit currently doesn't exist for environmental sensitive receptors, these modelled test instances that have the potential to cause temporary or permanent hearing loss in birds (i.e. 110 dB(A) or greater).

Table 12 - Big HRE testing maximum noise output

Receptor	Distance from Test Pads (km)		L_{Amax} (dB(A))	SEL (dB(A))	SEL Limit dB(A)	Meteorological Conditions
	Test Pad 1 (HRM Test Pad)	Test Pad 2 (LRE Test Pad)				
R1	3.66 40.441215°W	3.83 136.028842°E	62	83	110	Neutral
R9	0.26 9.358017°W	0.37 41.264826°E	121	142	-	Day with wind
R10	1.57 18.546062°E	1.70 27.405193°E	106	127	-	Day with wind
R11	1.26 84.97128°E	0.97 94.883198°W	91	103	115	Neutral with wind

6.2.2.1 Launch Impacts

Marine fauna behavioural responses such as vocalisation, resting, diving, and breathing patterns, mother-infant relationships and physiological effects associated with the auditory system which could temporarily or permanently affect hearing as well as non-auditory physiological effects are not expected to be affected because of launch activities due to the duration, frequencies and magnitude of noise generated during a launch.

The noise levels experienced by the local terrestrial and marine environments are expected to be of similar duration, frequencies, and magnitude to those experienced from natural sources such as during lightning and thunderstrike events.

It is expected that due to the short duration of noise generated during launch, and the significant timeframe between launch events, that long term fauna behaviours related to survival, habitation, reproduction, and migration will be unaffected.

The nearest residential dwellings to the BOS are expected to experience as much as 80-90 dB once a direct line of sight is possible to the Launch Vehicle during ascent depending on prevailing wind and weather conditions.

Abbot Point Port operations are situated approximately 7 km from the launch location. The noise generated during a launch is expected to be clearly audible at this location when standing out in the open.

Far sensitive receptors in the towns of Bowen or Merinda such as those on Queens Beach may find the rocket clearly audible during its ascent at approximately 70 dB, however this is wholly dependent on prevailing wind and weather conditions.

It is expected that no significant or long-term impacts will be experienced by sensitive receptors.



6.2.2.2 *Test Impacts*

As testing is proposed to occur over a period of 120 seconds, all noise related to the tests are defined as continuous. There are several modelled instances that have the potential to cause temporary or permanent hearing loss in birds (i.e. 110 dB(A) or greater). Noise-related impacts to environmental sensitive receptors will exceed that of a launch event due to the longer timeframe birds would be subject to these levels (i.e. up to 120 seconds). Additionally, these levels are modelled to occur during testing of the Catpack, Big HRE, Small LRE and Big LRE under a range of meteorological conditions.



6.2.3 Management

This EMP has considered the environmental objectives and performance outcomes for noise emissions in Queensland under Schedule 8, Part 3, Division 1 of the EP Regulation. Detailed management and monitoring requirements are included in the Noise and Vibration Management Plan (Appendix C). Key management activities are shown below:

Table 13 – Noise and Vibration Management Activities

Objectives	<ul style="list-style-type: none"> - Operational noise created during assembly and integration occurs within designated building areas to minimise addition to background noise. - Short duration rocket noise shall be maintained at levels which limit negative effects on the surrounding environment and community. - No environmental nuisance is caused at a noise sensitive place by noise emissions from the site - Aesthetics and amenity of the local environment is maintained 			
Performance Indicators	<ol style="list-style-type: none"> 1. Sound from the activity does not exceed acoustic quality objectives stated in the EPP Noise at a sensitive receptor. 2. The release of sound to the environment from the activity is managed so that adverse effects on environmental values, including health and wellbeing and sensitive ecosystems, are prevented or minimised. 3. All noise and impacts generated through activities are in line with expectations set during modelling to support initial development approvals. 4. All noise complaints related to potential damage or disruption and subsequent action are recorded in a Complaints Register. 			
Aspect	Actions	Responsibility	Evidence	Timing
Tasks / Actions	Sound Suppression System is operational for all launch activities to mitigate peak noise and vibration impact to the local environment during a launch / test.	Launch / Test Operations Supervisor	Maintenance records	At all times
	All plant and equipment are fitted with standard manufacturer’s noise control equipment (e.g. original mufflers, engine covers and attenuators). These controls are to be maintained.	Launch / Test Operations Supervisor	Maintenance records	At all times
	Adhere to site speed limits.	All personnel	Activity records	At all times
	No unnecessary use of horns or other audible signals on mobile plant or equipment.	All personnel	Activity records	At all times
	No unnecessary revving or idling of engines on mobile and stationary machines and shut down any equipment not in use.	All personnel	Activity records	At all times



	Keep equipment well maintained to limit noise emissions.	Launch / Test Operations Supervisor	Maintenance records	As per manufacturer's specifications
	<p>Complaints</p> <ul style="list-style-type: none"> - Investigate any complaint of environmental nuisance caused by noise or vibration emissions in a timely manner - Where required initiate additional monitoring at an appropriate location near the origin of the complaint. The method of measurement and reporting must comply with the latest edition of the DES Noise Measurement Manual and associated Australian Standards using calibrated and appropriately operated monitoring equipment. 	Launch / Test Operations Supervisor	Complaint Register	As required
Training	Ensure that all personnel are aware of the potential for noise and vibration exceedances and operate as per the requirements of this EMP.	Launch / Test Operations Supervisor	Induction records	At all times
Monitoring & Auditing	<p>Implement noise and vibration monitoring in accordance with the Noise and Vibration Management Plan (Appendix C) for the following:</p> <ul style="list-style-type: none"> - L_{max} (maximum value A-weighted) - LAE (sound exposure level – SEL) - DNL (day-night average sound level) - Vibration (mm/s) 	Launch / Test Operations Supervisor	Monitoring records	At all times
	<ul style="list-style-type: none"> - Conduct regular reviews of the implementation of the noise management practices. 	Launch / Test Operations Supervisor	A Records	As scheduled
	Maintain monitoring data and prepare noise and vibration event summaries, annual reports, and trigger level exceedance reports in accordance with Noise and Vibration Management Plan reporting requirements.	Launch / Test Operations Supervisor	Monitoring records	As required
	Report any malfunctioning equipment to the Launch Operations Supervisor.	All personnel	Activity records	As required



Reporting & Recording	Report any complaints to the Launch Operations Supervisor and record in the Complaint Register. As a minimum, the details to be recorded are: <ul style="list-style-type: none"> - Details of the complainant - The reason for the complaint - The time of the complaint and the duration of the offending event - Record of the activities undertaken at the site at the time the complaint was received - The measures undertaken to address the issues in the complaint. 	All personnel	Complaint Register	As required
	The Complaint Register will be always kept at the site and will be available for inspection by the regulatory authorities on request.	Launch / Test Operations Supervisor	Complaint Register	At all times
	Operational monitoring reports to be made available to the relevant administrating authority on request.	Launch / Test Operations Supervisor	Monitoring records	At all times
Corrective Actions	If a non-compliance occurs as a result of poor practices, personnel on site will be made aware of the problem and informed of acceptable work practices.	Launch / Test Operations Supervisor	Incident reports and training records	As required
	If performance criteria are not met, corrective actions may include: <ul style="list-style-type: none"> - Review the use of any audible signals. - Investigate feasible additional noise attenuation devices for plant or equipment. 	Launch / Test Operations Supervisor	CARs	As required



6.3 Water Quality

6.3.1 Environmental Values

The Caley Valley Wetlands is hydrologically connected to Saltwater Creek which runs along the northern border of Lot 10. Saltwater Creek conveys overflows from the Don River catchment via the connecting Euri Creek and overland flow from Mount Little. There are no reports of Saltwater Creek completely drying; however, water depths of <0.5 m across the creek have been reported.

There is limited demand or interaction with groundwater on and around the site with no current bores operational on Lot 10.

Adjacent to the Lot 10 is an existing quarry operation, and Abbot Point Road and the Newlands Rail Line which support bulk coal haulage operations. These operations add to the local risk of contaminants to the receiving waters due to dust, debris and chemicals.

6.3.2 Impacts

The VAB, PAD and Test Pads of the BOS development do not intersect Saltwater Creek or upstream tributaries. The access track into the property crosses one watercourse in a single location at a 90-degree angle.

Potential water impacts include:

- Release of oils or other chemicals or maintenance fluids stored in limited quantities during operational activities in preparation for a launch mission, such as lubricating of seals or machines or cleaning of equipment.
- Transport of sediments disturbed by erosion of soils during significant flood or weather events.
- It is possible during a launch event for steam from sound suppression water to condense outside of bunded area, influenced by wind and weather conditions.
- H₂O₂ and plastic solid fuel produce a H₂O and CO₂ exhaust emission and will not contribute to any water contamination by combustion during launch.
- Wastewater disposal from use of facility.

Impacts on groundwater quality and availability are unlikely to occur due to the nature of operational activities and the management protocols detailed in this EMP.



6.3.3 Management

This EMP has considered the environmental objectives and performance outcomes for water and wetland protection in Queensland under Schedule 8, Part 3, Division 1 of the EP Regulation. Detailed management and monitoring requirements are included in – the Stormwater Management Plan (Appendix D). Key management activities are shown below:

Table 14 – Water Quality Management Activities

Objectives	<ul style="list-style-type: none"> - The activity will be conducted in a way that protects environmental values of the receiving waters. - Wastewater is effectively contained and removed from the site to prevent transportation into surrounding waterways. - Contaminants and debris shall be safely contained on site and not released to surrounding waterways. - Infrastructure is designed for 1% AEP flooding events. - Site drainage shall prevent excessive runoff that results in erosion and sediment transportation into surrounding waterways 			
Performance Indicators	<ol style="list-style-type: none"> 1. There is no discharge of contaminants to waters that may cause an adverse effect on environmental values. 2. Site housekeeping is upheld, and bunds, diversion, drainage, and filtration mechanisms regularly checked and in place and maintained as and where required. 3. Storage and handling of contaminants includes effective means of secondary containment to prevent or minimise releases to the environment from spillage or leaks 4. Any discharge to water or a watercourse or wetland will be managed so that there will be no adverse effects due to the altering of existing flow regimes 			
Aspect	Actions	Responsibility	Evidence	Timing
Tasks / Actions	Chemical and Hazardous Goods <ul style="list-style-type: none"> - Ensure work involving oils, chemicals or fluids are performed in areas suitable for their use. - Always maintain spill kits for use on site. - Clean up any spills promptly. 	Launch / Test Operations Supervisor	Engineered bund designs Induction records Incident reports	At all times



	<p>Land Management</p> <ul style="list-style-type: none"> - Maintain roads, drains and drainage structures, bund walls, contour, and diversion banks throughout life of development as needed to ensure debris and chemicals contained and not released to water catchments. - Ensure unimpacted drainage (outside project footprint) is diverted around impacted areas. 	Launch / Test Operations Supervisor	Incident reports Remediation reports	At all times
	<p>Wastewater Disposal</p> <ul style="list-style-type: none"> - Wastewater remains within system while on site. - System is fit for purpose and maintained. - All chemicals used in cleaning and treatment that may end up in system are suitable. - Hazardous or dangerous waste is not disposed of in the wastewater stream. 	Launch / Test Operations Supervisor	Maintenance reports Inspection checklists	At all times
	<p>Maintenance of sumps and drainage structures</p> <ul style="list-style-type: none"> - Maintain drains and drainage structures, bund walls, contour, and diversion banks throughout life of development on as needs basis based on observations. 	Launch / Test Operations Supervisor	Incident reports	At all times
	Undertake vehicle washdown only in a nominated washdown area outside of the riparian buffers.	All personnel	Activity records	At all times
Training	Ensure that all personnel are aware of the potential for water contamination, sensitive environments, spills, and leaks and operate as per the requirements of this EMP.	Launch / Test Operations Supervisor	Induction records	At all times
Monitoring & Auditing	Conduct regular inspections of roads, drains and drainage structures, bund walls, contours, and diversion banks to ensure effectiveness.	Launch / Test Operations Supervisor	Inspection checklists	As scheduled
	Monitoring should be undertaken following any onsite spills that occur during launch activities or other onsite operations in accordance with the Stormwater Management Plan (Appendix D).	Launch / Test Operations Supervisor	Monitoring reports	When required



Reporting & Recording	Report any deterioration of stormwater infrastructure and erosion issues to the Launch Operations Supervisor.	All personnel	Activity records	As required
	Record any uncontrolled releases of water in the incident management system.	All personnel	Incident reports	As required
Corrective Actions	If a non-compliance occurs as a result of poor practices, personnel on site will be made aware of the problem and informed of acceptable work practices.	Launch / Test Operations Supervisor	Incident reports Training records	As required
	If performance criteria are not met, corrective actions may include: <ul style="list-style-type: none"> - Maintain stormwater infrastructure. - Review maintenance activities are undertaken off site to minimise the risk of water contamination. 	Launch / Test Operations Supervisor	CARs	As required



6.4 Waste Management

6.4.1 Environmental Values

The adjacent wetlands and coastal environment contain flora and fauna which may be susceptible to effects from the generation and release of unmanaged waste and contamination.

There exists no sewerage treatment or industrial waste facilities at the property.

The adjacent quarry and the bulk transport and coal export terminal are local sources of waste, contributing to the generation of waste which must be contained and removed from their sites.

6.4.2 Impacts

Launch operations will generate a range of wastes including liquid waste in the form of oils or machinery maintenance fluids and waste from cribbing and ablution with the potential need to manage waste propellant liquids.

Decommission of the project will produce a range of similar wastes in addition to various modular and fabricated steel, plastics and possibly concrete.

Waste generated on site has the potential to impact the following environmental values:

- Visual amenity
- Receiving environments such as land, air, surface water and groundwater
- Flora and fauna
- Health and hygiene of sensitive receptors



6.4.3 Management

Key management activities are shown below and detailed in Waste Management Plan (Appendix E).

Table 15 – Waste Management Activities

Objectives	<i>Any waste generated, transported, or received as part of carrying out the activity is managed in a way that protects all environmental values. Waste created is minimised, segregated, stored, managed, and disposed of in line with legal and community expectations.</i>			
Performance Indicators	<i>1. Waste generated, transported, or received is managed in accordance with the waste and resource management hierarchy under the Waste Reduction and Recycling Act 2011 Waste is disposed of in a way that prevents or minimises adverse effects on environmental values.</i>			
Aspect	Actions	Responsibility	Evidence	Timing
Tasks / Actions	Manage general waste in accordance with the EPP (Waste) principles and hierarchies.	Launch / Test Operations Supervisor	Waste records	At all times
	Remove all general waste from site in a timely manner to ensure the visual amenity of the site is maintained, and to minimise the risk of a release of general waste to the environment.	All personnel	Audit records	At all times
	Ensure adequate storage bins are provided to enable segregation and appropriate storage of wastes: <ul style="list-style-type: none"> - All regulated wastes (including wastewater sludge) to be stored in sealed appropriately labelled tanks within hardstand areas. These are then to be periodically removed by appropriately licensed contractor. - All spilled waste to be stored as per requirements of Safety Data Sheets (SDSs), or if this is not stipulated in sealed drums / containers to be taken off site by appropriately licensed contractor. - Stock and collect recyclable materials periodically. 	Launch / Test Operations Supervisor	Waste records	At all times



	Minimise liquid waste from machinery by limiting as much as is reasonably practical the quantities of liquids and waste liquids on site and also the amount of machinery maintenance conducted on site.	Launch / Test Operations Supervisor	Waste records	At all times
	Manage waste generated by cribbing and ablation throughout operation by installation of facility for the safe generation and temporary storage of these wastes, and the frequent removal from site for treatment to minimise quantity of waste kept on site.	Launch / Test Operations Supervisor	Waste records	At all times
	Perform all activities which may generate fuel, oxidant, or propellant waste on pads or banded areas designed for the purpose of safe containment of these.	All personnel	Waste records	At all times
	If oxidisers intended for use are deposited into dedicated bunds, they will rapidly decompose to free oxygen and water vapours without residue.	All personnel	Waste records	As required
	If propellants intended for use are deposited into dedicated bunds, they will remain stable such that they can be controlled and removed from site.	All personnel	Waste records	As required
	Collect, handle, store and dispose of all toxic or hazardous wastes and any other waste materials in accordance with waste management policies and procedures.	All personnel	Waste records	At all times
Training	Ensure that all personnel are aware of the waste commitments and specific directives including waste reuse/recycling/disposal system and operate as per the requirements of this EMP.	Launch / Test Operations Supervisor	Induction records	During construction and operation
Monitoring & Auditing	Conduct regular site inspections for waste storage, handling, and disposal practices.	Launch / Test Operations Supervisor	Inspection checklists	As scheduled
	Conduct regular reviews of the implementation of the waste management practices, including: <ul style="list-style-type: none"> - Checking the implementation of the requirement for waste segregation - Auditing compliance by assessing waste records. 	Launch / Test Operations Supervisor	Audit report	As scheduled
Reporting & Recording	Report any breakdowns in waste or wastewater systems to the Launch Operations Supervisor.	All personnel	Activity records	As required



	Retain records of waste disposal, particularly regulated waste.	Launch / Test Operations Supervisor	Waste records	At all times
	Report any removal or disposal of regulated waste in an unauthorised, improper, or unlawful manner to the relevant administering authority.	All personnel	Incident reports	As required
Corrective Actions	In the event that a non-compliance occurs as a result of poor practices, personnel on site will be made aware of the problem and informed of acceptable work practices.	Launch / Test Operations Supervisor	Incident reports Training records	As required
	If performance criteria are not met, corrective actions may include: <ul style="list-style-type: none"> - Review the use of any waste contractors. - Ensure appropriate storage and disposal facilities are available for regulated and general waste. 	Launch / Test Operations Supervisor	CARs	As required



6.5 Hazardous and Dangerous Goods

6.5.1 Environmental Values

Baseline soil assessments within and proximate to the launch facility area did not detect soil contamination for the range of analytes tested.

The Caley Valley Wetlands is hydrologically connected to Saltwater Creek that runs along the northern border of the BOS site. Saltwater Creek conveys water from Euri Creek and overland flows that cross the site from the slopes of Mount Little.

Adjacent to Lot 10 is an existing quarry operation, and Abbot Point Road and the Newlands Rail Line which support bulk coal haulage operations. These operations add to the local risk of contaminants to the existing water catchment environment due to dust, debris, and chemicals.

6.5.2 Impacts

Potential impacts to land and water from hazardous and dangerous goods include:

- Impact on environmental values from the release of oils or other chemicals or maintenance fluids stored in limited container quantities during operational activities in preparation for a launch mission such as lubricating of seals or machines or cleaning of equipment.



6.5.3 Management

Key management activities are shown below and in Appendix F – Hazardous and Dangerous Goods Management Plan.

Table 16 – Hazardous and Dangerous Goods Management Activities

Objectives	<ul style="list-style-type: none"> - To manage soil and land to reduce the risk of erosion, bushfire and contamination - To minimise the risk of adverse impacts of chemical and fuel spills on and around the operation area - Bunding and compound integrity are maintained, and all hazardous and dangerous goods safety management is upheld. 			
Performance Indicators	<ol style="list-style-type: none"> 1. No adverse impacts to existing surface water, groundwater, and land from site operations. 2. Oil, fuel, or chemical spills cleaned up promptly and effectively. 			
Aspect	Actions	Responsibility	Evidence	Timing
Tasks / Actions	Chemical and Hazardous Goods <ul style="list-style-type: none"> - Ensure the safe storage and handling of contaminants in accordance with Australian Standards (e.g., AS1940 and AS3833) and the requirements of the EP Act. - Ensure that any materials coming in contact with liquid oxygen are suitable for purpose and are cleaned of organic materials that could combust. - Ensure oils, chemicals and fluids are only used in areas suitable for their use. - Fit an external fire extinguisher(s) and fire blanket(s) to storage areas. - Maintain spill kits for use on site where hydrocarbons and chemicals are stored or used. - Clean up any spills promptly to minimise water contamination. 	Launch / Test Operations Supervisor	Engineered bund designs Induction records Incident reports	At all times
	Minimise the quantities of hazardous substances, fuel, oil, and chemicals stored on site.	Launch / Test Operations Supervisor	Activity records	At all times
	All hazardous substances or dangerous goods procured for use on the project will be accompanied with: <ul style="list-style-type: none"> - SDS. - Risk assessment generated by the supplier. 	Launch / Test Operations Supervisor	SDS Register Purchase records Risk assessment records	At all times



	- Adequate labels.			
	Transport any bulk chemicals only using an appropriately licensed and experienced operator.	Launch / Test Operations Supervisor	Purchase records	As required
	Smoking is not permitted within 5 metres of dangerous goods storage containers.	All personnel	Signage	At all times
Training	Ensure that all personnel have received appropriate training in spill prevention, response, and clean-up, including refuelling techniques and chemical storage and handling requirements.	Launch / Test Operations Supervisor	Induction records	At all times
Monitoring & Auditing	Inspect all equipment at daily start-up for fluid, oil or fuel leaks.	All personnel	Activity records	As scheduled
	Conduct regular site inspections of hazardous and dangerous goods storage, handling and disposal practices and spill kits and sheens or slicks on surface of receiving water.	Launch / Test Operations Supervisor	Inspection checklists	As scheduled
	Conduct regular reviews of the implementation of the dangerous goods management practices.	Launch / Test Operations Supervisor	Audit reports	As scheduled
Reporting & Recording	Report any hazardous and dangerous goods spills promptly to the Launch Operations Supervisor.	All personnel	Activity records	As required
	Retain records of hazardous and dangerous goods kept on site, along with a SDS register.	Launch / Test Operations Supervisor	SDS Register Purchase records	At all times
Corrective Actions	In the event that a non-compliance occurs as a result of poor practices, personnel on site will be made aware of the problem and informed of acceptable work practices.	Launch / Test Operations Supervisor	Incident reports Training records	As required
	If performance criteria are not met, corrective actions may include: <ul style="list-style-type: none"> - Review the use of any contractors. - Ensure appropriate storage and disposal facilities are available for hazardous and dangerous goods. 	Launch / Test Operations Supervisor	CARs	As required



6.6 Soil and Land Management

6.6.1 Environmental Values

The land of the site is coastal and largely undisturbed and has a history of use for cattle grazing. Mount Little is directly southwest of the site. The eastern side of this is a catchment flows to the Saltwater Creek through small highly ephemeral watercourses which intersect the property.

6.6.2 Impacts

Soil erosion is a potential risk following construction, particularly around rehabilitated areas adjacent to impervious surfaces and constructed facilities. Soil erosion could be increased because of poor drainage management. Erosion has the potential to result in the undermining of structures, impacts on the structural integrity of embankments, sedimentation of receiving environments and associated impacts on flora and fauna.

Soil contamination can occur due to the following: uncontrolled releases of stored chemicals, fuels, oils, lubricants, and other hazardous substances because of spills, accidents, fires, extreme weather etc, poor waste management practices, general project activities such as vehicle and equipment operation and maintenance, spraying for weeds and pesticides, solvents and chemicals used in painting and cleaning.

Launch activities are highly weather dependant so there is not a risk of concurrent drain or bund fill from oxidiser, fuel or propellant and overflow from significant weather event leading to contamination.



6.6.3 Management

Key management activities are shown below with further detail provided in Stormwater Management Plan (Appendix D), –Site-based Land and Pest Management Plan (Appendix G), Decommissioning and Rehabilitation Management Plan (Appendix H) and Bushfire Management Plan (Appendix I).

Table 17 – Soil and Land Management Activities

Objectives	- Soil and land are managed to mitigate the risks of erosion, bushfire, and contamination.			
Performance Indicators	1. Erosion is not exacerbated by construction and operation activities. 2. No contamination of soil or land occurs.			
Aspect	Actions	Responsibility	Evidence	Timing
Tasks / Actions	Implement the Stormwater Management Plan to manage the site during operation: <ul style="list-style-type: none"> - Maintain stormwater structures. - Maintain cover on earth batters and other steep areas to control runoff - Maintain bunds and drainage channels to capture runoff 	Launch / Test Operations Supervisor	Maintenance records	At all times
	Undertake operational activities within constructed areas to avoid any further on ground disturbances wherever possible	All personnel	Activity records	At all times
	Manage PAD, drain and bunds, ensuring oxidant bunds will not have residual product which could be stored, and any waste is removed, and assets cleaned to minimise any potential from overflow contamination.	Launch / Test Operations Supervisor	Maintenance records	At all times
	Bushfire <ul style="list-style-type: none"> - Maintain firebreaks in accordance with the Firebreak Schedule in the Bushfire Management Plan - Maintain fuel management zones in accordance with the Fuel Management Zone Treatments for the Asset Protection Zone, SFMZ 1 and SFMZ 2 areas - Firefighting water supplies are full and maintained for the duration of the fire season - Firefighting appliances are serviceable, stocked and checked regularly for the duration of the fire season 	Launch / Test Operations Supervisor	Maintenance records	As scheduled



	Minimise or avoid the movement of vehicles and equipment in the event of rain and wet soils.	All personnel		At all times
	Vehicles shall not enter the designated wetland area buffer and keep to designated access tracks wherever possible.	All personnel		At all times
Training	Ensure that all personnel are aware of the potential for erosion and land contamination issues and operate as per the requirements of this EMP and the Stormwater Management Plan.	All personnel	Induction records	At all times
Monitoring & Auditing	Conduct regular visual inspections of the site for soil and land contamination and maintenance of stormwater structures.	Launch / Test Operations Supervisor	Inspection checklists	As scheduled
	Conduct regular reviews of the implementation of the soil and land management practices.	Launch / Test Operations Supervisor	Audit reports	As scheduled
Reporting & Recording	Report accumulation of sediment within stormwater control devices to the Launch Operations Supervisor.	All personnel	Activity records	As required
Corrective Actions	If a non-compliance occurs because of poor practices, personnel on site will be made aware of the problem and informed of acceptable work practices.	Launch / Test Operations Supervisor	Incident report Training records	As required
	If performance criteria are not met, corrective actions may include: <ul style="list-style-type: none"> - Repair or maintain stormwater controls. - Review the use of any contractors. - Ensure appropriate storage and disposal facilities are available for materials collected in bunds. 	All personnel	CARs	As required



6.7 GBRMP and CSMP

6.7.1 Environmental Values

Flight trajectories to LEO from the BOS are east over the GBRMP, which is a World Heritage property. Whilst no direct impact on the GBRMP is expected to occur during nominal operations, an unsuccessful mission may result in some limited impacts to the GBRMP.

The CSMP sits beyond the GBRMP and is a commonwealth marine reserve. The first jettisoned booster stage is expected to fall into marine waters within the Habitat Protection Zone (IUCN category IV).

6.7.2 Impacts

Pollution resulting from the activity will primarily consist of debris (i.e. booster sections) jettisoned into marine waters during the flight. Solid components would rapidly sink to the ocean floor and are unlikely to impact aquatic species in any meaningful way. Besides the presence of debris, the booster sections are not expected to result in measurable chemical contaminants in the marine environment.

Impacts from a nominal mission include the noise effects from launch which are unlikely to affect marine species within the intertidal zone of the GBRMP.



6.7.3 Management

Key management activities are shown below:

Table 18 – GBRMP and CSMP Management Activities

Objectives	- Contamination and debris are minimised and managed to ensure that no lasting damage or degradation to environments persist from Gilmour Space launch operations.			
Performance Indicators	1. No adverse effect on either marine park 2. The activity is managed in a way that prevents or minimises adverse effects on the GBRMP or CSMP.			
Aspect	Actions	Responsibility	Evidence	Timing
Tasks / Actions	Launch Vehicle Reliability - Ensure Engineering Design uses ECSS, NASA, ISO, and other design best practice codes, and engineering judgement. - Conduct detailed verification and testing of all systems in line with detailed verification and test plans.	Launch Operations Supervisor	Engineering design, verification and testing all presented for attainment of independent flight safety approval	During operation
	Flight Safety Analysis - Launch Permit Application Approved by Australian Space Agency	Launch Operations Supervisor	Launch Permit	During operation
Training	Ensure that all personnel are aware of the recovery procedures and operate as per the requirements of this EMP.	Launch Operations Supervisor	Induction records	During operation
Monitoring & Auditing	Conduct regular visual inspections of the site for launch debris.	Launch Operations Supervisor	Inspection checklists	As scheduled
	Conduct regular reviews of the implementation of the emergency recovery operations.	Launch Operations Supervisor	Audit reports	As scheduled



Reporting & Recording	Retain records of launch incidents.	Launch Operations Supervisor	Incident reports	At all times
	Report any launch incidents and recovery events to the relevant administering authority.	Launch Operations Supervisor	Incident reports	As required
Corrective Actions	If a non-compliance occurs as a result of poor practices, personnel on site will be made aware of the problem and informed of acceptable work practices.	Launch Operations Supervisor	Incident reports Training records	As required
	If performance criteria are not met, corrective actions may include: - Review the use of any launch equipment.	Launch Operations Supervisor	CARs	As required



6.8 Flora and Fauna Management

6.8.1 Environmental Values

The Abbot Point region supports several important habitat types that are known to, or potentially support listed threatened or migratory species including:

- Caley Valley Wetlands which cover an area of about 5,154 ha and is listed in the Directory of Important Wetlands in Australia. The wetlands provide important habitat for colonial and non-colonial birds including threatened and migratory species. The area contains important habitat for the Australian painted snipe.
- Saltwater Creek links the freshwater Caley Valley wetland basin to Euri Creek east of the project area and supports a number of wetland bird species.
- Intertidal and foreshore habitats along Eastern Beach to the north of the launch site provides foraging and roosting habitat for shorebirds and beach nesting birds including beach stone-curlew, curlew sandpiper, greater sand plover, lesser sand plover, bar-tailed godwit, and eastern curlew.

On site vegetation communities are generally intact, consisting of four Least Concern Category B regional ecosystems (REs) exist on site (11.1.1, 11.1.2, 11.3.30 and 11.12.1) under the *Vegetation Management Act 1999*. No threatened or near threatened plants are known to occur on the site.

Threatened species identified as having the potential to occur within the impact area include but are not necessarily limited to curlew sandpiper, greater sand plover, lesser sand plover, beach stone-curlew, squatter pigeon, white-throated needletail, bar-tailed godwit, eastern curlew, Australian painted snipe, and koala.

A beach known to support breeding for green and flatback turtles has been identified 1.8 km north of the site.

6.8.2 Impacts

Potential impacts on flora and fauna include:

- Injury or death due to vehicle collisions during onsite operations
- Noise, dust, and light emissions causing disturbance to fauna behaviour and/or temporary or permanent displacement of wildlife from the area
- Weed spread resulting in altered habitat structure and suitability for native species
- Pest fauna species competing with, or preying upon native fauna species



6.8.3 Management

Key flora and fauna management activities are shown below with further detail provided in the Flora and Fauna Management Plan (Appendix J).

Table 19 – Flora and Fauna Management Activities

Objectives	<ul style="list-style-type: none"> - The activity will be operated in a way that protects the environmental values of wetlands. - Populations of species are not to be affected by operational and launch activities, and existing habitats are managed and protected. 			
Performance Indicators	<ol style="list-style-type: none"> 2. The activity will be managed in a way that prevents or minimises adverse effects on wetlands, flora, and fauna. 3. No loss of threatened species or communities due to operations. 4. No injury or death of native wildlife caused by operations. 5. The integrity of native flora values is protected by minimising weed dispersal. 			
Aspect	Actions	Responsibility	Evidence	Timing
Tasks / Actions	Habituate fauna to noise <ul style="list-style-type: none"> - Engage in regular noise producing activities onsite and proximate to Saltwater Creek to facilitate fauna habituation to noise (i.e. testing of launch siren, onsite engine testing) in accordance with Appendix J. 	Launch / Test Operations Supervisor	Activity records	Three months leading up to launch / test
	<ul style="list-style-type: none"> - Utilise launch sirens as a noise deterrent in the lead up to each launch / test event to minimise the likelihood of bird strike 	Launch / Test Operations Supervisor	Activity records	Between dawn and dusk in the 24 hours leading up to launch / test
	Fauna injury during launch <ul style="list-style-type: none"> - Undertake searches and relocate any fauna species identified within a 100 m to 200 m radius from the launch site and test site - Relocate animals into suitable adjacent microhabitats where present 	Launch / Test Operations Supervisor	Activity records	Within 6 hours prior to the launch / test



	Noise minimisation - Implement water deluge system to minimise noise and vibration during launch	Launch / Test Operations Supervisor	Activity records	During launch
	Fauna vehicle impacts - Implement onsite speed restrictions, 20 km/hr	Launch / Test Operations Supervisor	Activity records	All operations
	Any wildlife found injured and sick due to operational activities will be taken to a wildlife veterinarian or qualified wildlife carer for treatment / rehabilitation.	All personnel	Incident reports	At all times
	Light minimisation - Minimise artificial light generated on site after dark - All external lights fitted facing away from beach, shielded from transmission in the horizontal plane and controlled by motion sensors or timers	Launch / Test Operations Supervisor	Construction Records	At all times
Training	Ensure that all personnel are aware of the native flora and fauna values and operate as per the requirements of this EMP.	Launch / Test Operations Supervisor	Induction records	At all times
Monitoring & Auditing	Conduct regular reviews of the implementation of flora and fauna management practices including: - Checking the implementation of habituation, deterrence and injury mitigation measures	Launch / Test Operations Supervisor	Inspection checklists	At all times
	Conduct regular visual inspections of the area along Saltwater Creek for nesting birds in accordance with Appendix J.	Launch / Test Operations Supervisor	Inspection checklists	As scheduled
	Implement fauna monitoring in accordance with the Flora and Fauna Management Plan (Appendix J).	Launch / Test Operations Supervisor	Monitoring records	As scheduled
	Compile monitoring records and ensure fauna monitoring event summaries and 3-yearly report/s are completed and made available to the relevant administering authority on request	Launch Operations Manager	Monitoring reports	As scheduled



Reporting & Recording	Report any injured or sick fauna to the Launch / Test Operations Supervisor.	All personnel	Incident reports	At all times
	Report any injury or death of native fauna to the relevant administering authority.	Launch / Test Operations Supervisor	Incident reports	As required
Corrective Actions	In the event that a non-compliance occurs as a result of poor practices, personnel on site will be made aware of the problem and informed of acceptable work practices.	Launch / Test Operations Supervisor	Incident reports Training records	As required
	If performance criteria are not met, corrective actions may include: <ul style="list-style-type: none"> - Review the use of any fencing or wildlife contractors. - Ensure appropriate procedures are in place for dealing with wildlife. 	Launch / Test Operations Supervisor	CARs	As required



6.9 Weed and Pest Management

6.9.1 Environmental Values

Weeds occurs across the grassy sections of the project area, particularly Buffel Grass (*Cenchrus ciliaris*), Passionflower (*Passiflora foetida*), and Flannel Weed (*Sida cordifolia*). Other weeds of note include Snakeweed (*Stachytarpheta jamaicensis*) and Mimosa Bush (*Vachellia farnesiana*). Rubber Vine (*Cryptostegia grandiflora*) and Lantana (*Lantana camara*) are also likely to be present in this area. Prickly Acacia (*Acacia nilotica*) and Chinee Apple (*Ziziphus mauritiana*) are also known to occur in the broader Abbot Point area.

6.9.2 Impacts

Operational activities have the potential to increase the abundance and extent of pest flora and fauna in the project area via the movement of vehicle and equipment and waste management.



6.9.3 Management

Key weed and pest management activities are shown below with further detail provided in Site-based Land and Pest Management Plan (Appendix G).

Table 20 – Weed and Pest Management Activities

Objectives	- Ensure that the distribution or abundance of invasive species does not increase because of the operational activities, including the spread of invasive species from the site onto adjacent areas.			
Performance Indicators	<ol style="list-style-type: none"> 1. All operations are managed in accordance with the obligations under the Biosecurity Act to prevent the movement of declared pest plants to and from the site, the relevant management plans and any other relevant approvals, standards, guidelines, and statutory requirements. 2. No introduction of weeds or increase in their distribution as a consequence of operational activities. 3. Existing populations of introduced weeds/pests are controlled. 4. No mosquito breeding habitat is created during operational activities. 			
Aspect	Actions	Responsibility	Evidence	Timing
Tasks / Actions	Vehicles should keep to designated access tracks wherever possible, and particularly avoid driving over declared weeds to avoid translocating seeds.	Launch / Test Operations Supervisor	Activity records	During operation
	Consider potential for soil disturbance when determining pest flora control methods. Chemical control or slashing may be preferable to heavy mechanical control in situations where erosion and sedimentation area an issue.	Launch / Test Operations Supervisor	Activity records	During operation
	Vehicles are prohibited from entering the wetland area and associated 50 m buffer.	Launch / Test Operations Supervisor	Activity records	During operation
	Undertake regular property monitoring for the establishment of new weeds.	Launch / Test Operations Supervisor	Activity records	During operation
	Contracts with suppliers of equipment and services will include vehicle washdown conditions prior to presenting to site.	Launch / Test Operations Supervisor	Activity records	During operation
	All inspections of vehicles, machinery, personnel and materials should be undertaken by a suitably trained and proficient personnel.	Launch / Test Operations Supervisor	Activity records	During operation



	<p>Treatment and control:</p> <ul style="list-style-type: none"> - Weed control to be undertaken by a suitably qualified contractor to the extent of the property boundaries - Ensure all procedures for the treatment and control of pest are current, in accordance with best practice and compliant with relevant legislative guidelines - Chemicals used in the control of pest species should be used in accordance with any label requirements and safety data sheets - Treatment options should be undertaken using an integrated approach. Methods may involve a combination of physical, chemical and/or biological methods, to the situation or site setting to which the herbicide applies, the rate of application and the method of application - Appropriate waste control measures should be established to minimise the transfer or plant waste and external seed sources and new, external food sources for pest fauna - All putrescible waste should be limited to a maximum one week in the project area 	Launch / Test Operations Supervisor	Activity records	During operation
Training	Appropriate induction procedures should be developed to train staff, contractors and visitors in the identification and management of pest species in accordance with the Site-based Land and Pest Management Plan.	Launch / Test Operations Supervisor	Induction records	During operation
Monitoring & Auditing	Conduct regular site inspections to assess the presence of vermin on site and for inadequate weed and pest management measures.	Launch / Test Operations Supervisor	Inspection checklists	As scheduled
	<p>Conduct regular reviews of the implementation of the weed and pest management practices, including:</p> <ul style="list-style-type: none"> - Checking the implementation of the requirement for weed control - Auditing compliance by assessing activity records. 	Launch / Test Operations Supervisor	Audit reports	As scheduled



Reporting & Records	Report any incursion of new weed and pest species.	All personnel	Activity records	As required
	Retain records of weed and pest management controls undertaken.	Launch / Test Operations Supervisor	Activity records	At all times
	Herbicide distribution contractors' records in accordance with ACDC Act	Launch / Test Operations Supervisor	Activity records	As required
Corrective Actions	If a non-compliance occurs because of poor practices, personnel on site will be made aware of the problem and informed of acceptable work practices.	Launch / Test Operations Supervisor	Incident reports Training records	As required
	If performance criteria are not met, corrective actions may include: <ul style="list-style-type: none"> - Review the use of any weed contractors. - Ensure appropriate storage and disposal facilities are available for weed and pest control chemicals and equipment. 	Launch / Test Operations Supervisor	CARs	As required



6.10 Energy and Natural Resources (Climate Change)

6.10.1 Environmental Values

Power generation in the APSDA is usually supplied either by diesel generation or supplied by grid connected services. Noting that natural power generation is very possible within the area, Gilmour Space has established a solar power generation and storage capability for the BOS, supplemented by diesel power generation during any periods of shortfall.

6.10.2 Impacts

Potential impacts from power generation and usage and the use of natural resources include:

- Distraction of pilots in overflying aircraft due to glare from solar panels on site.
- Generation of greenhouse gases.
- Overconsumption of power and natural resources, such as water and natural materials.



6.10.3 Management

Key management activities are shown below with further detail provided in Appendix B – Ambient Air Quality Management Plan.

Table 21 – Energy and Natural Resources Management Activities

Objectives	<ul style="list-style-type: none"> - Minimise the use of and maximise efficiency of the use of energy and natural resources where practicable. - Monitor the amount of greenhouse gasses produced by activities. 			
Performance Indicators	<ol style="list-style-type: none"> 1. Maintain the aesthetics and amenity of the local environment. 2. Lights that may cause confusion, distraction, or glare to pilots in the air be extinguished or modified in accordance with regulation 94 of the Civil Aviation Regulations 1988 (CASA). 			
Aspect	Actions	Responsibility	Evidence	Timing
Tasks / Actions	Use Renewable energy on site to the maximum extent possible <ul style="list-style-type: none"> - Use solar panels made of non-reflective glass to minimise the amount of glare. 	Launch / Test Operations Supervisor	Construction records	During operation
	Modify glare from solar panels or external lighting identified as hazardous by CASA.	Launch / Test Operations Supervisor	Activity records	During operation
	Reduce energy through material use and selection including: <ul style="list-style-type: none"> - Where possible use materials with high recycled content or lower embodied construction materials. - Install energy saving timers and energy efficient lighting where possible. - Maintain plant and equipment to manufacturer’s standards. - Use fuel efficient vehicles on-site. 	Launch / Test Operations Supervisor	Activity records	During operation
	Emissions Management <ul style="list-style-type: none"> - Ensure power generation is situated in suitable locations away from amenity areas. - Maintain and operate all plant and equipment in accordance with Australian Design Rules and manufacturer’s specifications. - Monitor Greenhouse Gas emissions from power generation. 	Launch / Test Operations Supervisor	Audit reports Activity records Emission measurement	During operation



	<ul style="list-style-type: none"> - Ensure machinery or plant is not left running idle when not in use. - Direct artificial light only to where it is required (i.e., areas critical for security and safety). - Utilise artificial light only during necessary periods. - Deploy artificial lighting at the lowest intensity required for the purpose. - Turn off lighting after midnight where possible and direct light downward using shielding in circumstances where this is not possible. - Avoid the use of ultraviolet light emitting outdoor lighting. 			
Training	Ensure that all personnel are aware of the power generation issues and operate as per the requirements of this EMP.	All personnel	Induction records	During operation
Monitoring & Auditing	Conduct regular site inspections and check energy consumption requirements.	Launch / Test Operations Supervisor	Inspection checklists	As scheduled
	Conduct regular reviews of the implementation of the energy generation management practices.	Launch / Test Operations Supervisor	Audit reports	As scheduled
Reporting & Recording	Report malfunctioning equipment to the Launch Operations Supervisor.	All personnel	Activity records	As required
	Retain records of energy usage.	Launch / Test Operations Supervisor	Activity records	At all times
Corrective Actions	If a non-compliance occurs as a result of poor practices, personnel on site will be made aware of the problem and informed of acceptable work practices.		Incident report Training records	As required
	If performance criteria are not met, corrective actions may include: <ul style="list-style-type: none"> - Review the use of any energy consuming equipment. - Investigate feasible external lighting modifications. 	Launch / Test Operations Supervisor	CARs	As required



6.11 Cultural Heritage

6.11.1 Environmental Values

Kyburra Munda Yalga Aboriginal Corporation holds the native title rights and interests on trust for the Juru People and is the prescribed body corporate for the native title holders under the Native Title Act.

6.11.2 Impacts

Construction activities have the potential to disturb or cause the loss of items, values, artefacts or places of indigenous cultural heritage significance or non-indigenous historical importance.



6.11.3 Management

Key cultural heritage management activities are shown below with further detail provided in Cultural Heritage Management Agreement (Appendix K).

Table 22 – Cultural Heritage Management Activities

Objectives	- Do not damage, interfere, or disrespect Indigenous and European cultural heritage sites, and where possible act to preserve these sites.			
Performance Indicators	1. No loss of or damage to indigenous and indigenous cultural heritage.			
Aspect	Actions	Responsibility	Evidence	Timing
Tasks / Actions	Engage in ongoing consultation with Traditional Owners.	Launch / Test Operations Supervisor	Operational records	As required
	Cease all work activities in the area immediately upon finding a cultural heritage object and notify the Launch Operations Supervisor.	All personnel	Operational records	As required
	Manage all indigenous archaeological items found during operations in accordance with the Aboriginal and Cultural Heritage Act 2003 Duty of Care Guidelines and any requirements stated in consultations with Traditional Owners.	Launch / Test Operations Supervisor	Operational records	As required
	Cease work around suspected non-indigenous heritage discoveries and notify Launch Operations Supervisor.	All personnel	Operational records	As required
	Cease work immediately (within 100m of the remains) if human skeletal material is discovered during operations and notify the Launch Operations Supervisor.	All personnel	Operational records	As required
Training	Ensure that all personnel are aware of the importance of the Cultural Heritage Duty of Care and operate as per the requirements of this EMP.	Launch / Test Operations Supervisor	Induction records	At all times
Monitoring & Auditing	Conduct regular reviews of the implementation of the cultural heritage management practices.	Launch / Test Operations Supervisor	Audit report	As scheduled
	Report any cultural heritage discoveries to the Launch Operations Supervisor.	All personnel	Activity records	As required



Reporting & Recording	Retain records of items of cultural heritage.	Launch / Test Operations Supervisor	Culture heritage records	At all times
	Contact immediately the Queensland Police, Cultural Heritage Coordination Unit (DES) and Traditional Owner representative(s) if any human skeletal materials discovered.	Launch / Test Operations Supervisor	Incident reports	As required
	Contact Traditional Owner representative(s) if any indigenous items discovered and contact DES if any non-indigenous items discovered.	Launch Operations Supervisor	Incident reports	As required
Corrective Actions	In the event that a non-compliance occurs as a result of poor practices, personnel on site will be made aware of the problem and informed of acceptable work practices.	Launch / Test Operations Supervisor	Incident reports Training records	As required
	If performance criteria are not met, corrective actions may include: <ul style="list-style-type: none"> - Review the use of the EMP. 	Launch / Test Operations Supervisor	CARs	As required



6.12 Community Stakeholder Engagement

6.12.1 Environmental Values

The operational areas subject to this EMP are located within the APSDA Industry Precinct Zone. Currently much of the Industry Precinct Zone remains undeveloped and is utilised for agricultural purposes, primarily cattle grazing.

Sensitive receptors near the site include the Abbot Point Quarry operational area located approximately 600 m from the launch facility and the site office located approximately 1 km from the launch facility. There are no existing nearby residents which would be considered sensitive receptors to normal operational activity noise.

6.12.2 Impacts

Noise impacts associated with launches may result in complaints from sensitive receptors or from the wider community.



6.12.3 Management

Key management activities are shown below:

Table 23 – Community Stakeholder Management Activities

Objectives	- Actively inform and engage with community stakeholders about operational activities to minimise disturbance and disruption.			
Performance Indicators	1. No complaints received from sensitive receptors or regulatory authorities.			
Aspect	Actions	Responsibility	Evidence	Timing
Tasks / Actions	Liaise with/notify sensitive receptors of launches / tests and intended operation times and the potential for increased noise levels during the launches tests.	Launch / Test Operations Supervisor	Notification records	A month prior to launch / test
	Adhere to liaised/approved launch / test dates and times.	Launch / Test Operations Supervisor	Activity records	During operation
	Investigate all complaints in a timely manner, and if required undertake monitoring at an appropriate location near the origin of the complaint.	Launch / Test Operations Supervisor	Complaint Register	As required
Training	Ensure that all personnel are aware of the recovery procedures and operate as per the requirements of this EMP.	All personnel	Induction records	During construction and operation
Monitoring & Auditing	Maintain the Complaint Register to determine if trends in complaints are occurring and that issues are fully resolved	Launch / Test Operations Supervisor	Complaint register and Audit reports	As scheduled
	Conduct regular reviews of the implementation of the community stakeholder practices.	Launch / Test Operations Supervisor	Audit reports	As scheduled
Reporting & Recording	Report any stakeholder interactions to the Launch Operations Supervisor for reporting and resolution	All personnel	Activity records	As required



	Retain records of stakeholder engagement including outcomes	Launch / Test Operations Supervisor	Stakeholder records	At all times
	Record any complaints in the Complaint Register. As a minimum, the details to be recorded are: <ul style="list-style-type: none"> - Details of the complainant - The reason for the complaint - The time of the complaint and the duration of the offending event - Record of the activities undertaken at the site at the time the complaint was received - The measures undertaken to address the issues in the complaint. 	Launch / Test Operations Supervisor	Complaint Register	As required
	The Complaint Register will be kept at the site at all times. and will be available for inspection by the regulatory authorities on request.	Launch / Test Operations Supervisor	Complaint Register	At all times
	Any operation monitoring records in response to a complaint will be available for review by the relevant administrating authority on request.	Launch / Test Operations Supervisor	Monitoring records	At all times
Corrective Actions	In the event that a non-compliance occurs as a result of poor practices, personnel on site will be made aware of the problem and informed of acceptable work practices.	Launch / Test Operations Supervisor	Incident reports Training records	As required
	If performance criteria are not met, corrective actions may include: <ul style="list-style-type: none"> - Review the use of any notices in newspapers etc. - Ensure stakeholder contact list is up to date. 	Launch / Test Operations Supervisor	CARs	As required



7 Environmental Monitoring Summary

A summary of the environmental monitoring requirements associated with the EMP and relevant plans are detailed below. The location of monitoring points is presented in Figure 13.

- Air Management Plan (Appendix B) - Table 24
- Noise and Vibration Management Plan (Appendix C) - Table 25
- Stormwater Management Plan (Appendix D) - Table 26
- Flora and Fauna Management Plan (Appendix J) – Table 27

Table 24 – Summary of Air Quality Monitoring Program

Monitoring Location	Monitoring equipment	Monitoring equipment code	Deployment period	Analysis frequency	Analysis suite
MS01	PM10 Survey	NE01_PM10	Continuous	24-hour period around launch event	PM10
	PM2.5 Survey	NE01_PM2.5	Continuous	24-hour period around launch event	PM2.5
	Gas detector	G01	48-hour period around launch event	24-hour period around launch event	CO, CO2, NO2
	Dust Deposition	D01	Continuous	30-day interval	Total Insoluble Matter
MS02 – Co-located with R09	Gas detector	G02	48-hour period around launch event	24-hour period around launch event	CO, CO2, NO2
	Dust Deposition	D02	Continuous	30-day interval	Total Insoluble Matter
MS03	PM10 Survey	NE02_PM10	Continuous	24-hour period around launch event	PM10
	PM2.5 Survey	NE02_PM2.5	Continuous	24-hour period around launch event	PM2.5
	Gas detector	G03	48-hour period around launch event	24-hour period around launch event	CO, CO2, NO2
	Dust Deposition	D03	Continuous	30-day interval	Total Insoluble Matter



Monitoring Location	Monitoring equipment	Monitoring equipment code	Deployment period	Analysis frequency	Analysis suite
MS04	Dust Deposition	D04	Continuous	30-day interval	Total Insoluble Matter
MS05	Meteorological station	MS01	Continuous	As required to support findings	Wind speed and direction, humidity, temperature, and precipitation

Table 25 – Summary of Noise and Vibration Monitoring Program

Monitoring location	Monitoring equipment	Monitoring equipment code	Analysis Frequency	Analysis suite
R01	Type 1 noise logger	N01	24 hours preceding and following all launch events, including the launch event	Second-by-second measurements of LAeq (converted to SEL) and LMax
R08	Type 1 noise logger	N02	24 hours preceding and following the first two launch events	Second-by-second measurements of LAeq (converted to SEL) and LMax
R09	Type 1 noise logger	N03	24 hours preceding and following all launch events, including the launch event	Second-by-second measurements of LAeq (converted to SEL) and LMax
	Geophone	V02	24 hours preceding and following all launch events, including the launch event	Minimum second-by-second measurements vibration in mm/s

Table 26 – Summary of Stormwater Monitoring Program

Monitoring location	Monitoring frequency	Water Quality Parameters
SW01		In situ:



Monitoring location	Monitoring frequency	Water Quality Parameters
SW02	Only to be undertaken following any onsite spills that occur during launch activities or other onsite activities	<ul style="list-style-type: none"> - pH - Temperature - Conductivity - Dissolved oxygen - Turbidity Laboratory: <ul style="list-style-type: none"> - Total suspended solids - Hydrocarbons
SW03		

Table 27 – Summary of Fauna Monitoring Program

Monitoring location	Monitoring frequency	Parameters
Coastline surveys	Prior to and following launch activities	Bird counts
Wetland surveys	Prior to and following launch activities	Bird counts
Riverine surveys	Prior to and following launch activities	Bird counts



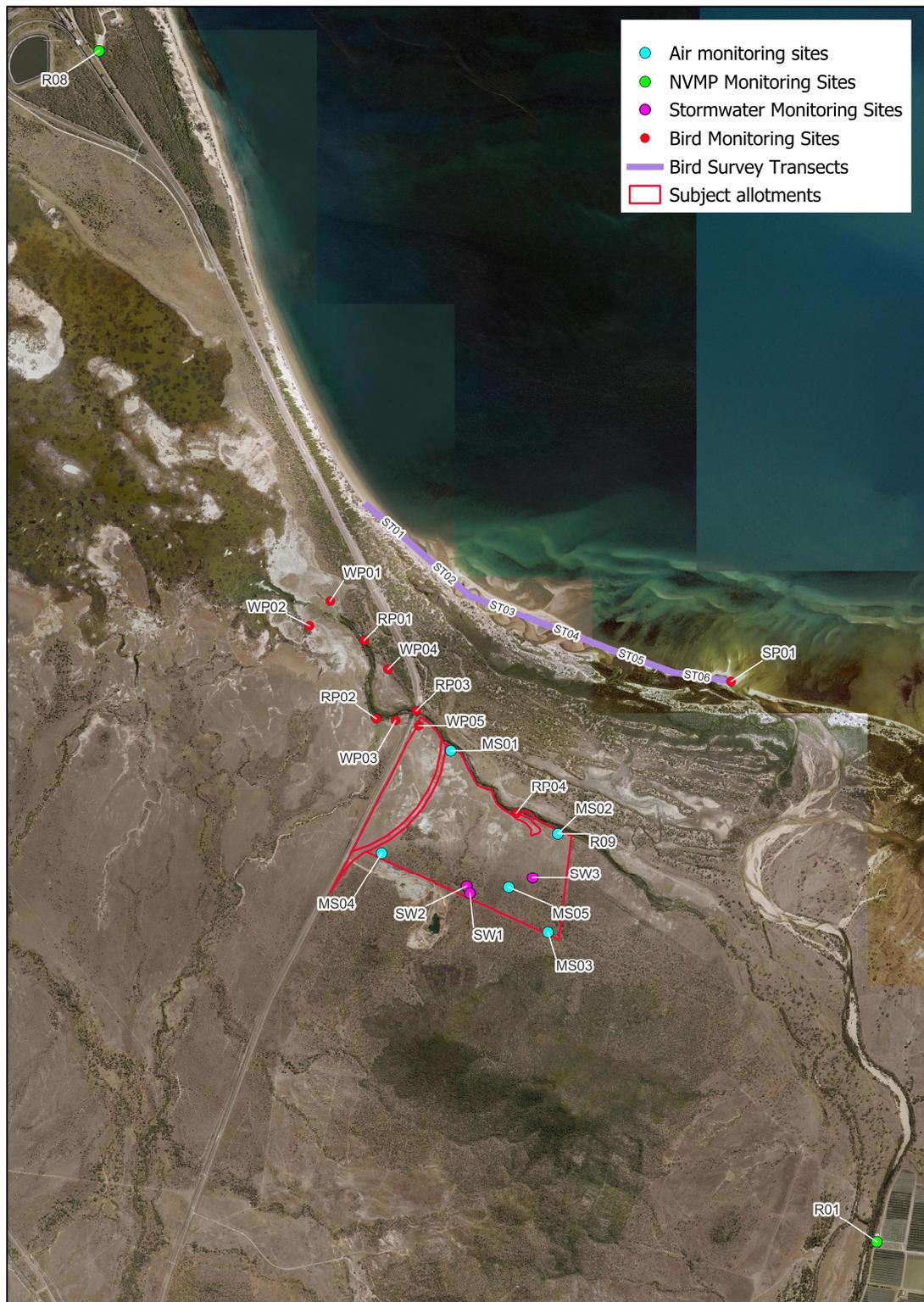


Figure 13 - Monitoring locations



8 Monitoring, Auditing and Documentation

8.1 Monitoring and Auditing

An Environmental Inspection Checklist (Appendix L) will be used to assist with assessing site operations against the requirements of the EMP and identify any opportunities for improvement. An inspection shall be undertaken regularly by the launch operations team and reported to the Launch / Test Operations Supervisor.

8.2 Reporting

General Progress Reports shall be prepared by the Launch / Test Operations Supervisor or delegate for regular submission to the Executive Team. The report will include the following summaries:

- EMP revisions
- Environmental Monitoring and Performance results
- Environmental training
- Internal audit results
- Non-compliances, incidents and/or proposed actions for rectification or improvement of management procedures
- The status of open non-compliances.

8.3 Records Management and Document Control

A copy of the EMP shall be kept in the Gilmour Space SharePoint site in accordance with Gilmour Space's document control procedures.

Any record or document required as an outcome of this EMP or requested by an administering authority must be kept in accordance with the Gilmour Space's Document Management Plan and will be made available to an authorised person upon request.

Records must be kept of the key environmental performance indicators, monitoring results, corrective actions, environmental incidents and complaints, reports to management, and any records required by law.

Records and documents are required to be kept for at least 5 years and made available to the Coordinator-General or a delegate of the Coordinator-General upon request.

8.4 Document Review and Improvement

This EMP is a dynamic document that stipulates the procedures used to manage each environmental element. The EMP will be reviewed as required and updated where required after each inspection and at least annually to capture any changes to procedures and ensure it remains relevant. The EMP will deliver its stated outcomes by:

- Developing environmental practices and procedures that are practical, sensible and manageable
- Maintaining environmental awareness and promoting skills amongst contract workers on-site
- Detailing appropriate action for complaint response



8.5 Continual Improvement

8.5.1 Non-Compliance and Corrective Action

The Launch / Test Operations Supervisor shall assume responsibility for implementation of this EMP. Where the Launch / Test Operations Supervisor becomes aware of a site or operational condition that does not comply, a Corrective Action Report (CAR) form is to be completed and actioned.

In some instances, further investigation or monitoring may be required to establish whether the EMP has been adequately implemented, or whether the work is compliant with relevant legislation, guidelines, and policy. In these instances, an independent party, such as an Environmental Consultant or Auditor, may carry out the investigation or monitoring.

8.6 Confidentiality

The EMP is copyright protected and shall not be copied or reproduced without the express permission of the Gilmour Space Technologies.

8.7 Precedence

Where ambiguity is detected regarding environmental requirements between the procedures and requirements specified herein and other management documents, then the procedures specified herein shall take precedence until a review has been conducted.



9 Incidents, Emergencies and Complaints

9.1 Incident Types

An incident refers to a work-related event or occurrence that exposes persons health and safety, the environment or other objective to risk. In the environmental context, an incident has the risk of causing:

- Environmental Nuisance which refers to any unreasonable interference or likely interference with an environmental value caused by – a) aerosols, fumes, light, noise, odour, particles, or smoke; or b) an unhealthy, offensive, or unsightly condition because of contamination; or c) another way prescribed by regulation. OR
- Environmental Harm which refers to any adverse effect, or potential adverse effect (whether temporary or permanent and of whatever magnitude, duration, or frequency) on an environmental value, and includes environmental nuisance.

An incident is a non-compliance with this EMP. This may include but is not limited to:

- Complaints regarding the facility
- Contamination outside the site confines
- Dusty, odorous, or noisy conditions
- Threatened species death resulting from activities
- Unauthorised waste disposal

9.2 Incident Reporting and Notification

9.2.1 Internal Incident Reporting

All personnel are responsible for reporting all incidents to the Launch / Test Operations Supervisor. The Launch / Test Operations Supervisor will be responsible for reporting environmental incidents to the Launch Operations Manager and appropriate agencies. All incidents are to be recorded the Incident Report Form provided in the Facility Management Plan. All persons attending the site are required to comply with the procedures in the Site Security Plan and are provided with the contact details for emergencies.

9.2.2 Regulatory Agencies Notification

The Launch / Test Operations Supervisor shall telephone DES's pollution hotline as soon as practical after becoming aware of any release of contaminants not in accordance with the DES Permits. Following this, a written notice detailing the following information must be provided to DES within 14 days. The notification of any emergency or incident involving the release of contaminants that is not in accordance with conditions of the relevant approval, must include, but should not be limited to the following information:

- The name of the holder of the approval
- The number of the relevant approval
- The name and telephone number of the designated contact person
- The location and time of the emergency or incident
- The time the Launch / Test Operations Supervisor became aware of the release
- The quantity and substance released
- The suspected cause of the release
- The environmental nuisance/harm caused, threatened, or suspected to be caused by the release



- Actions taken to prevent any further release and mitigate any environmental nuisance/harm caused by the release.

9.3 Incident Response

All immediate incident response activity including those involving launch anomalies will be conducted in accordance with the Emergency Response Plan. Once the site of the incident is safe to access and if required, the regulatory requirements of the Space (launches and returns) Act have been met regarding accident investigation, Gilmour Space will commence site remediation and reporting activities.

Site remediation will be conducted in consultation with the relevant authorities and any affected landholder and will include:

1. Employing necessary means to contain and dilute non-persistent contaminants where safe to do so (including temporary earthen berms, sandbags etc)
2. Recording the condition of the impact site
3. Removing any residual vehicle parts
4. Testing soils and waters for any persistent contaminants
5. Isolation, where possible, and treatment of any waters affected by persistent contaminants
6. Engaging suitably qualified contractors to remove and treat any soils affected by persistent contaminants
7. Engaging suitably qualified Land Management Contractors to restore land condition
8. Establish environmental monitoring program to assess and if necessary, adjust the remediation progress of the site

Note that under the Space Act, until authorised by the Minister's representative:

It is an offence to remove or interfere with any object or part of the launch vehicle unless required to:

- extract persons (including deceased persons) from the wreckage of a space object;
- protecting the wreckage from being destroyed by fire or other cause;
- prevent immediate danger to the safety of persons or property; or
- to move the space object or the wreckage and its contents to a safe place when the object or rocket crashes on water or is wrecked on water.

9.4 Incident Investigation

All incidents that affect the environment of the BOS shall be investigated by the Launch / Test Operations Supervisor to determine:

- Nature, type, location and extent of the incident and the affected area
- Actual and/or potential environmental impacts of the incident
- Suspected cause of the incident
- Measures required to mitigate any further environmental harm
- Remedial measures required to correct any environmental harm
- Measures to be implemented to prevent a recurrence of the incident.

In the event of a small fire at the site, a portable fire extinguisher shall be used to attempt to extinguish the fire. If the initial response to a fire is unsuccessful or if there are any doubts as to the capability of the onsite firefighting resources, the Queensland Fire and Emergency Service shall be contacted immediately.



9.5 Complaint Management

All complainants from the public will be treated respectfully. The administering authority (OCG) and Gilmour Space will notify on site personnel within 24 hours of any complaint received requiring further action. All complaints must be handled promptly. The Launch / Test Operations Supervisor will maintain the Complaints Register which is included within the Gilmour Space EMS. As a minimum, the following details must be recorded for all complaints received:

1. Date, time and nature of any non-conformance or complaint
2. Name and contact details of any complainant
3. Any investigations undertaken
4. Conclusions formed
5. Any actions taken
6. The person responsible for the action
7. Resolution of complaint
8. Any abatement measures implemented
9. The person responsible for complaint resolution

The Complaints Register will be included in any audit reports and records. A complaints procedure is provided in Figure 14.

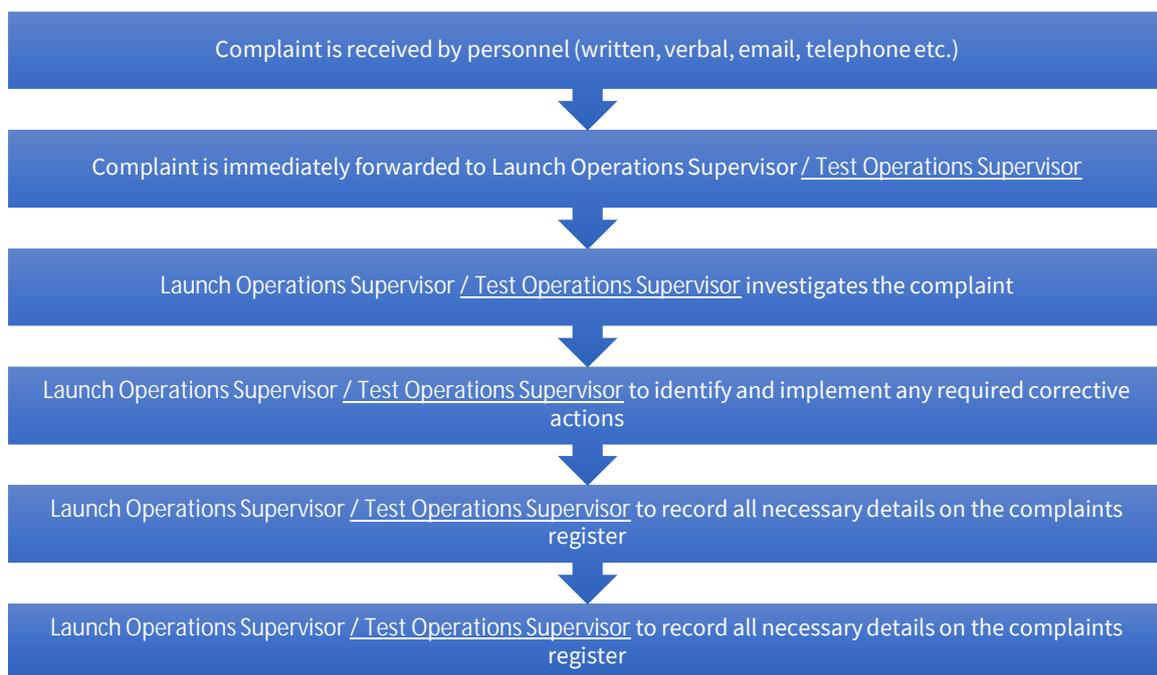


Figure 14 – Complaints Procedure



Abbreviations

Abbreviation	Definition
AAQMP	Ambient Air Quality Management Plan
AEP	Annual Exceedance Probability
ASS	Acid Sulphate Soil
BMP	Bushfire Management Plan
BOS	Bowen Orbital Spaceport
CAR	Corrective Action Report
CASA	Civil Aviation Safety Authority
CSMP	Coral Sea Marine Park
DES	Queensland Department of Environment and Science
ECSS	European College of Sport Science
EMP	Environmental Management Plan
EP Act	<i>Environmental Protection Act 1994</i>
EP Regulation	<i>Environmental Protection Regulation 2019</i>
EPBC Act	<i>Environmental Protection Biodiversity Conservation Act 1999</i>
EPP Air	<i>Environmental Protection (Air) Policy 2019</i>
EPP Noise	<i>Environmental Protection (Noise) Policy 2019</i>
EPP Water & Wetlands	<i>Environmental Protection (Water and Wetland Biodiversity) Policy 2019</i>
ESCP	Erosion and Sediment Control Plan
FFMP	Flora and Fauna Management Plan
FOD	Foreign Object Debris
GEMS	Gilmour Space's Environmental Management System
Gilmour Space	Gilmour Space Technologies
GBRMP	Great Barrier Reef Marine Park
GBRWHA	Great Barrier Reef World Heritage Area
IAASS	International Association for the Advancement of Space Safety
IUCN	International Union for Conservation of Nature
KPI	Key Performance Indicator
LCC	Launch Control Centre
LEO	Lower Earth Orbit
PAD	Launch Pad



Abbreviation	Definition
MNES	Matters of National Environmental Significance
NASA	National Aeronautics and Space Administration
NQBP	North Queensland Bulk Ports
NVMP	Noise and Vibration Management Plan
PPE	Personal Protective Equipment
RE	Regional Ecosystem
SDA	Abbot Point State Development Area
SDS	Safety Data Sheet
SBLPMP	Site-based Land and Pest Management Plan
SWMP	Stormwater Management Plan
VAB	Vehicle Assembly Building
Waste Act	<i>Waste Reduction and Recycling Act 2011</i>



Appendix A Gilmour Space’s Environmental Policy



ENVIRONMENTAL POLICY

COMMITMENT

With a growing concern for our environment GILMOUR SPACE TECHNOLOGIES will implement a systematic approach to controlling pollution of the environment. Consideration for our environment is of the utmost importance. Resources in line with the importance attached to our environment will be made available to comply with all relevant Acts and Regulations and to ensure that the workplace is safe and without risks to health.

RESPONSIBILITIES

The promotion and maintenance of the environment in which we work is mainly the responsibility of management. Management at all levels of the organisation is required to contribute to the overall environmental conditions at our place of work.

- Each manager is required to ensure that this policy and the programme is effectively implemented in their areas of control and to support supervisors and hold them accountable for their specific responsibilities
- Each supervisor is responsible and will be held accountable for taking all practical measures to ensure that:
 - the workplace under their control is free from polluting the environment and
 - any refuse or waste product is to be removed, controlled or treated to prevent pollution of the environment
 - all legislative requirements are being met.

Systematic Approach to Environmental Control

1. Identify and conform to legislative requirements pertaining to our industry
 2. Consult with the necessary authorities regarding waste disposal
 3. Design and implement safe systems of operation
 4. Design and implement correct disposal procedures
 5. Implement an environmental preventative maintenance programme at each work site
 6. Implement an employee awareness program
- I. the supervisor will be held accountable for detecting any unsafe or unhealthy condition
 - II. if the supervisor does not have the necessary authority to fix a problem, they will be held accountable for reporting the matter promptly with any recommendations for remedial action to a person who does have the necessary authority

Managers/Supervisors

The supervisor or manager who has the necessary authority will be held accountable for taking prompt remedial action to prevent or eliminate any unsafe occurrence and to provide the necessary control mechanisms to assist in the management of the environment where appropriate

Employees

All employees are required to co-operate with management so that the policy, programmes and legislative requirements ensure that the environment remains in a safe and healthy condition



Signature: *Adam Gilmer* Date: 9/12/19
Name:



Appendix B Ambient Air Quality Management Plan



AMBIENT AIR QUALITY MANAGEMENT PLAN

Gilmour Space Technologies Pty Ltd



202108

Ambient Air Quality
Management Plan

10/10/2022

Document status

Project No	Version	Document name	Client	Author	Reviewer	Review date
202108	Draft	Ambient Air Quality Management Plan	Gilmour Space Technologies Pty Ltd	A. Fitzgerald M. Simpson	L. Liessmann	10/10/2022

Approval for issue

Approver	Signature	Approval date
A. Fitzgerald		10/10/2022

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Contents

1	INTRODUCTION	1
1.1	Objectives	1
2	RELEVANT LEGISLATION, GUIDELINES, STANDARDS AND APPROVAL CONDITIONS.....	2
2.1	Legislation.....	2
2.2	Development approval conditions	2
3	EXISTING ENVIRONMENT	5
3.1	Site location and description.....	5
3.2	Sensitive receptors.....	5
3.3	Existing air quality environment	7
3.4	Prevailing wind.....	7
4	DESCRIPTION OF ACTIVITIES	8
4.1	Bowen Orbital Spaceport Operations.....	8
5	AIR QUALITY MONITORING PLAN.....	9
5.1	Background and context.....	9
5.2	Applicable standards and guidelines.....	10
5.3	Ambient air quality and dust deposition trigger limits.....	10
5.4	Monitoring equipment.....	11
5.5	Monitoring locations and frequency	12
5.6	Monitoring program summary.....	14
6	REPORTING	15
6.1	Air quality monitoring event summaries	15
6.2	Annual air quality monitoring report	15
6.3	Trigger level exceedance reporting.....	15
7	AIR QUALITY MANAGEMENT.....	17
7.1	Recommended control measures	17

Tables

Table 1	Relevant legislation	2
Table 2	Relevant conditions from DA permits.....	3
Table 3	Relevant sensitive receptors and proximity to launch operations (SEG 2021)	5
Table 4	Estimated pollutant levels (State of the Environment Report 2020)	7
Table 5	Predicted concentrations of carbon monoxide and carbon dioxide at sensitive receptors (including assumed ambient levels where available) (SEG 2021).....	9
Table 6	Relevant Air Quality Guideline Values	10
Table 7	Air monitoring locations for launch facility	12
Table 8	Summary of air quality monitoring program.....	14

Figures

Figure 1	Location of sensitive receptors	6
Figure 2	Wind rose data for the BOS.....	7
Figure 3	BOS monitoring sites.....	13

1 INTRODUCTION

This Ambient Air Quality Management Plan (AAQMP) was produced by Terra Solutions Pty Ltd (Terra) and Simpson Engineering Group (SEG) for Gilmour Space Technologies (Gilmour) for the Bowen Orbital Spaceport (BOS) Launch Operations located on Lots 8, 9 and 10 on SP295408 (the Site) in the Abbot Point State Development Area.

The Office of the Coordinator General (OCG) approved a material change of use (MCU) for a high impact industry (launch facility) in accordance with section 84E of the *State Development and Public Works Organisation Act 1971*. The MCU provides this approval from the date of obtaining Commonwealth approval pursuant to the *Space (Launches and Returns) Act 2018*, for a launch facility licence to operate a launch facility on the site.

The following relevant conditions of the OCG approval require that an AAQMP be prepared and implemented:

- Condition 12.1: Prepare and submit to the Coordinator-General and Whitsunday Regional Council, a detailed project specific Environmental Management Plan (EMP) addressing both the construction and operational phases of the project, including Condition 12.1 (a) Air Quality and Dust Management Plan.
- Condition 25: An Ambient Air Quality Monitoring (AAQM) Program must be developed and implemented to specify how the ambient dust impacts of the project will be monitored. The AAQM Program must be conducted in accordance with the Queensland Air Quality Sampling Manual and applicable Australian Standards and is to include, but not necessarily be limited to:
 - Locations, frequencies and methods for monitoring of potential air contaminants for determining the actual impacts from the proposed activity on the receiving environment
 - provision for the use of at least three air quality samplers (CO, CO₂ and NO₂) and one meteorological station capable of monitoring wind speed and direction, humidity, temperature and precipitation

The AAQMP stipulates ambient air quality and dust deposition monitoring and reporting requirements to be followed to ensure the General Environmental Duty of Care is met under the *Environmental Protection Act 1994* (EP Act) and associated Regulations.

1.1 Objectives

The objectives of this AAQMP are to:

- Develop an AAQMP
- Characterise air quality in the environment within and surrounding the BOS site
- Assess impacts at the interface to sensitive land uses
- Determine whether there is potential for nuisance or environmental harm
- Document mitigation and measures proposed to prevent spray drift, odour, noise, dust, smoke, or ash emission on nuisance sensitive places

2 RELEVANT LEGISLATION, GUIDELINES, STANDARDS AND APPROVAL CONDITIONS

2.1 Legislation

Relevant legislation is presented in Table 1

Table 1 Relevant legislation

Legislation	Description
Environmental Protection Act 1994 (EP Act)	The object of the EP Act is to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (ecologically sustainable development).
<i>Environmental Protection (Air) Policy 2019 (EPP (Air))</i>	The EPP (Air) addresses the environmental values to be enhanced or protected namely— (a) the qualities of the air environment that are conducive to protecting the health and biodiversity of ecosystems; and (b) the qualities of the air environment that are conducive to human health and wellbeing; and (c) the qualities of the air environment that are conducive to protecting the aesthetics of the environment, including the appearance of buildings, structures and other property; and (d) the qualities of the air environment that are conducive to protecting agricultural use of the environment.
<i>National Environment Protection (Ambient Air Quality) Measure 2016 (NEPM (Ambient Air))</i>	The purpose of NEPM (Ambient Air), among other things, is to: a) set ambient air quality goals that minimise the risk of adverse health impacts from exposure to air pollution, and b) guide the formulation of strategies for the management of human activities that may affect the environment c) set standards for consisting of quantifiable characteristics of the air against which ambient air quality can be assessed d) set out the processes to be followed in measuring the concentration of pollutants in the air

2.2 Development approval conditions

The permits applicable to the activity include the following:

- Decision notice for AP2021/007 – SDA approval for a material change of use for a high impact industry (launch facility) in the Abbot Point State Development Area (SDA)

The approval contains the following requirements relevant to the establishment of the AMP.

Table 2 Relevant conditions from DA permits

Condition Number	Condition	Section addressed
AP2021/007 – SDA approval for a material change of use for a high impact industry (launch facility) in the Abbot Point State Development Area (SDA)		
12.1	<p>Prepare and submit to the Coordinator-General and Whitsunday Regional Council, a detailed project specific Environmental Management Plan (EMP) addressing both the construction and operational phases of the project.</p> <p>The EMP must be certified by an independent suitably qualified third-party confirming the adequacy of the EMP in accordance with current best practice. The EMP must include the following matters:</p> <p>(a) air quality and dust management</p>	Entire document
25.1 – Ambient Air Quality Monitoring Program	An Ambient Air Quality Monitoring (AAQM) Program must be developed and implemented to specify how the ambient dust impacts of the project will be monitored, including:	Section 5
	(a) locations, frequencies and methods for monitoring of potential air contaminants for determining the actual impacts from the proposed activity on the receiving environment values	Section 5
	(b) provision for the use of at least three air quality samplers (CO, CO2 and NO2) and one meteorological station capable of monitoring wind speed and direction, humidity, temperature and precipitation	Section 5
	(c) air quality sampling must be conducted in accordance with the Queensland Air Quality Sampling Manual and applicable Australian Standards	Section 5
	(d) should an alternative sampling method be required; the proponent must seek approval from administering authority to exclude this requirement. In seeking such exclusion, the reasons for the exclusion shall be provided and be justified.	Section 5.4
25.2	The activities at the development must not exceed the air quality limits specified in <i>Table 2 – Maximum ground level concentration limit and monitoring program</i> to condition 25.1, at or beyond the boundaries of the development. The AAQM Program as outlined in <i>Table 6 - Maximum ground level concentration limit and monitoring program</i> :	Section 5.3
Enclosure 2 To demonstrate compliance with condition 12.1 and condition 25 of this development approval, prepare a site-based air quality and dust management plan (by a suitably qualified person) that addresses, but is not necessarily limited to, the following matters:		
a)	An ‘Ambient Air Quality Monitoring Program’	Section 5
b)	mitigation and measures proposed to prevent spray drift, odour, noise, dust, smoke, or ash emission on nuisance sensitive places	Section 7

Condition Number	Condition	Section addressed
c)	mitigation and measures proposed to ensure dust deposition attributable to project activities, when measured at a nuisance sensitive place must not exceed 120 milligrams per square metre per day, averaged over 1 month	Section 7
d)	mitigation and measures proposed to ensure other indicators that a measured at any nuisance sensitive place must not exceed the air quality objectives specified in Schedule 1 of the Environmental Protection (Air) Policy 2019	Section 7
e)	site clearance and soil stockpiles must be maintained using all reasonable and practicable measures using water sprays or alternative dust suppression and/or mitigation measures	Not applicable to operational processes
f)	ensure all access roadways, material storage areas and vehicle entry points have appropriate dust mitigation	Section 7
g)	restrict vehicle movements to specifically defined areas and adhere to onsite speed limits	Section 7
h)	ambient dust monitoring program that includes parameters such as dust deposition (insoluble matter) and suspended particulate concentrations of PM10 and PM2.5	Section 5
i)	undertake visual monitoring for fugitive dust during construction and implement appropriate controls to contain fugitive dust and ensure that all plant and equipment are maintained and operated in accordance with Australian Design Rules and manufacturers specifications	Section 5

3 EXISTING ENVIRONMENT

3.1 Site location and description

The BOS Site is located approximately 15 km west of the Bowen township in the Whitsunday Regional Council LGA. The Site is in the north-eastern corner of the Abbot Point State Development Area (APSDA) over three allotments with property descriptions of Lots 8, 9 and 10 on SP295408. Collectively these properties occupy an area of 94 ha within an area of the APSDA designated as an industrial use precinct and the facility footprint will be approximately 3 ha.

The facility shares boundaries with:

- Two cattle grazing properties
- An operational hard rock quarry (west of the launch site)
- Intermittent road and rail services along Abbot Point Road corridor and the Newlands System rail which connect the North Queensland Bulk Ports terminal.
- Saltwater creek and dune systems between the site and the coastline

The APSDA provides for a range of existing and future development opportunities including the port facilities precinct which consists of existing port infrastructure, port expansion precinct, restricted development precinct, industry precinct, infrastructure and corridors precinct and environmental management/materials transportation precinct. The launch facility is located within the industry precinct, which is largely undeveloped from an industrial perspective and is still dominated by a grazing land use.

3.2 Sensitive receptors

Several sensitive receptors were previously identified in the BOS Noise, Vibration and Air Quality assessment (SEG 2021) and will be used to determine suitable locations for monitoring sites. The distance and bearing from the launch pad to the identified receptors from this report is presented in Table 3. The receptors comprise dwellings, commercial uses, and natural features. The closest residential sensitive receptors comprise a series of dwellings along Euri Creek between 3.7km and 4.8km adjacent to Euri Creek, refer to Table 3 and Figure 1.

Table 3 Relevant sensitive receptors and proximity to launch operations (SEG 2021)

Receptor ID	Description	Approximate distance and bearing from launch pad
R1	Sensitive receptor, Dwelling	3,700m at 135°
R2	Sensitive receptor, Dwelling	4,100m at 140°
R3	Sensitive receptor, Dwelling	4,400m at 150°
R4	Sensitive receptor, Dwelling	4,800m at 165°
R5	Sensitive receptor, Dwellings, Queens Beach	11,800m at 95°
R6	Sensitive receptor, School	8,300m at 145°
R7	Sensitive receptor, Bowen Township	13,800m at 110°
R8	Industrial Use, Abbott Point Coal Terminal	7,200m at 330°
R9	Environmental receptor (Saltwater Creek) and northern property boundary	450m at 15°
R10	Environmental receptor (Beach) north of Launch Pad	1,800m at 5°
R11	Industrial Use, Quarry	820m at 270°

3.3 Existing air quality environment

The pollutants of interest from the launch operation are predominantly carbon monoxide and carbon dioxide which are both components of the rocket exhaust.

The Department of Environment and Science, Queensland operates a network of air quality monitoring stations in Queensland. These stations monitor various pollutants at various sites. The maximum of the monitoring period levels is summarised in the yearly reports and the relevant results for the 2020 monitoring period have been used as well as the State of the Environment Report 2020.

Where site specific measurements are not available the maximum measurement from the monitoring network has been adopted. It is likely that these levels are conservatively high as the measurement sites are close to operating industrial sites compared to the proposed site. These levels are presented in Table 3 below.

Table 4 Estimated pollutant levels (State of the Environment Report 2020)

Contaminant	Averaging period	Concentration	
		PPM	mg/m ³
Carbon monoxide	8-hour	0.9	1.0
Carbon dioxide	Not monitored	-	-
Nitrogen dioxide	1 hour	0.38	0.72

3.4 Prevailing wind

The wind rose data show the frequency of occurrence of winds by direction and strength (Figure 1). The predominant wind direction during the year is from the north-east through to the south-east.

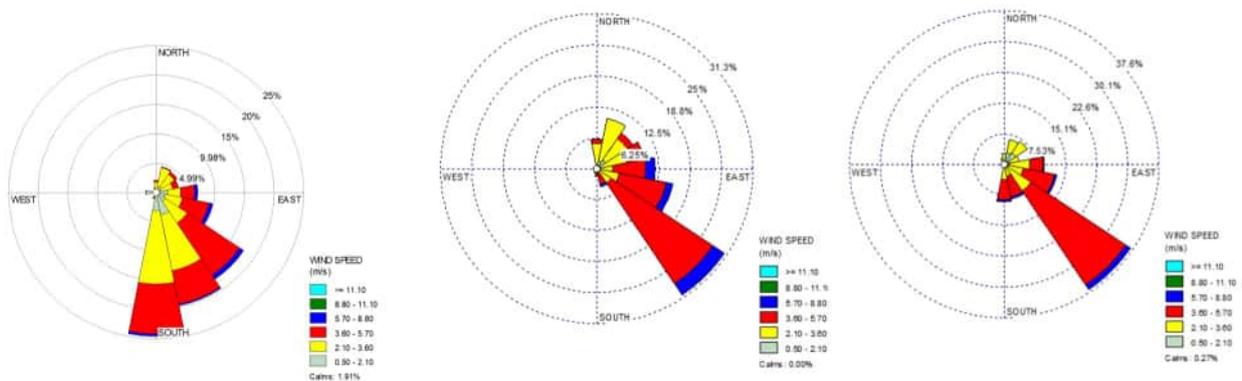


Figure 2 Wind rose data for the BOS

4 DESCRIPTION OF ACTIVITIES

4.1 Bowen Orbital Spaceport Operations

Launch operations from the BOS are approximately 60-90 day campaigns where a launch vehicle undergoes final assembly and commissioning prior to fuelling and launch.

The BOS facility comprises a Launch Control Centre, Vehicle Assembly Building (VAB), launch pad and launch fluids and utilities storage pads.

The VAB is the primary location for onsite operations. The VAB possesses large roller doors at the northern and southern and internal facilities including air-conditioned clean rooms, cribbing and ablation, open plan office, tooling and equipment and a material storage room. The northern end of the VAB is aligned with the launch pad centre.

The launch and utilities storage pads are north of the VAB and connected via an internal site road. The facility consists of several 20x20m (approx.) concrete pads for fluid storage along with infrastructure to transport and erect Gilmour Rockets. The launch pad includes a water deluge system that is designed to suppress noise and vibrations and prevent damage to the launch pad and launch vehicle in the moments prior to and immediately after lift-off. The suppression system also works to limit environmental noise emissions during this phase of the launch. Operation and management of activities on the launch pad follow detailed launch procedures which are developed and maintained for each launch mission.

The Gilmour Space ERIS (Small Class Orbital Expendable Launch vehicle) is approximately 25m in length with a mass at lift-off of approximately 35 tonnes. The rocket comprises 3 stages with Stage 1 being relevant to ground level take-off. The stage 1 booster is a hybrid rocket which provides up to 600kN vacuum thrust. The hybrid rocket utilises a hydrogen peroxide liquid fuel along with a solid fuel. The decomposition of the hydrogen peroxide in the rocket motor produces superheated steam (water) and oxygen. The oxygen is primarily consumed in the combustion of the solid fuel to produce several gases but primarily incorporating carbon dioxide, carbon monoxide and nitrogen dioxide.

The flight time from take-off to 10km (altitude of commercial jets in cruise) is approximately 60 seconds and an additional 20 seconds is required to attain an altitude of 20km (above the troposphere).

Flight paths between the 19° - 65° trajectories are considered possible from the BOS. The angle is specified anti-clockwise relative to due east. The noise modelling has been based on 57° trajectory since this alignment is likely to be the most common, noting that each launch will require its own independent flight safety analysis and launch permit approval from the Australian Space Agency.

During a launch activity, no sonic boom would be expected to occur proximal to the ground during the vertical ascent phase of the flight because the acoustic energy of the sonic boom is directed upward, unless the atmosphere causes some energy to refract back to the ground. As the launch vehicle pitches over to access the specified target orbit, the sonic boom energy (rays) may intersect the earth's surface. Given the proposed range of trajectories the sonic boom is not expected to be experienced on land.

In the event of a launch failure the rocket is autonomously deactivated by cutting off thrust. A failure on or close to the launch pad would have the greatest blast energy since the rocket during this early phase of the launch has not consumed any fuel. Detonation of the launch vehicle is unlikely due to the fuel and oxidiser selected by Gilmour Space Technologies but is noted as the only unexpected event with potential noise and vibration consequences.

Current projections indicate there are likely to be 2 launches per year until 2025 and then increase in frequency towards a target of monthly launches.

5 AIR QUALITY MONITORING PLAN

5.1 Background and context

The launch vehicle (i.e. primary emission source) will be momentarily on the launch pad before accelerating vertically upwards. At ground level and close to ground level emissions will only occur for a few seconds and the volume of air pollutants and dust may be described as a puff. This puff will disperse and move away from the launch location with the prevailing winds. Winds will flow around hills and obstacles. The puff event is in direct contrast to typical industrial emissions that remain stationary and have emissions over time.

At low to zero windspeeds a puff event will last several minutes close to the launch facility but will not be measurable at large distances (i.e. close to dwellings) since the only transport mechanism is diffusion. At higher wind speeds the puff event will be measurable for a short period and at larger distances down wind. Under these conditions the puff concentration will be low due to the turbulence enhancing dispersion of pollutants.

Air quality impacts associated with launch events were estimated by SEG (2021) using a model of the site air movements simulated using TAPM and Calpuff for 2020. The modelling indicated compliance with the air quality objectives at sensitive receptors under various simulated meteorological conditions. The predicted ground level concentration of carbon monoxide and carbon dioxide at sensitive receptors are presented in Table 5.

Monitoring for gas and dust pollutants close to the emission source has a much higher probability of intercepting the puff compared with monitoring at sensitive receptors. Additionally, the highest pollutant levels will be experienced close to the launch site and can be modelled more effectively. Thus the focus of the monitoring program will be on the site.

Existing dust and contamination sources proximate to the site include Abbot Point Road and the Newland System Rail Corridor located approximately 1.23 km from the launch facility and Abbot Point Quarry located approximately 630 m from the launch facility.

Table 5 Predicted concentrations of carbon monoxide and carbon dioxide at sensitive receptors (including assumed ambient levels where available) (SEG 2021)

Receptor	Carbon Monoxide 30s Maximum	Carbon Monoxide 1 Hour	Carbon Monoxide 8 Hour	Carbon Dioxide 30 Second Maximum	Carbon Dioxide 15 Minute	Carbon Dioxide 1 Hour
Limit	458	31.24	11	72,000	54,000	9,000
Existing ambient		4.5	1.4			955
R1 – Dwelling	0.120	4.505	1.401	9.9	9.9	955.4
R2 – Dwelling	0.105	4.506	1.401	8.6	8.6	955.5
R3 – Dwelling	0.114	4.520	1.403	9.4	9.4	956.6
R4 – Dwelling	0.362	4.518	1.402	29.8	29.8	956.5
R8 – Dwelling	0.076	4.506	1.401	6.2	6.2	955.5
R9 – Environmental	0.868	4.529	1.404	71.5	71.5	957.4
R10 – Environmental	0.315	4.513	1.402	25.9	25.9	956.1
R11 – Quarry	0.759	4.529	1.404	62.5	62.5	957.4

5.2 Applicable standards and guidelines

Air quality monitoring should be undertaken in accordance with the following guidelines and Australian Standards:

- Australian Standard AS/NZS 3580.1.1:2016 – Methods for sampling and analysis of ambient air Guide to siting air monitoring equipment
- Australian Standard AS/NZS 3580.10.1:2016 – Methods for sampling and analysis of ambient air Determination of particulate matter - Deposited matter - Gravimetric method
- Australian Standard AS 2923 ‘Ambient Air – Guide for Measurement of Horizontal Wind for Air Quality Applications’
- Queensland Air Quality Sampling Manual (EPA 1997)
- Australian Standard AS 3580.14 - 2011: Methods for sampling and analysis of ambient air – Part 14: Meteorological monitoring for ambient air quality monitoring applications.

5.3 Ambient air quality and dust deposition trigger limits

Ambient air quality and dust deposition limits as detailed in the Development Permit are presented in Table 6 in addition to air quality criteria detailed in the following:

- Workplace Exposure Standards for Airborne Contaminants (Safe Work Australia, 2013)
- National Environment Protection (Ambient Air Quality) Measure (Department of the Environment 2016)
- Environmental Protection (Air) Policy 2019.

Table 6 Relevant Air Quality Guideline Values

Contaminant	Averaging period	Air Quality Guideline Values ^{1,2,3}			Permit Condition trigger
		µg/m ³	mg/m ³	PPM	
Gas contaminants⁴					
CO	30-second		458 ¹	400 ¹	
	1 hour				31 mg/m ³
	8-hour		11 ¹ ; 34 ²	9 ^{1,3} ; 30 ²	11 mg/m ³
CO ₂	30-second		72,000 ¹	40,000 ¹	
	15-minute		54,000 ²	30,000 ²	
	1 hour				60 µg/m ³
	8-hour		9,000 ²	5,000 ²	
NO ₂	15-minute		9.4	5	
	8-hour		5.6	3	
NO ₂ (health and wellbeing)	1 hour	250 ¹		0.12 ^{1,3}	250 µg/m ³
	24 hours	62 ¹		0.03 ^{1,3}	
NO ₂ (health and biodiversity of ecosystems)	24 hours	33 ¹		0.016 ¹	
Particulates					

Total suspended particles	24 hours	90 ^{1,3}			
Particulates (PM 10 fraction)	24 hours	50 ^{1,3}			
	1-year	25 ^{1,3}			
Particulates (PM 2.5 fraction)	24 hours	25 ^{1,3}			
	1-year	8 ^{1,3}			
Dust Deposition					
Dust deposition (total insoluble matter) ⁶	Monthly average				120 mg/m ² /day
Meteorological data⁷					
Wind speed and direction, humidity, temperature and precipitation collected to contextualise all air quality guideline values and trigger limits during the monitoring program.					
¹ . Limits based on Schedule 1 of the Environmental Protection (Air) Policy 2018. ² Limit based on Safework Australia, National Environment Protection (Ambient Air Quality) Measure ³ National Environment Protection (Ambient Air Quality) Measure, Department of the Environment ⁴ Measured in concentration per cubic metre at 0 degrees Celsius and an atmospheric pressure of 1.					

5.4 Monitoring equipment

Gilmour’s air monitoring requirements relate to suspended particulates, deposited particulates and contaminant gases from launch activities requiring the following monitoring equipment:

- PM10 and PM2.5 survey samplers (TSI Dusttrack or equivalent) will be utilised at each of the particulate monitoring locations to allow for assessment of 24-hour averages around launch events to assess particulate exposure.
- Dust deposition gauges (bottle with funnel)
- Monitoring of contaminant gases will utilise appropriate gas detection equipment (Honeywell Area RAE Pro or equivalent) with logging capacity. The gas detectors sensitivity and operating range shall be based on the compliance limit, rather than the much lower projected exposure.
- A permanent Windsonic M 1405-PK weather station (or similar) will be established at the site including the following sensors: wind speed (25m mast vane anemometer), wind direction, humidity, temperature and precipitation. This station is appropriate for the purposes of assessing prevailing local meteorological conditions.

The program equipment used is consistent with approaches outlined in Australian and Queensland standards and guidelines except for particulate monitoring PM10 and PM2.5 as particulate emissions generated from the project are minor. Thus, the intent is to adopt a survey method for the monitoring using a nephelometer style instrument. In the event of high dust events a compliance method will be adopted for particulates.

Typically compliance monitoring systems are designed to achieve the highest levels of accuracy and refer to national and international standards. Survey methods are often at a lower level of accuracy and involve lower cost equipment and method. Compliance methods will be adopted if the survey method indicates the site has emissions close to the compliance limits.

To ensure data quality and accuracy all monitoring equipment shall be deployed at the proposed site either by a person with experience or under instruction by a person with experience in the calibration and use of the monitoring equipment specified.

5.5 Monitoring locations and frequency

The monitoring requirements relate to both launch events and general site use (e.g. vehicle movements, ground disturbing activities). The launch facility and access tracks are well defined and the placement of samplers proximate to potential sources of contamination is achievable.

The DA conditions specify provision for the use of at least three air quality samplers to record observations of CO, CO₂ and NO₂. The primary source of these contaminants relates to launches. These samplers will be located at MS01, MS02 and MS03 (refer Table 7 and Figure 3). CO, CO₂ and NO₂ are only associated with launch activities and the monitoring of these pollutants will be limited to the launch window.

Additional ambient monitoring will include dust deposition (insoluble matter) and suspended particulate concentrations of PM₁₀ and PM_{2.5} utilising survey methods. It is not intended to survey TSP since nephelometers do not reliably measure TSP. This requires monitoring to be undertaken during each launch event, as well as at appropriate regular intervals (minimum monthly) to inform an understanding of ambient air conditions at other times. The use of continuous particulate samplers will enable the identification of existing background trends and will also address the broader issues of site operations and management (i.e. confirm the consequence of particular events).

Dust deposition (insoluble matter) and suspended particulate sampling sites have been positioned in a direct line between the launch facility and the closest sensitive receptors. Dust deposition samplers are located at MS01, MS02, MS03 and MS04 and particulate samplers are located at MS01 and MS03 (refer Table 7 and Figure 3). Particulate monitoring shall be undertaken at MS01 and MS03 (refer Table 7 and Figure 3).

For clarity, this AMP is based on the following combination of monitoring frequencies:

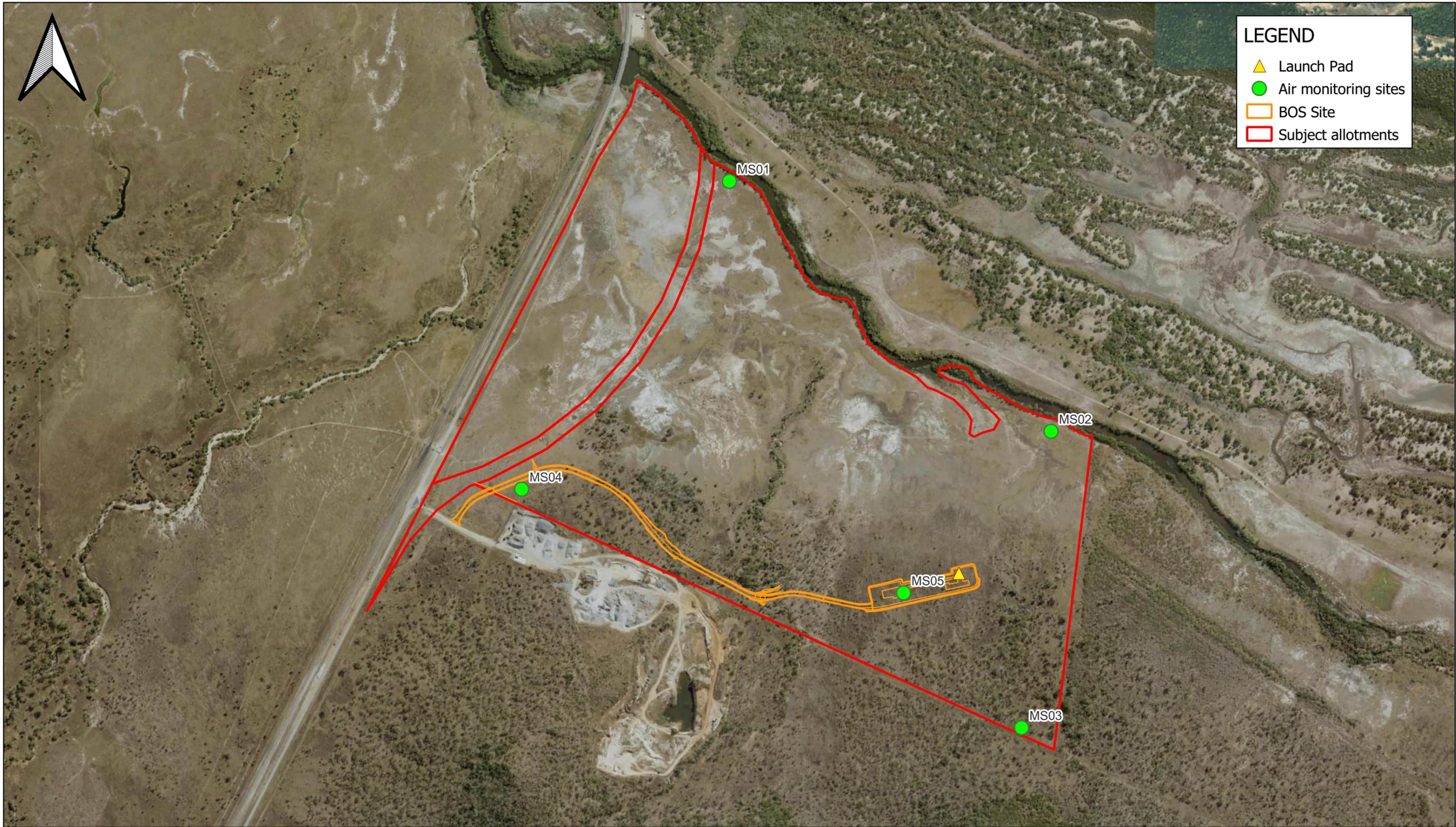
- Carbon monoxide, carbon dioxide and nitrogen dioxide monitoring at three (3) locations at least 200 m from the launch facility for a 24-hour period around the launch event
- PM₁₀ and PM_{2.5} continuous survey monitoring at two (2) locations near the site boundary with data analysis over at least a 24-hour period around each launch event.
- Dust deposition at four locations near the site boundary collected every month for analysis and averaged over a 30-day period

A meteorological station capable of monitoring wind speed and direction, humidity, temperature and precipitation will be installed at MS05 to contextualise monitoring results with consideration of meteorological data at the time of monitoring.

Visual monitoring for fugitive dust shall be undertaken weekly with a focus on entrainment by vehicles traversing onsite access tracks and during periods of high wind speed. Visual monitoring shall be undertaken from a high point with views across the site.

Table 7 Air monitoring locations for launch facility

Site ID	Easting	Northing	Gas monitoring	Particulate monitoring	Dust deposition	Meteorological
Analysis suite			CO, CO ₂ , NO ₂	PM ₁₀ and PM _{2.5}	Total insoluble matter	Wind speed and direction, humidity, temperature and precipitation
MS01	615972	7793725	✓	✓	✓	
MS02	616749	7793118	✓		✓	
MS03	616678	7792397	✓	✓	✓	
MS04	615470	7792977			✓	
MS05	616393	7792725				✓



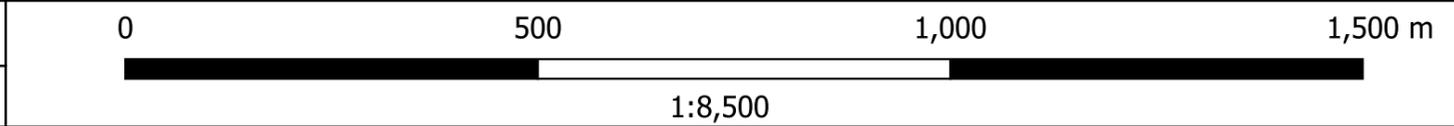
CLIENT: GILMOUR SPACE TECHNOLOGIES

FIGURE 3: AIR QUALITY MONITORING SITES

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DOCUMENT: 202108-3_Air monitoring locations

DATE: 10/10/2022 AUTHOR: A.Fitzaerald



Coordinate system: GDA94 / MGA zone 55 EPSG:28355

5.6 Monitoring program summary

Presented in Table 8 is a summary of the BOS AAQMP.

Table 8 Summary of air quality monitoring program

Monitoring Location	Monitoring Equipment	Monitoring Equipment Code	Deployment period	Analysis frequency	Analysis Suite
MS01	PM ₁₀ Survey	NE01_PM10	Continuous	24-hour period around launch event	PM ₁₀
	PM _{2.5} Survey	NE01_PM2.5	Continuous	24-hour period around launch event	PM _{2.5}
	Gas detector	G01	48-hour period around launch event	24-hour period around launch event	CO, CO ₂ , NO ₂
	Dust Deposition	D01	Continuous	30-day interval	Total Insoluble Matter
MS02	Gas detector	G02	48-hour period around launch event	24-hour period around launch event	CO, CO ₂ , NO ₂
	Dust Deposition	D02	Continuous	30-day interval	Total Insoluble Matter
MS03	PM ₁₀ Survey	NE02_PM10	Continuous	24-hour period around launch event	PM ₁₀
	PM _{2.5} Survey	NE02_PM2.5	Continuous	24-hour period around launch event	PM _{2.5}
	Gas detector	G03	48-hour period around launch event	24-hour period around launch event	CO, CO ₂ , NO ₂
	Dust Deposition	D03	Continuous	30-day interval	Total Insoluble Matter
MS04	Dust Deposition	D04	Continuous	30-day interval	Total Insoluble Matter
MS05	Meteorological station	MS01	Continuous	As required to support findings	Wind speed and direction, humidity, temperature and precipitation

6 REPORTING

6.1 Air quality monitoring event summaries

Air quality monitoring data will be evaluated after each monitoring event to provide an understanding of the air quality conditions at the site, including any restrictions that may be placed on data collected. Air quality analytical data will be compiled in tables and the quality assurance and quality control (QA/QC) checks undertaken. If the QA/QC checks reveal that the data has been affected in any way, the effects will be summarised. Each monitoring event will be summarised in a technical memorandum for future reference.

Provided that instrumentation has been deployed in accordance with the requirements of Section 5.4, air quality datasets from deployed instruments may be readily downloaded by Gilmour personnel. The initial one or two datasets shall be provided to a suitably qualified environmental scientist for analysis as a quality measure, to provide examples of any air quality exceedances and to prepare event summaries. Following the initial monitoring event summary/ies, Gilmour personnel could readily prepare the summaries, initially under the advice of a suitably qualified environmental scientist.

The following information will be summarised as a minimum:

- Date(s) of the monitoring event
- Brief methodology of what field work was conducted and how (e.g. in accordance with this AAQMP)
- Include a brief description of any deviations from the AAQMP, standards or guidelines
- Table of what was analysed plus results
- Summary of any QA/QC issues and consequences for the data collected
- Summary of any site conditions or other relevant issues that may influence the data throughout the monitoring period

6.2 Annual air quality monitoring report

The annual report will include as a minimum, but is not limited to, the following:

An introduction stating the objectives of the monitoring program and the scope of work carried out during the reporting period.

- A brief discussion of the monitoring network
- A brief description of the methodologies used - referring to relevant standards, guidelines, monitoring plans, where necessary
- Discussion of any deviation to the AAQMP or changes to monitoring since the previous annual report
- The results of the air quality sampling

6.3 Trigger level exceedance reporting

Exceedance of Air Quality limits will be reviewed by the site manager to determine whether the exceedance event was due to Gilmore Space or more from external sources. For example dust storms and bushfires may result in exceedance of air quality objectives. The prevailing wind direction will also be reviewed to assist with the determination. If an exceedance event due to Gilmore Space operations has been established as likely, the data shall be referred to an air pollution expert to determine whether any sensitive receptor is likely to have been adversely affected. Should the air pollution expert consider that an exceedance event has

occurred at a sensitive receptor then the results of the investigation will consist of a report to the reviewing authority.

7 AIR QUALITY MANAGEMENT

7.1 Recommended control measures

To ensure ongoing compliance with the air quality and dust deposition criteria presented in Table 6 a number of air quality management measures will be used to assist in attenuating dust, particulate and gas emissions associated with the proposed activity on site including:

- Vehicle and plant engines are maintained in accordance with manufacturer specifications and faulty equipment is repaired or replaced
- Vehicle to only drive on formed roads and not to drive over grassland and bare exposed areas. Onsite speed limits are 20 km/h.
- Careful handling/transfer of materials will be undertaken to reduce emissions (i.e. placement of materials near the site to minimise vehicle use)
- Daily visual inspection by the responsible person to identify whether excessive levels of airborne dust is dispersing beyond the site boundary
- Wet access roads and operational areas with water trucks should excessive levels of airborne dust be observed during monitoring
- Spray water on unsealed surfaces prior to proximate to the launch facility to minimise dust entrainment during launches. Surface soils shall be moistened to the extent that it remains moist during launch.
- All complaints regarding dust emissions will be recorded, investigated and appropriate measures implemented in a timely manner. As required monitoring to be undertaken at an appropriate location near the complainant in accordance with Australian Standards
- Conduct monthly Environmental Inspections of all areas

Appendix C Noise and Vibration Management Plan



NOISE AND VIBRATION MANAGEMENT PLAN

Gilmour Space Technologies Pty Ltd



202108

Noise and Vibration Management
Plan

22/02/2024

Document status

Project No	Version	Document name	Client	Author	Reviewer	Review date
202108	Draft	Noise and Vibration Management Plan	Gilmour Space Technologies Pty Ltd	A. Fitzgerald M. Simpson	L. Liessmann	10/10/2022
202108	1.0	Noise and Vibration Management Plan	Gilmour Space Technologies Pty Ltd	A. Fitzgerald	L. Liessmann	22/02/2024

Approval for issue

Approver	Signature	Approval date
A. Fitzgerald		22/02/2024

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Contents

1	INTRODUCTION	1
1.1	Objectives.....	1
2	RELEVANT LEGISLATION AND APPROVAL CONDITIONS	2
2.1	Development approval conditions	2
3	EXISTING ENVIRONMENT	4
3.1	Site location and description	4
3.2	Sensitive receptors.....	4
3.3	Existing noise environment	5
3.4	Existing vibration environment	6
4	OPERATIONS DESCRIPTION	8
4.1	BOS Launch Operations	8
4.2	BOS Test Facility Operations.....	8
4.2.1	Test Pad 1.....	9
4.2.2	Test Pad 2.....	10
4.2.3	Testing Regime.....	10
4.3	Noise sources.....	11
4.4	Vibration sources	11
4.5	Prevailing wind	13
5	NOISE AND VIBRATION MONITORING PROGRAM	14
5.1	Background and context	14
5.2	Outline of Monitoring Program	15
5.3	Applicable standards and guidelines	16
5.4	Acoustic quality objectives	16
5.5	Monitoring locations and frequency	17
5.6	Monitoring equipment.....	19
5.7	Monitoring program summary	19
6	REPORTING	20
6.1	Acoustic quality monitoring event summaries.....	20
6.2	Acoustic quality monitoring report.....	20
6.3	Trigger level exceedance reporting.....	20
7	ACOUSTIC QUALITY AND VIBRATION MANAGEMENT	22

Tables

Table 1	Relevant legislation	2
Table 2	Relevant conditions from DA permits.....	2
Table 3	Relevant sensitive receptors and proximity to BOS operations (SEG 2021).....	5
Table 4	Assumed rating background noise level [dB(A)] for rural residential areas (SEG 2021).....	6
Table 5	Engine test locations	8
Table 6	Engine test plans.....	11
Table 7	Calculated launch noise levels at selected receptors (from SEG 2021).....	14
Table 8	Calculated test noise levels range at selected receptors (from SEG 2023)	15
Table 9	Noise and vibration objectives	17

Table 10	Noise monitoring locations for launch and test facility	17
Table 11	Summary of noise and vibration monitoring program	19

Figures

Figure 1	Location of nearby sensitive receptors	7
Figure 2	Test Pad 1 Showing Engine Stands, Container Wall, and 20 m Long Sandbag Wall	9
Figure 3	Link Block Walls Test Stand 1A	9
Figure 4	Test Pad 2 Showing Test Stand and Link Block Walls	10
Figure 5	Test Pad 2 Link Block Walls Description	10
Figure 6	Monitoring locations	18

1 INTRODUCTION

This Noise and Vibration Monitoring and Management Plan (NVMMP) was produced by Terra Solutions Pty Ltd (Terra) and Simpson Engineering Group (SEG) for Gilmour Space Technologies (Gilmour) for the Bowen Orbital Spaceport (BOS) Launch Operations located on Lots 8, 9 and 10 on SP295408 (the Site) in the Abbot Point State Development Area.

Gilmour has conditioned approval for a material change of use (MCU) for a high impact industry (launch facility) at the site. The MCU provides this approval from the date of obtaining Commonwealth approval pursuant to the Space (Launches and Returns) Act 2018, for a launch facility licence to operate a launch / test facility on the site.

Relevant conditions of the Development Permit and associated conditions require that an NVMMP be implemented to demonstrate compliance with the Development Approval:

- Condition 12.1: Prepare and submit to the Coordinator-General and Whitsunday Regional Council, a detailed project specific Environmental Management Plan (EMP) addressing both the construction and operational phases of the project, including Condition 12.1 (i) Air Quality and Dust Management Plan.
- Condition 26: The operator of the development must ensure that noise generated by launch activities does not cause noise limits specified in the approval to be exceeded at a sensitive place or commercial premises.

The NVMMP stipulates the noise and vibration monitoring, and reporting requirements that shall be followed to ensure the General Environmental Duty of Care is met under the Environmental Protection Act 1994 (EP Act) and associated Regulations.

1.1 Objectives

The objectives of this NVMMP are to provide protocols to:

- identify all potential sensitive and commercial locations which may be affected by noise and vibration impacts from launch activities
- quantify the cumulative noise impact at commercial locations that accounts for launch / test activities occurring simultaneously (i.e. existing noise levels at the commercial location plus the noise impact of a launch event)
- identification of all major sources of noise and vibration emissions that may occur as result of the operation of the launch facility
- describe procedures to manage noise and vibration emissions from the sources identified
- collect and record noise and vibration data to compile empirical data for each launch / test event for the duration of the approval period
- identify adverse meteorological conditions likely to produce elevated levels of noise and vibration at a sensitive or commercial place due to launch / test activities
- minimise the potential for noise and vibration emissions
- describe the procedures to be undertaken if any exceedance is detected

2 RELEVANT LEGISLATION AND APPROVAL CONDITIONS

The key legislative requirements for consideration in this NVMP are provided in Table 1 below.

Table 1 Relevant legislation

Legislation	Authorising Body
<i>Environmental Protection Act 1994 (EP Act)</i>	The object of the EP Act is to protect Queensland’s environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (ecologically sustainable development).
<i>Environmental Protection (Noise) Policy 2019</i>	<p>The Environmental Protection (Noise) Policy 2019 which seeks to achieve the objects of the EP Act by:</p> <ul style="list-style-type: none"> a) Identifying environmental values to be enhanced or protected b) Stating acoustic quality objectives for enhancing or protecting the environmental values c) Providing a framework for making consistent, equitable and informed decisions about the acoustic environment. <p>The EPP (Noise) identifies specific Acoustic Quality Objectives for sensitive receptors. Sensitive land uses/receptors indicated within the policy identified that have the potential to be impacted by launch activities include:</p> <ul style="list-style-type: none"> • a dwelling (detached or attached) including house, townhouse, unit, reformatory institution, caravan park or retirement village • a library, childcare centre, kindergarten, school, school playground, college, university, museum, art • gallery or other educational institution, hospital, respite care facility, nursing home, aged care facility, surgery or other medical centre • a community building including a place of public worship • a court of law • a hotel, motel or other premises which provides accommodation for the public • a commercial (office) or retail facility • a protected area, or an area identified under a conservation plan as a critical habitat or an area of major interest under the Nature Conservation Act 1992 • an outdoor recreational area (such as public park or gardens open to the public, whether or not on payment of a fee, for passive recreation other than for sport or organised entertainment) or a private open space.

2.1 Development approval conditions

The permits applicable to the activity include the following:

- Decision notice for AP2021/007 – SDA approval for a material change of use for a high impact industry (launch facility) in the Abbot Point State Development Area (SDA)

The approval contains the following requirements relevant to the establishment of the Noise and Vibration Management Plan.

Table 2 Relevant conditions from DA permits

Condition Number	Condition	Relevant section of NVMP
AP2021/007 – SDA approval for a material change of use for a high impact industry (launch facility) in the Abbot Point State Development Area (SDA)		

Condition Number	Condition	Relevant section of NVMP
12.1	<p>Prepare and submit to the Coordinator-General and Whitsunday Regional Council, a detailed project specific Environmental Management Plan (EMP) addressing both the construction and operational phases of the project.</p> <p>The EMP must be certified by an independent suitably qualified third-party confirming the adequacy of the EMP in accordance with current best practice. The EMP must include the following matters:</p> <p>(i) noise and vibration management</p>	Entire document
26.1	<p>The operator of the development must ensure that noise generated by launch activities does not cause the criteria in Table 1 - Noise limits for launch activities", to be exceeded at a sensitive place or commercial premises.</p>	Section 5.4
<p>Enclosure 8 To demonstrate compliance with condition 12.1 and condition 26 of this development approval, a noise and vibration management plan (prepared by a suitably qualified person) must be implemented at the site of the development and must include the following as a minimum:</p>		
a)	<p>identification of all potential sensitive and commercial locations which may be affected by noise and vibration impacts from launch activities and quantify the cumulative noise impact at those commercial locations that accounts for launch activities occurring simultaneously (that is the existing noise levels at the commercial location plus the noise impact of a launch event)</p>	Section 3.2 - Section 3.4 and Section 5.5
b)	<p>identification of all major sources of noise and vibration emissions that may occur as result of the operation of the launch facility</p>	Section 4.2 and Section 4.3
c)	<p>description of the procedures to manage the noise and vibration emissions from the sources identified</p>	Section 7
d)	<p>collection and recording of noise and vibration data to compile empirical data for each launch event for the duration of the approval period</p>	Section 5
e)	<p>identifying adverse meteorological conditions likely to produce elevated levels of noise and vibration at a sensitive or commercial place due to launch activities</p>	Section 5.2
f)	<p>protocols to minimise the potential for noise and vibration emissions, and</p>	Section 7
g)	<p>description of procedures to be undertaken if any exceedance is detected</p>	Section 6.3

3 EXISTING ENVIRONMENT

3.1 Site location and description

The BOS Site is located approximately 15 km west of the Bowen township in the Whitsunday Regional Council LGA. The Site is in the north-eastern corner of the Abbot Point State Development Area (APSDA) over three allotments with property descriptions of Lots 8, 9 and 10 on SP295408. Collectively these properties occupy an area of 94 ha within an area of the APSDA designated as an industrial use precinct and the facility footprint will be approximately 3 ha.

The facility shares boundaries with:

- Two cattle grazing properties
- An operational hard rock quarry (west of the launch site)
- Intermittent road and rail services along Abbot Point Road corridor and the Newlands System rail which connect the North Queensland Bulk Ports terminal.
- Saltwater creek and dune systems between the site and the coastline

Areas to the east and north of the site consist of coastal dune and estuarine environments. Small rural allotments are located between the site and the township of Bowen. A quarry is located to the southwest of the launch facility. Abbot Point Road and the Newlands railway line are located to the west of the site with the latter providing coal bulk haulage to the Abbot Point Coal terminal located to the north-west of the launch site. West of the Newlands bulk coal rail line is the Caley Valley wetlands which in addition to Saltwater Creek and the coastal environment to the north are the main ecological areas proximate to the site. The closest bound of the wetland area is at Saltwater creek which drains west toward the main wetland areas closer to the Abbot Point Coal Terminal and runs along the northern boundary of the property.

The APSDA provides for a range of existing and future development opportunities including the port facilities precinct which consists of existing port infrastructure, port expansion precinct, restricted development precinct, industry precinct, infrastructure and corridors precinct and environmental management/materials transportation precinct. The launch facility is located within the industry precinct, which is largely undeveloped from an industrial perspective and is still dominated by a grazing land use.

Waters to the west, north and south of the Port of Abbot Point are classified as a General Use Zone under the GBRMP zoning (Map 8 – Cape Upstart). The area of water directly associated with the Port is classified as an exclusion zone within the Great Barrier Reef Marine Park.

3.2 Sensitive receptors

Several sensitive receptors were previously identified in the BOS Noise, Vibration and Air Quality assessment (SEG 2021) and are used here to determine suitable locations for monitoring sites. The distance and bearing from the launch pad to the identified receptors from this report is presented in Table 3. The receptors comprise sensitive receptors, commercial uses, and natural features. The closest sensitive receptors comprise a series of dwelling along Euri Creek between 3.7 km and 4.8 km adjacent to Euri Creek, refer to Table 3 and Figure 1.

Table 3 Relevant sensitive receptors and proximity to BOS operations (SEG 2021)

Receptor ID	Description	Approximate distance and bearing from launch pad	Approximate distance and bearing from test pads	
			Test Pad 1	Test Pad 2
R1	Sensitive receptor, Dwelling	3,700m at 135°	3,656 m at 140°E	3,828 m at 136°E
R2	Sensitive receptor, Dwelling	4,100 m at 140°	4,087 m at 147°E	4,230 m at 143°E
R3	Sensitive receptor, Dwelling	4,400 m at 150°	4,440 m 154°E	4,549 m at 150°E
R4	Sensitive receptor, Dwelling	4,800 m at 165°	4,956 m at 169E	4,990 m at 166°E
R5	Sensitive receptor, Dwellings, Queens Beach	11,800 m at 95°	11,372 m at 98°E	11,652 m at 98°E
R6	Sensitive receptor, School	8,300 m at 145°	8,191 m at 143°E	8,344 m at 141°E
R7	Sensitive receptor, Bowen Township	13,800 m at 110°	13,489 m at 112°E	13,745 m at 112°E
R8	Industrial Use, Abbott Point Coal Terminal	7,200 m at 330°	7,233 m at 30°W	7,121 m at 27°W
R9	Environmental receptor (Saltwater Creek) and northern property boundary	450 m at 15°	255 m at 9°W	372 m at 41°E
R10	Environmental receptor (Beach) north of Launch Pad	1,800 m at 5°	1,570 m at 19°E	1,708 m at 27°E
R11	Industrial Use, Quarry	820 m at 270°	1,258 m at 85°E	970 m at 95°W

3.3 Existing noise environment

The existing noise environment is typical of a rural, coastal area, with low levels of background noise by natural sources (e.g., wind, animals, and insects). Additional to natural noise sources is the noise generated by industrial activities associated with the quarry and bulk coal transport and processing within the APSDA.

Areas to the west and north of the site would have noise levels typical of semi-industrial areas. The noise sources include those from road transport vehicles and rail bulk haulage trains along Abbot Point Road as well as large heavy machinery and occasional blasting for quarrying activities.

Areas to the east of the site would experience noise levels typical of rural or rural-residential areas with limited traffic, commercial or industrial noise. This is also true for the residential dwellings to the southeast of the site. Road and rail corridors to the south of these dwellings are expected to have only a minor influence of ambient noise levels at the residential dwellings (R1 – R4) located southeast of the site (SEG 2021).

The rating background level (RBL) is an overall single-figure background level assumed for various time periods. RBL’s for residential dwellings (R1 – R4) are based on those expected in quiet rural residential areas as presented in (Table 2).

The noise profile of commercial activities at the Abbot Point Processing terminal are likely to be typical of large-scale industrial activities with noise sources including loading events, machinery, and plant movements.

Table 4 Assumed rating background noise level [dB(A)] for rural residential areas (SEG 2021)

Time Period	Assumed Rating Background Noise Level [dB(A)]
Day (Monday – Sunday: 7am to 6pm)	40 dB(A)
Evening (Monday – Sunday: 6pm to 10pm)	38 dB(A)
Night (Monday – Sunday: 10pm to 6am)	30 dB(A)

3.4 Existing vibration environment

The Newland’s rail line provides capacity for up to 19 two-way bulk haulage trains per day. The area adversely affected by the vibration associated with rail movements is typically less than 100 m from the line. These vibrations are generally far too weak to damage buildings.

The main existing source of vibration comprises blasting and extractive industry activities in the quarry adjacent to the site. The quarry would comply with Queensland blasting guidelines and given the separation distance, would most likely readily comply with vibration levels of 5 mm/s at all sensitive receptors (SEG 2021). Vibration levels of 5 mm/s are designed to protect structures. It is anticipated 5 mm/s vibration velocity would be met between 300 m and 1 km of the quarry for blasting.

Since potentially adversely affected zones is typically much less than 100 m from the railway and 1 km from the quarry, there are not any sensitive receptors likely to have noticeable vibration events.

4 OPERATIONS DESCRIPTION

4.1 BOS Launch Operations

Launch operations from the BOS are approximately 60-90 day campaigns where a launch vehicle undergoes final assembly and commissioning prior to fuelling and launch.

The BOS launch facility comprises a Launch Control Centre, Vehicle Assembly Building (VAB), launch pad and launch fluids and utilities storage pads.

The launch pad includes a water deluge system that is designed to suppress noise and vibrations and prevent damage to the launch pad and launch vehicle in the moments prior to and immediately after lift-off. The suppression system also works to limit environmental noise emissions during this phase of the launch. Operation and management of activities on the launch pad follow detailed launch procedures which are developed and maintained for each launch mission.

The flight time from take-off to 10 km (altitude of commercial jets in cruise) is approximately 60 seconds and an additional 20 seconds is required to attain an altitude of 20 km (above the troposphere).

Flight paths between trajectories of 25° - 71 ° clockwise from true north are considered possible from the BOS. The angle is specified anti-clockwise relative to due east. The noise modelling has been based on 57° trajectory since this alignment is likely to be the most common, noting that each launch will require its own independent flight safety analysis and launch permit approval from the Australian Space Agency.

During a launch activity, no sonic boom would be expected to occur proximal to the ground during the vertical ascent phase of the flight because the acoustic energy of the sonic boom is directed upward, unless particular atmospheric conditions cause some energy to refract back to the ground. As the launch vehicle pitches over to access the specified target orbit, the sonic boom energy (rays) may intersect the water. Given the proposed range of trajectories the sonic boom is not expected to be experienced on land.

In the event of a launch failure the rocket is autonomously deactivated by cutting off thrust. A failure on or close to the launch pad would have the greatest blast energy since the rocket during this early phase of the launch has not consumed any fuel. Detonation of the launch vehicle is unlikely due to the fuel and oxidiser selected by Gilmour Space Technologies but is noted as the only unexpected event with potential noise and vibration consequences.

Current projections indicate there are likely to be 2 launches per year until 2025 and then increase in frequency towards a target of monthly launches.

4.2 BOS Test Facility Operations

The BOS test facility comprises testing of rocket engines within two purpose-built engine test pads (Test Pad 1 and Test Pad 2). The test pads comprise a central concrete slab surrounded by a gravel surface, with block walls constructed adjacent to the primary engine test stand. Each pad includes thrust structures, power supply, fluids supply networks including temporary storage facilities for kerosene and liquid oxygen; control instrumentation and data acquisition equipment; kinetic capture and armouring structures; and emergency stop apparatus.

Testing of various engine types and sizes will occur. The engine type and their proposed test pads are presented in Table 5.

Table 5 Engine test locations

Engine Type	Test Pad
Catpack	1

Small HRE	1
Big HRE	1
Small RCS	1
Big RCS	1
Small LRE	2
Big LRE	2

4.2.1 Test Pad 1

Test Pad 1 is located at Latitude: 19°57'24.57" S and Longitude: 148° 6'54.96" E. The pad supports a container wall comprising 2 rows of 40ft containers, a sandbag wall that is 3m high and 20m long, two test stands (1A and 1B) and temporary link block walls that are erected around Test Stands. The test pad layout is shown in Figure 2 and the proposed link block wall configuration is shown in Figure 3.

Test stand 1A is for firing engine types Catpack and Big HRE while Test stand 1B is for firing engine types Small HRE, Small RCS and Big RCS. The firing direction is 25°, i.e. to the NE.

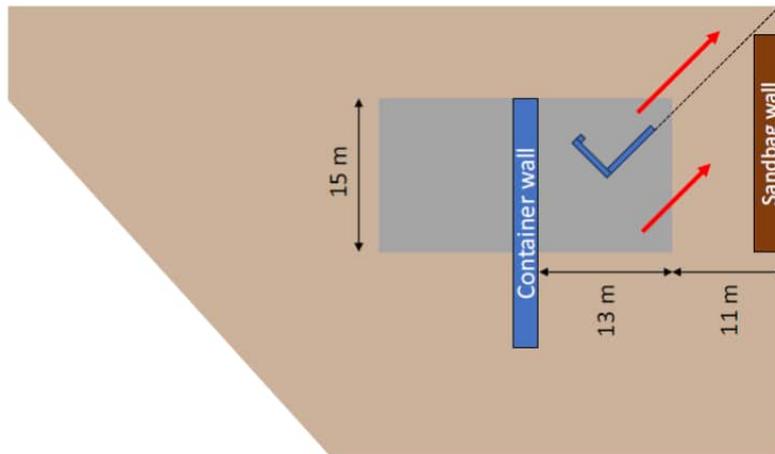


Figure 2 Test Pad 1 Showing Engine Stands, Container Wall, and 20 m Long Sandbag Wall

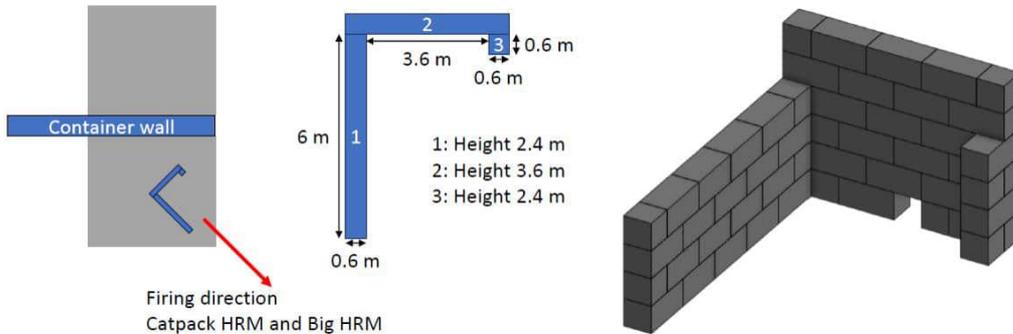


Figure 3 Typical Link Block Walls Test Stand 1A

4.2.2 Test Pad 2

Test Pad 2 is located at Latitude: 19°57'25.23" S Longitude: 148° 6'45.70" E. The layout of Test Pad 2 is presented in Figure 4 and the typical link block walls are shown in Figure 5. Test Pad 2 will be for testing engine types Small LRE and Big LRE. The firing direction is 17°, i.e. to the NE. Test Pad 2 is primarily intended for Small LRE and Big LRE engine tests.

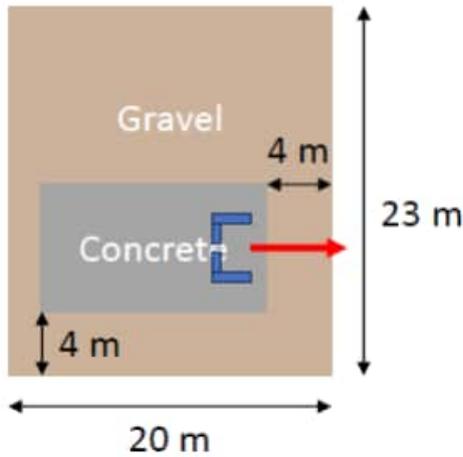


Figure 4 Test Pad 2 Showing Test Stand and Link Block Walls



Figure 5 Test Pad 2 Link Block Walls Description

Each pad is contained within a designated fenced area and incorporates a raised hardstand, vehicle access ramp and thrust structure. Each test pad is configurable to support a variety of tests. Test engines are fired horizontally.

4.2.3 Testing Regime

Engine tests may be performed as a part of a verification / qualification activity in support of a launch campaign or as a separate experimental or developmental activity. These activities may be conducted over very short durations of 1-3 seconds or full burn durations of up to 2-4 minutes. All engine tests are carried out during the day, 7am to 6pm. These activities are typically nested within test campaigns lasting from days to weeks.

The probable maximum testing regimes are presented in Table 6. Seven alternative engine test options were modelled with up to 6 engine test firings in a day (Option 4b).

Table 6 Engine test plans

Test Day Options	Engine Tests
Option 1	1 Big HRE test for 120 sec
Option 2a	3 Catpack tests for 30 sec each + 1 Small LRE test for 240 sec
Option 2b	3 Catpack tests for 30 sec each + 2 Big RCS tests for 60 sec each
Option 3a	2 Small HRE tests for 120 sec each + 1 Small LRE test for 240 sec
Option 3b	2 Small HRE tests for 120 sec each + 2 Big RCS tests for 60 sec each
Option 4a	4 Big RCS tests for 60 sec each + 1 Small LRE test for 240 sec
Option 4b	4 Big RCS tests for 60 sec each + 2 Big LRE tests for 5 sec each

4.3 Noise sources

Short-term increases in noise would result from the use of heavy equipment during construction and development of the site and eventual rocket launches / tests. Construction noise is largely limited to the site being developed, will be typical of road and industrial building construction and is unlikely to carry to nearby sensitive receptors (SEG 2021).

Rocket noise is generated from both the combustion process and the turbulent mixing of the exhaust flow with the surrounding air.

At the launch facility, a water deluge system will be employed on lift off, introducing high volume flows of water into the rocket exhaust to dissipate sound energy. This is intended to protect the Launch Pad, its infrastructure, and the launch vehicle itself from the sound energy occurring on lift off. While it will slightly lower the noise generated in the environment for the first five or so seconds of engine burn it will rapidly become ineffective as the vehicle accelerates clear of the Launch Pad.

Noise generated on launch is directly related to the amount of thrust generated: the mitigation of rocket noise beyond the initial few seconds of launch is not practicable.

Temporary mechanical noise will be produced in the lead-up to each launch (see noise associated with construction).

Noise production resulting from all engines and engine combinations have been modelled, assessed, and compared with the environmental site license (SEG 2023). There are several instances where noise levels produced during engine tests are modelled to exceed 110 dB(A) at nearby environmental receptor sites including testing of Catpack, Big HRE, Small LRE and Big LRE under a range of meteorological conditions (SEG 2023). Whilst noise generated during testing will contribute significantly to the immediate noise environment all testing will readily comply with license conditions at residential and commercial sensitive receptors (SEG 2023). Proposed management measures for environmental receptors are presented in the Flora and Fauna Management Plan (Terra Solutions 2024)

4.4 Vibration sources

Two potential sources of ground vibration will be generated during a launch activity, which are the ignition pulse and conversion of air-borne acoustical energy into ground vibration (SEG 2021). Other sources of vibration associated with onsite work will be negligible.

The ignition pulse is generated from the high velocity jet and rocket motor exhaust which directly impacts the ground during the ignition phase of the launch. The proposed hybrid rocket motors do not produce a significant peak (or pulse) on ignition, the thrust develops gradually and maintains a relatively constant

pressure on the concrete launch pad. Consequently, it is not anticipated the ignition component of the launch will generate any noticeable vibration pulse into the ground (SEG 2021).

The transmission of acoustic energy over the surface of the launch pad and launch structure is chaotic and variable over time and will reduce rapidly after ignition as the launch vehicle gains altitude (SEG 2021). By way of guidance, most acoustic energy is reflected from a solid impervious surface, however even a small fraction of transmissibility could cause vibration in the structures close to the rocket motors (SEG 2021).

To address the operational issues associated with vibrations caused by high acoustic levels during launch, the launch facility adopts a water deluge system to attenuate high acoustic levels during the initial phase of the launch, which is expected to reduce the sound power by approximately 38 dB (Panda et al 2014 cited in SEG 2021).

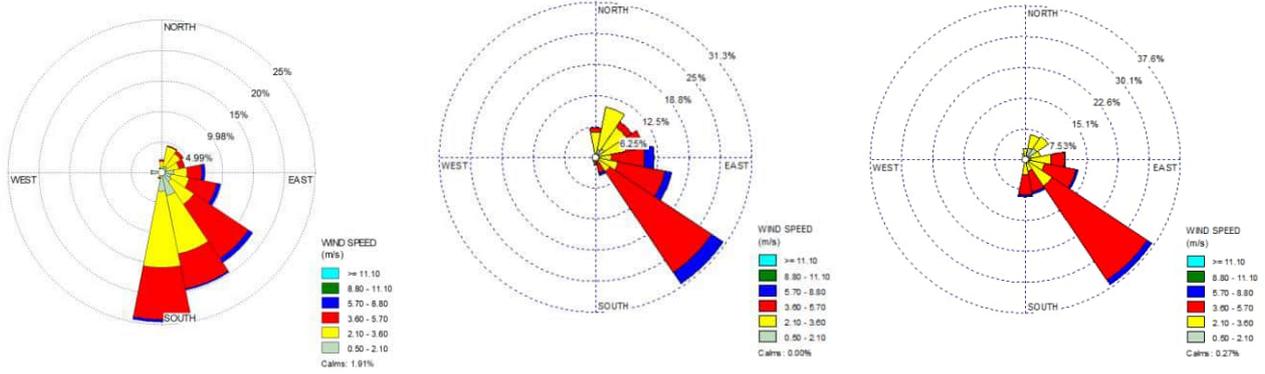
Sound power which may be transmissible to vibration at the launch pad location is expected to be attenuated by approximately 78 dB by the combined effects of a water deluge, and the transmissibility effects. The source sound power level from the rocket exhaust is expected to be approximately 180 dB, which may result in a modelled incident vibration of up to 102 dB (SEG 2021).

When considering the high acoustic noise levels at a macroscale, there will not be large areas of in-phase or resonance vibrations and consequently environmental effects from this effect would be limited. It is conservatively estimated PPV ground vibrations at 100 m from the launch pad would be below 10 mm/s (SEG 2021).

Ground vibrations during engine testing are expected to be negligible as the ignition pulse and air-borne acoustical energy will be directed through the air due to the horizontal arrangement of the engines.

4.5 Prevailing wind

The wind rose data show the frequency of occurrence of winds by direction and strength (Appendix A: Windrose for Site). The predominant wind direction during the year is from the north-east through to the south-east.



5 NOISE AND VIBRATION MONITORING PROGRAM

5.1 Background and context

Launch activities will result in a noise signature throughout the launch profile (on the ground and in flight) and the maximum noise level will be dependent on receptor location, prevailing meteorological and launch profiles.

Sound power level measurements from Hybrid Rocket Testing undertaken by SEG (2021) determined the source sound power level for the Gilmour Space Technologies hybrid motor of 179 dB(A). Subsequent noise modelling of these measurements predicts the following noise levels at the following sensitive receptors during launch events (SEG 2021) (also refer to Table 7):

- Saltwater creek, beach areas to the north of the launch site and the quarry is calculated to be exposed to high impact noise levels of 120 dB(A), 105 dB(A) and 115 dB(A) respectively.
- Abbott Point Coal Terminal is predicted to have low noise impact (based on the SEL) and a maximum noise level of 98 dB(A).
- The closest group of dwellings, to the east of the launch site is calculated to be exposed to a maximum noise level between 90 dB(A) and 94 dB(A). The SEL indicates the site would be exposed to a borderline low to moderate noise impact.
- The noise level at Queens Beach and Bowen is likely to be exposed to a maximum noise level of 78 dB(A) and the SEL indicates no adverse impacts.
- The noise level at R6 the school is likely to be exposed to a maximum noise level of 83 dB(A) and the SEL indicates borderline no adverse impacts to low adverse impacts.

Noise modelling indicates that ground-level sound levels will naturally dissipate as the launch vehicle reaches higher altitudes, with levels falling below 90 dB(A) approximately 42 seconds after launch (5-kilometre altitude). Whilst noises of the magnitudes in Table 7 are characterised as very loud, they will be infrequent and of very short duration (approximately 20 seconds of intense sound per launch) which will limit noise exposure and thus the level of impact to sensitive receptors.

Sonic booms are not expected to occur over any populated areas.

Table 7 Calculated launch noise levels at selected receptors (from SEG 2021)

Receptor	Calculated LAmax [dB(A)]	Calculated SEL [dB(A)]	Impact category
R1 – Dwelling	94	105	Low – Moderate
R2 – Dwelling	92	104	Low – Moderate
R3 – Dwelling	91	103	Low – Moderate
R4 – Dwelling	90	101	Low – Moderate
R5 – Dwelling	78	94	No impact
R6 – Dwelling	83	96	Nil – Low
R7 – Dwelling	78	94	No impact
R8 – Industrial – Abbot Point Bulk Coal	85	98	Low
R9 – Northern boundary and Saltwater Creek	120	124	High
R10 – Beach north of launch pad	104	112	High
R11 – Industrial – Quarry	115	119	High

During the launch / test there is a very short period when vibrations will affect the launch vehicle support structure and into the ground. Vibrations propagate in a predictable way and are not influenced by meteorological conditions. Vibrations are expected to be very low and only measurable above the background vibration near the launch / test site. Once the launch vehicle is in flight the potential to generate vibrations is virtually nil.

The range of calculated noise levels identified in the *Bowen Orbital Spaceport - Engine Test Facilities Report* (SEG 2023) are outlined in Table 8. The varying L_{Amax} and SEL values are dependent on engine type, daily use options and meteorological conditions.

All L_{Amax} and DNL values in Table 7 are derived from modelling the Big HRE engine noise which is tested for a maximum of 120 seconds. Assuming a constant sound output over 120 seconds, SEL will be 21 dB(A) higher at each sensitive receptor.

Table 8 Calculated test noise levels range at selected receptors (from SEG 2023)

Receptor	Calculated L_{Amax} [dB(A)]	Calculated DNL [dB(A)]	Estimated SEL [dB(A)]	Impact category
R1 – Dwelling	62	33	83	No impact
R2 – Dwelling	52	23	73	No impact
R3 – Dwelling	48	20	69	No impact
R4 – Dwelling	41	13	62	No impact
R5 – Dwelling	58	29	79	No impact
R6 – Dwelling	45	16	66	No impact
R7 – Dwelling	52	23	73	No impact
R9 – Northern boundary and Saltwater Creek	121	92	142	High
R10 – Beach north of launch pad	106	78	127	High
R11 – Industrial - Quarry	91	59	112	Moderate

5.2 Outline of Monitoring Program

The primary purpose of the monitoring program is to inform the noise and vibration levels occurring during launch, test, and ground preparation activities.

The monitoring program will focus on the zone likely to experience the highest noise levels during the launch / test and occupied by people. The locations selected represent sensitive receptors in that zone and commercial receptors with significant staff. Additionally, measurements close to the BOS facility will capture near field effects and the effects on foreshore and wetland areas.

The measures are designed to obtain noise and vibration profile during the launch / test. These measurements will be used by the Gilmore Space as an input into future launch / test profile planning and engine design. The measurements will be available to regulators to confirm that rocket launches / tests are meeting performance specifications and to assist with development planning in the Bowen Area. Furthermore, the measurements will be made available to the affected community so they may contextualise past noise events with future launch / test events.

The noise levels will be recorded on a second-by-second basis to permit correlation of the measured noise levels with rocket launch / test and to assist with rejection of noise events associated with non-launch / test noise sources. The L_{Amax} goal is particularly problematic since there are numerous noises in the environment that regularly exceed the acoustic quality objectives. For instance, bird calls located close to the microphone

recording device, car horns, gardening equipment are examples of common noise sources in the environment.

As vibration from launch / test activities are expected to be localised the monitoring of vibration will be restricted to the site only.

A meteorological station capable of monitoring wind speed and direction, humidity, temperature, and precipitation will be installed at MS05 (refer to Air Quality Management Plan) to contextualise noise and vibration results with consideration of meteorological data at the time of monitoring.

5.3 Applicable standards and guidelines

The following noise and vibration guidelines are relevant to this monitoring program:

- QLD Noise Measurement Manual (2020)
- AS IEC 61260.1:2019 Acoustics – Octave-band and fractional-octave-band-filters.
- Environmental Protection Act 1994, Queensland Government
- Standards Australia AS 1055:2018 Acoustics – Description and measurement of environmental noise.
- Standards Australia AS/NZS IEC61672.1:2019 Electroacoustics – Sound Level Meters – Specifications.
- Standards Australia AS IEC 61672.2:2019 Electroacoustics - Sound level meters - Pattern evaluation tests.
- Standards Australia AS 1633-1985 Acoustics – Glossary of terms and related symbols.
- Standards Australia AS 2659 – Guide to the use of sound measuring equipment.
- AS 2606–1993 Vibration and shock—vocabulary.
- AS 2670.1–2001 Evaluation of human exposure to whole-body vibration. Part 1: General requirements.
- AS 2670.2–1990 Evaluation of human exposure to whole body vibration. Part 2: Continuous and shock induced vibration in buildings (1 to 80 Hz).
- AS 2670.3–1990 Evaluation of human exposure to whole body vibration. Part 3: Evaluation of exposure to whole body x axis vertical vibration in the frequency range 0.1 to 0.63 Hz.
- AS 2775–2004 Mechanical vibration and shock—Mechanical mounting of accelerometers
- AS 3658–1989 Vibration and shock—Mechanical vibration and shock affecting humans— vocabulary.
- BS 6472–1984 Evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz).
- BS 6472–1992 Guide to evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz).
- BS 7482–1991 Parts 1 and 3: Instrumentation for the measurement of vibration exposure of human beings.

5.4 Acoustic quality objectives

The acoustic quality objectives as detailed in the Development Permit are presented in Table 9. The analysis of noise levels obtained at the locations and frequencies outlined in the following sections will be undertaken to ascertain compliance or otherwise of Gilmour’s operations with these relevant limits.

The units of measurement conditioned in the Development Permit and their purpose are outlined below:

- L_{Amax} is the maximum value (max sub-index) A-weighted (A sub-index) sound pressure level reached during a measurement period. The measurement is expressed in dB(A) and considered an appropriate

measurement for community noise assessment of a single event such as a rocket launch (SEG 2021). L_{Amax} is typically used to assess the level of interference from a noise event (i.e. conversation, TV or radio listening, sleep etc.). Although the L_{Amax} provides some measure of a noise event, it does not capture the total event, because it does not incorporate the period of the event (SEG 2021).

- Sound exposure level (LAE or SEL-a) is a more complete noise metric which includes the sound level and the duration of exposure and is therefore a suitable measure for noise events that vary in intensity over time. SEL provides an overall impact of noise event and allows sound exposures of different duration to be compared in terms of total acoustic energy for transient noise (e.g. aircraft flyover).
- Day-Night Average Sound Level (DNL) represents an average of the sound levels from a noise source, along with all other noise sources at a location, over a 24-hour period.

Table 9 Noise and vibration objectives

Noise level dB(A) measured as:	Sensitive place	Commercial place
L_{Amax}	96	115
L_{AE} (SEL)	110	115
DNL	70	80
Vibration	10 mm/s	15 mm/s

5.5 Monitoring locations and frequency

The proposed noise and vibration monitoring locations are included in Table 10 and Figure 6.

Noise and vibration monitoring will be undertaken over a period of 48-hours around launch / test events (24 hours prior and 24 hours following). Noise recording intervals will consist of second-by-second recordings of L_{Aeq} (converted to SEL) and L_{Amax} over the 48-hour period. Vibration recording intervals will be second-by-second recordings in mm/s over the 48-hour period.

It is proposed to provide noise monitoring at R9 for all launch activities over the life of the project and at R1 and R8 for the first 2 launches. R8 is already a substantial source of noise, and it is considered noise monitoring at this location will be significantly influenced by intermittent rail and coal handling noise forming the primary component of the noise profile in this area.

Vibration monitoring will be undertaken at R9 for the first two launches. Since the attenuation of vibration is predictable and unlikely to vary substantially between launch events, monitoring shall be discontinued at one or both sites if vibration from launch activities is not detected during the first two launch events.

Table 10 Noise monitoring locations for launch and test facility

Receptor ID	Easting	Northing	Description	Noise monitoring	Vibration monitoring
R01	619066	7790126	Sensitive receptor, Dwelling	✓	✓
R08	613417	7798848	Industrial Use, Abbott Point Coal Terminal	✓	
R09	616749	7793118	Environmental receptor (Saltwater Creek) and northern property boundary	✓	✓



LEGEND

- ▲ Launch Pad
- NVMP Monitoring Sites
- BOS Site
- Subject allotments
- Railway line
- Private / Restricted Road

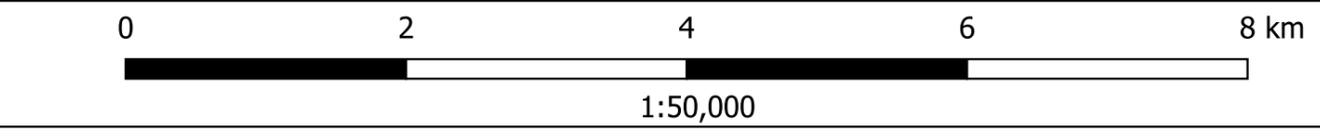


CLIENT: GILMOUR SPACE TECHNOLOGIES

FIGURE 6: NVMP MONITORING SITES

Credits:
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DOCUMENT: 202108-3_NVMP monitoring locations
 DATE: 01/10/2022 AUTHOR: A.Fitzaerald



Coordinate system: GDA94 / MGA zone 55 EPSG:28355

5.6 Monitoring equipment

Noise monitoring data will be collected using a Type 1 sound monitoring device (i.e. Joey 139 or similar). The measurements will be recorded on a second-by-second basis to measure the L_{Aeq} (60 second running) L_{Aeq} and L_{Amax} in each one second period. The SEL is calculated from the L_{Aeq} after the rocket launch / test is complete. The sound monitoring equipment is to be permanently deployed and shall be provided with high quality outdoor protection to avoid water ingress onto the microphone cartridge. All systems (temporary and permanent) shall have effective windscreens. Ideally, the noise loggers will provide the data in real-time to the cloud. The logger will be positioned at least 20 m from any vertical (wall) or diagonal (roof) reflecting surface.

It is recommended the sound level meter be configured to record the 60 second running L_{Aeq} (60 seconds), i.e. each second the L_{Aeq} from the previous 60 seconds is calculated. Since the noise from a rocket launch lasts for approximately 30 seconds and the noise from the rocket launch is much greater than the ambient noise, then the SEL is the L_{Aeq} (60 second) plus $10 \cdot \log(60)$ (+17.8 dB). This approach would not be valid if the ambient noise is within 20 decibels of the maximum noise from the launch.

The vibration monitoring equipment is to comprise a Texcel GTM Ground Vibration Monitor consisting of a highly sensitive geophone and a data recording system.. Performance characteristics for the measurement instrumentation should meet the requirements set out in BS 6841 and BS 7482 Parts 1 and 3. A minimum dynamic range of 40 dB is assumed. The geophone transducer will be firmly mounted to ensure the ground vibration is accurately measured, See Australian Standard AS 2775–2004 Mechanical vibration and shock—Mechanical mounting of accelerometers.

To ensure data quality and accuracy all monitoring equipment shall be deployed at the proposed sites by a person with experience in the calibration and use of the monitoring equipment specified or under instruction by a person with that experience.

5.7 Monitoring program summary

Presented in Table 11 is a summary of the BOS NVMP.

Table 11 Summary of noise and vibration monitoring program

Monitoring Location	Monitoring Equipment	Monitoring Equipment Code	Analysis Frequency	Analysis Suite
R1	Type 1 noise logger	N01	24 hours preceding and following all launch events, including the launch event	Second-by-second measurements of L_{Aeq} (converted to SEL) and L_{Amax}
R8	Type 1 noise logger	N02	24 hours preceding and following the first two launch events	Second-by-second measurements of L_{Aeq} (converted to SEL) and L_{Amax}
R9	Type 1 noise logger	N03	24 hours preceding and following all test and launch events, including the launch event	Second-by-second measurements of L_{Aeq} (converted to SEL) and L_{Amax}
	Geophone	V02	24 hours preceding and following all launch events, including the launch event	Minimum second-by-second measurements vibration in mm/s

6 REPORTING

6.1 Acoustic quality monitoring event summaries

Acoustic data will be evaluated after each monitoring event to confirm that modelled data accurately represents the on ground acoustic data and meets the limits stipulated in the development conditions. The analytical data will be compiled in tables and the quality assurance and quality control (QA/QC) checks undertaken. If the QA/QC checks reveal that the data has been affected in any way, the effects will be summarised. Each monitoring event will be summarised in a technical memorandum for future reference.

Provided that instrumentation has been deployed in accordance with the requirements of Section 5.4, noise and vibration datasets from deployed instruments may be readily downloaded by Gilmour personnel and provided for analysis by a suitably qualified noise and vibration engineer. Most of the time, reporting can be undertaken by Gilmour engineering staff. Occasionally there may be events requiring additional analysis (i.e. events that fall outside the normal parameters, such as very long duration launch events or noisy ambient levels at the time of launch).

The following information will be summarised as a minimum:

- Date(s) of the monitoring event
- Brief methodology of what field work was conducted and how (e.g. in accordance with this NVMP)
- Include a brief description of any deviations from the NVMP, standards or guidelines
- Table of what was analysed and the results of the analysis
- Summary of any QA/QC issues and consequences for the data collected
- Summary of any site conditions or other relevant issues that may influence the data throughout the monitoring period

6.2 Acoustic quality monitoring report

The annual report will include as a minimum, but is not limited to, the following:

An introduction stating the objectives of the monitoring program and the scope of work carried out during the reporting period.

- A brief discussion of the monitoring network
- A brief description of the methodologies used - referring to relevant standards, guidelines, monitoring plans, where necessary
- Discussion of any deviation to the DVMP or changes to monitoring since the previous annual report
- The results of the air quality sampling

6.3 Trigger level exceedance reporting

Exceedance of acoustic quality limits at monitored residential dwellings or commercial places will be reviewed by the site manager to determine whether the exceedance event was due to Gilmore Space or external sources. The prevailing wind direction will also be reviewed to assist with the determination. If an exceedance event due to Gilmore Space operations has been established as likely, the data shall be referred to a noise and vibration expert to determine whether any sensitive receptor is likely to have been adversely affected. Should the noise and vibration expert consider that an exceedance event has occurred at

a sensitive receptor then the results of the investigation will consist of a report to the reviewing authority. Further investigations should consider the following as required:

- the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems
- the qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to sleep, study or learn and/or be involved in recreation including relaxation and conversation
- the qualities of the acoustic environment that are conducive to protecting the amenity of the community

7 ACOUSTIC QUALITY AND VIBRATION MANAGEMENT

To ensure ongoing compliance with noise and vibration objectives detailed in Table 9, a number of management measures are proposed. The measures cited below are primarily adaptive, to be implemented where it has been identified through monitoring and independent noise assessment that regular exceedances of the noise criteria occur due to launch activities and affected landowners requests such measures. Where required the proposed measures may include one or more of the following:

- Refinement of on-site noise mitigation measures and operating procedures, where it is identified through monitoring that prevailing weather conditions are impacting on capacity to comply with noise criteria
- Discussions with relevant landowners to assess concerns
- Development of private noise agreements, where acceptable to the impacted landholder
- Installation of feasible and reasonable acoustic mitigation at receivers (which may include window glazing, insulation and/or air conditioning)
- Launch / test activities to minimise, where possible, noise levels at sensitive receptors by considering the prevailing meteorological conditions via an onsite weather station and forecasts.
- Rocket launch / test windows are communicated to nearby sensitive receptors and to the community generally via news releases, social media, and direct contact with neighbours. It is expected the launch will generate significant interest in the community. Since the event will be notified and the expected noise levels are similar in magnitude to other noises already experienced in areas throughout Queensland, it is expected the community will not be adversely impacted by the introduction launch operations and the noise impacts would be acceptable.
- To address the operational issues associated with vibration and high acoustic levels during launch, the site will be adopting a water deluge system to attenuate high acoustic levels during the initial phase of the launch. The suppression system is highly effective at reducing these effects while the launch vehicle exhaust is incident on the pad and is expected to reduce the sound power by approximately 38 dB.
- To address operational issues associated with vibration and high acoustic levels during test activities block walls are constructed adjacent to the primary engine stand. Additionally, test pad 1 contains a container wall (two rows of 40 ft containers) and a sandbag wall (three meters tall by 20 m long). The test pads firing direction has been positioned to reduce noise related impacts to residential and commercial sensitive receptors.

NOISE AND VIBRATION MANAGEMENT PLAN

Gilmour Space Technologies Pty Ltd



202108

Noise and Vibration Management
Plan

22/02/2024

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Contents

1	INTRODUCTION	1
1.1	Objectives.....	1
2	RELEVANT LEGISLATION AND APPROVAL CONDITIONS	2
2.1	Development approval conditions.....	2
3	EXISTING ENVIRONMENT	4
3.1	Site location and description	4
3.2	Sensitive receptors.....	4
3.3	Existing noise environment	5
3.4	Existing vibration environment	6
4	OPERATIONS DESCRIPTION	8
4.1	BOS Launch Operations	8
4.2	BOS Test Facility Operations.....	8
4.2.1	Test Pad 1.....	9
4.2.2	Test Pad 2.....	10
4.2.3	Testing Regime.....	10
4.3	Noise sources.....	11
4.4	Vibration sources	11
4.5	Prevailing wind	13
5	NOISE AND VIBRATION MONITORING PROGRAM	14
5.1	Background and context	14
5.2	Outline of Monitoring Program	15
5.3	Applicable standards and guidelines	16
5.4	Acoustic quality objectives	16
5.5	Monitoring locations and frequency	17
5.6	Monitoring equipment.....	19
5.7	Monitoring program summary	19
6	REPORTING	20
6.1	Acoustic quality monitoring event summaries.....	20
6.2	Acoustic quality monitoring report.....	20
6.3	Trigger level exceedance reporting.....	20
7	ACOUSTIC QUALITY AND VIBRATION MANAGEMENT	22

Tables

Table 1	Relevant legislation	2
Table 2	Relevant conditions from DA permits.....	2
Table 3	Relevant sensitive receptors and proximity to BOS operations (SEG 2021).....	5
Table 4	Assumed rating background noise level [dB(A)] for rural residential areas (SEG 2021).....	6
Table 5	Engine test locations	8
Table 6	Engine test plans.....	11
Table 7	Calculated launch noise levels at selected receptors (from SEG 2021).....	14
Table 8	Calculated test noise levels range at selected receptors (from SEG 2023)	15
Table 9	Noise and vibration objectives	17

Table 10	Noise monitoring locations for launch and test facility	17
Table 11	Summary of noise and vibration monitoring program	19

Figures

Figure 1	Location of nearby sensitive receptors	7
Figure 2	Test Pad 1 Showing Engine Stands, Container Wall, and 20 m Long Sandbag Wall	9
Figure 3	Link Block Walls Test Stand 1A	9
Figure 4	Test Pad 2 Showing Test Stand and Link Block Walls	10
Figure 5	Test Pad 2 Link Block Walls Description	10
Figure 6	Monitoring locations	18

1 INTRODUCTION

This Noise and Vibration Monitoring and Management Plan (NVMMP) was produced by Terra Solutions Pty Ltd (Terra) and Simpson Engineering Group (SEG) for Gilmour Space Technologies (Gilmour) for the Bowen Orbital Spaceport (BOS) Launch Operations located on Lots 8, 9 and 10 on SP295408 (the Site) in the Abbot Point State Development Area.

Gilmour has conditioned approval for a material change of use (MCU) for a high impact industry (launch facility) at the site. The MCU provides this approval from the date of obtaining Commonwealth approval pursuant to the Space (Launches and Returns) Act 2018, for a launch facility licence to operate a launch / test facility on the site.

Relevant conditions of the Development Permit and associated conditions require that an NVMMP be implemented to demonstrate compliance with the Development Approval:

- Condition 12.1: Prepare and submit to the Coordinator-General and Whitsunday Regional Council, a detailed project specific Environmental Management Plan (EMP) addressing both the construction and operational phases of the project, including Condition 12.1 (i) Air Quality and Dust Management Plan.
- Condition 26: The operator of the development must ensure that noise generated by launch activities does not cause noise limits specified in the approval to be exceeded at a sensitive place or commercial premises.

The NVMMP stipulates the noise and vibration monitoring, and reporting requirements that shall be followed to ensure the General Environmental Duty of Care is met under the Environmental Protection Act 1994 (EP Act) and associated Regulations.

1.1 Objectives

The objectives of this NVMMP are to provide protocols to:

- identify all potential sensitive and commercial locations which may be affected by noise and vibration impacts from launch activities
- quantify the cumulative noise impact at commercial locations that accounts for launch / test activities occurring simultaneously (i.e. existing noise levels at the commercial location plus the noise impact of a launch event)
- identification of all major sources of noise and vibration emissions that may occur as result of the operation of the launch facility
- describe procedures to manage noise and vibration emissions from the sources identified
- collect and record noise and vibration data to compile empirical data for each launch / test event for the duration of the approval period
- identify adverse meteorological conditions likely to produce elevated levels of noise and vibration at a sensitive or commercial place due to launch / test activities
- minimise the potential for noise and vibration emissions
- describe the procedures to be undertaken if any exceedance is detected

2 RELEVANT LEGISLATION AND APPROVAL CONDITIONS

The key legislative requirements for consideration in this NVMP are provided in Table 1 below.

Table 1 Relevant legislation

Legislation	Authorising Body
<i>Environmental Protection Act 1994 (EP Act)</i>	The object of the EP Act is to protect Queensland’s environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (ecologically sustainable development).
<i>Environmental Protection (Noise) Policy 2019</i>	<p>The Environmental Protection (Noise) Policy 2019 which seeks to achieve the objects of the EP Act by:</p> <ul style="list-style-type: none"> a) Identifying environmental values to be enhanced or protected b) Stating acoustic quality objectives for enhancing or protecting the environmental values c) Providing a framework for making consistent, equitable and informed decisions about the acoustic environment. <p>The EPP (Noise) identifies specific Acoustic Quality Objectives for sensitive receptors. Sensitive land uses/receptors indicated within the policy identified that have the potential to be impacted by launch activities include:</p> <ul style="list-style-type: none"> • a dwelling (detached or attached) including house, townhouse, unit, reformatory institution, caravan park or retirement village • a library, childcare centre, kindergarten, school, school playground, college, university, museum, art • gallery or other educational institution, hospital, respite care facility, nursing home, aged care facility, surgery or other medical centre • a community building including a place of public worship • a court of law • a hotel, motel or other premises which provides accommodation for the public • a commercial (office) or retail facility • a protected area, or an area identified under a conservation plan as a critical habitat or an area of major interest under the Nature Conservation Act 1992 • an outdoor recreational area (such as public park or gardens open to the public, whether or not on payment of a fee, for passive recreation other than for sport or organised entertainment) or a private open space.

2.1 Development approval conditions

The permits applicable to the activity include the following:

- Decision notice for AP2021/007 – SDA approval for a material change of use for a high impact industry (launch facility) in the Abbot Point State Development Area (SDA)

The approval contains the following requirements relevant to the establishment of the Noise and Vibration Management Plan.

Table 2 Relevant conditions from DA permits

Condition Number	Condition	Relevant section of NVMP
AP2021/007 – SDA approval for a material change of use for a high impact industry (launch facility) in the Abbot Point State Development Area (SDA)		

Condition Number	Condition	Relevant section of NVMP
12.1	<p>Prepare and submit to the Coordinator-General and Whitsunday Regional Council, a detailed project specific Environmental Management Plan (EMP) addressing both the construction and operational phases of the project.</p> <p>The EMP must be certified by an independent suitably qualified third-party confirming the adequacy of the EMP in accordance with current best practice. The EMP must include the following matters:</p> <p>(i) noise and vibration management</p>	Entire document
26.1	<p>The operator of the development must ensure that noise generated by launch activities does not cause the criteria in Table 1 - Noise limits for launch activities", to be exceeded at a sensitive place or commercial premises.</p>	Section 5.4
<p>Enclosure 8 To demonstrate compliance with condition 12.1 and condition 26 of this development approval, a noise and vibration management plan (prepared by a suitably qualified person) must be implemented at the site of the development and must include the following as a minimum:</p>		
a)	<p>identification of all potential sensitive and commercial locations which may be affected by noise and vibration impacts from launch activities and quantify the cumulative noise impact at those commercial locations that accounts for launch activities occurring simultaneously (that is the existing noise levels at the commercial location plus the noise impact of a launch event)</p>	Section 3.2 - Section 3.4 and Section 5.5
b)	<p>identification of all major sources of noise and vibration emissions that may occur as result of the operation of the launch facility</p>	Section 4.2 and Section 4.3
c)	<p>description of the procedures to manage the noise and vibration emissions from the sources identified</p>	Section 7
d)	<p>collection and recording of noise and vibration data to compile empirical data for each launch event for the duration of the approval period</p>	Section 5
e)	<p>identifying adverse meteorological conditions likely to produce elevated levels of noise and vibration at a sensitive or commercial place due to launch activities</p>	Section 5.2
f)	<p>protocols to minimise the potential for noise and vibration emissions, and</p>	Section 7
g)	<p>description of procedures to be undertaken if any exceedance is detected</p>	Section 6.3

3 EXISTING ENVIRONMENT

3.1 Site location and description

The BOS Site is located approximately 15 km west of the Bowen township in the Whitsunday Regional Council LGA. The Site is in the north-eastern corner of the Abbot Point State Development Area (APSDA) over three allotments with property descriptions of Lots 8, 9 and 10 on SP295408. Collectively these properties occupy an area of 94 ha within an area of the APSDA designated as an industrial use precinct and the facility footprint will be approximately 3 ha.

The facility shares boundaries with:

- Two cattle grazing properties
- An operational hard rock quarry (west of the launch site)
- Intermittent road and rail services along Abbot Point Road corridor and the Newlands System rail which connect the North Queensland Bulk Ports terminal.
- Saltwater creek and dune systems between the site and the coastline

Areas to the east and north of the site consist of coastal dune and estuarine environments. Small rural allotments are located between the site and the township of Bowen. A quarry is located to the southwest of the launch facility. Abbot Point Road and the Newlands railway line are located to the west of the site with the latter providing coal bulk haulage to the Abbot Point Coal terminal located to the north-west of the launch site. West of the Newlands bulk coal rail line is the Caley Valley wetlands which in addition to Saltwater Creek and the coastal environment to the north are the main ecological areas proximate to the site. The closest bound of the wetland area is at Saltwater creek which drains west toward the main wetland areas closer to the Abbot Point Coal Terminal and runs along the northern boundary of the property.

The APSDA provides for a range of existing and future development opportunities including the port facilities precinct which consists of existing port infrastructure, port expansion precinct, restricted development precinct, industry precinct, infrastructure and corridors precinct and environmental management/materials transportation precinct. The launch facility is located within the industry precinct, which is largely undeveloped from an industrial perspective and is still dominated by a grazing land use.

Waters to the west, north and south of the Port of Abbot Point are classified as a General Use Zone under the GBRMP zoning (Map 8 – Cape Upstart). The area of water directly associated with the Port is classified as an exclusion zone within the Great Barrier Reef Marine Park.

3.2 Sensitive receptors

Several sensitive receptors were previously identified in the BOS Noise, Vibration and Air Quality assessment (SEG 2021) and are used here to determine suitable locations for monitoring sites. The distance and bearing from the launch pad to the identified receptors from this report is presented in Table 3. The receptors comprise sensitive receptors, commercial uses, and natural features. The closest sensitive receptors comprise a series of dwelling along Euri Creek between 3.7 km and 4.8 km adjacent to Euri Creek, refer to Table 3 and Figure 1.

Table 3 Relevant sensitive receptors and proximity to BOS operations (SEG 2021)

Receptor ID	Description	Approximate distance and bearing from launch pad	Approximate distance and bearing from test pads	
			Test Pad 1	Test Pad 2
R1	Sensitive receptor, Dwelling	3,700m at 135°	3,656 m at 140°E	3,828 m at 136°E
R2	Sensitive receptor, Dwelling	4,100 m at 140°	4,087 m at 147°E	4,230 m at 143°E
R3	Sensitive receptor, Dwelling	4,400 m at 150°	4,440 m 154°E	4,549 m at 150°E
R4	Sensitive receptor, Dwelling	4,800 m at 165°	4,956 m at 169E	4,990 m at 166°E
R5	Sensitive receptor, Dwellings, Queens Beach	11,800 m at 95°	11,372 m at 98°E	11,652 m at 98°E
R6	Sensitive receptor, School	8,300 m at 145°	8,191 m at 143°E	8,344 m at 141°E
R7	Sensitive receptor, Bowen Township	13,800 m at 110°	13,489 m at 112°E	13,745 m at 112°E
R8	Industrial Use, Abbott Point Coal Terminal	7,200 m at 330°	7,233 m at 30°W	7,121 m at 27°W
R9	Environmental receptor (Saltwater Creek) and northern property boundary	450 m at 15°	255 m at 9°W	372 m at 41°E
R10	Environmental receptor (Beach) north of Launch Pad	1,800 m at 5°	1,570 m at 19°E	1,708 m at 27°E
R11	Industrial Use, Quarry	820 m at 270°	1,258 m at 85°E	970 m at 95°W

3.3 Existing noise environment

The existing noise environment is typical of a rural, coastal area, with low levels of background noise by natural sources (e.g., wind, animals, and insects). Additional to natural noise sources is the noise generated by industrial activities associated with the quarry and bulk coal transport and processing within the APSDA.

Areas to the west and north of the site would have noise levels typical of semi-industrial areas. The noise sources include those from road transport vehicles and rail bulk haulage trains along Abbot Point Road as well as large heavy machinery and occasional blasting for quarrying activities.

Areas to the east of the site would experience noise levels typical of rural or rural-residential areas with limited traffic, commercial or industrial noise. This is also true for the residential dwellings to the southeast of the site. Road and rail corridors to the south of these dwellings are expected to have only a minor influence of ambient noise levels at the residential dwellings (R1 – R4) located southeast of the site (SEG 2021).

The rating background level (RBL) is an overall single-figure background level assumed for various time periods. RBL’s for residential dwellings (R1 – R4) are based on those expected in quiet rural residential areas as presented in (Table 2).

The noise profile of commercial activities at the Abbot Point Processing terminal are likely to be typical of large-scale industrial activities with noise sources including loading events, machinery, and plant movements.

Table 4 Assumed rating background noise level [dB(A)] for rural residential areas (SEG 2021)

Time Period	Assumed Rating Background Noise Level [dB(A)]
Day (Monday – Sunday: 7am to 6pm)	40 dB(A)
Evening (Monday – Sunday: 6pm to 10pm)	38 dB(A)
Night (Monday – Sunday: 10pm to 6am)	30 dB(A)

3.4 Existing vibration environment

The Newland’s rail line provides capacity for up to 19 two-way bulk haulage trains per day. The area adversely affected by the vibration associated with rail movements is typically less than 100 m from the line. These vibrations are generally far too weak to damage buildings.

The main existing source of vibration comprises blasting and extractive industry activities in the quarry adjacent to the site. The quarry would comply with Queensland blasting guidelines and given the separation distance, would most likely readily comply with vibration levels of 5 mm/s at all sensitive receptors (SEG 2021). Vibration levels of 5 mm/s are designed to protect structures. It is anticipated 5 mm/s vibration velocity would be met between 300 m and 1 km of the quarry for blasting.

Since potentially adversely affected zones is typically much less than 100 m from the railway and 1 km from the quarry, there are not any sensitive receptors likely to have noticeable vibration events.

4 OPERATIONS DESCRIPTION

4.1 BOS Launch Operations

Launch operations from the BOS are approximately 60-90 day campaigns where a launch vehicle undergoes final assembly and commissioning prior to fuelling and launch.

The BOS launch facility comprises a Launch Control Centre, Vehicle Assembly Building (VAB), launch pad and launch fluids and utilities storage pads.

The launch pad includes a water deluge system that is designed to suppress noise and vibrations and prevent damage to the launch pad and launch vehicle in the moments prior to and immediately after lift-off. The suppression system also works to limit environmental noise emissions during this phase of the launch. Operation and management of activities on the launch pad follow detailed launch procedures which are developed and maintained for each launch mission.

The flight time from take-off to 10 km (altitude of commercial jets in cruise) is approximately 60 seconds and an additional 20 seconds is required to attain an altitude of 20 km (above the troposphere).

Flight paths between trajectories of 25° - 71 ° clockwise from true north are considered possible from the BOS. The angle is specified anti-clockwise relative to due east. The noise modelling has been based on 57° trajectory since this alignment is likely to be the most common, noting that each launch will require its own independent flight safety analysis and launch permit approval from the Australian Space Agency.

During a launch activity, no sonic boom would be expected to occur proximal to the ground during the vertical ascent phase of the flight because the acoustic energy of the sonic boom is directed upward, unless particular atmospheric conditions cause some energy to refract back to the ground. As the launch vehicle pitches over to access the specified target orbit, the sonic boom energy (rays) may intersect the water. Given the proposed range of trajectories the sonic boom is not expected to be experienced on land.

In the event of a launch failure the rocket is autonomously deactivated by cutting off thrust. A failure on or close to the launch pad would have the greatest blast energy since the rocket during this early phase of the launch has not consumed any fuel. Detonation of the launch vehicle is unlikely due to the fuel and oxidiser selected by Gilmour Space Technologies but is noted as the only unexpected event with potential noise and vibration consequences.

Current projections indicate there are likely to be 2 launches per year until 2025 and then increase in frequency towards a target of monthly launches.

4.2 BOS Test Facility Operations

The BOS test facility comprises testing of rocket engines within two purpose-built engine test pads (Test Pad 1 and Test Pad 2). The test pads comprise a central concrete slab surrounded by a gravel surface, with block walls constructed adjacent to the primary engine test stand. Each pad includes thrust structures, power supply, fluids supply networks including temporary storage facilities for kerosene and liquid oxygen; control instrumentation and data acquisition equipment; kinetic capture and armouring structures; and emergency stop apparatus.

Testing of various engine types and sizes will occur. The engine type and their proposed test pads are presented in Table 5.

Table 5 Engine test locations

Engine Type	Test Pad
Catpack	1

Small HRE	1
Big HRE	1
Small RCS	1
Big RCS	1
Small LRE	2
Big LRE	2

4.2.1 Test Pad 1

Test Pad 1 is located at Latitude: 19°57'24.57" S and Longitude: 148° 6'54.96" E. The pad supports a container wall comprising 2 rows of 40ft containers, a sandbag wall that is 3m high and 20m long, two test stands (1A and 1B) and temporary link block walls that are erected around Test Stands. The test pad layout is shown in Figure 2 and the proposed link block wall configuration is shown in Figure 3.

Test stand 1A is for firing engine types Catpack and Big HRE while Test stand 1B is for firing engine types Small HRE, Small RCS and Big RCS. The firing direction is 25°, i.e. to the NE.

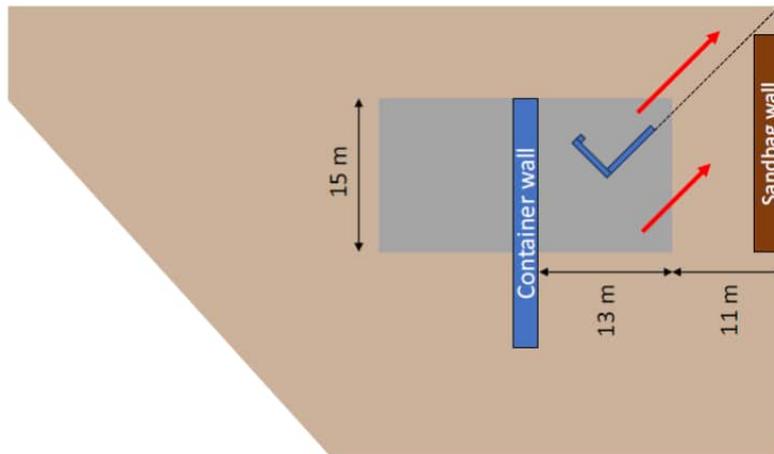


Figure 2 Test Pad 1 Showing Engine Stands, Container Wall, and 20 m Long Sandbag Wall

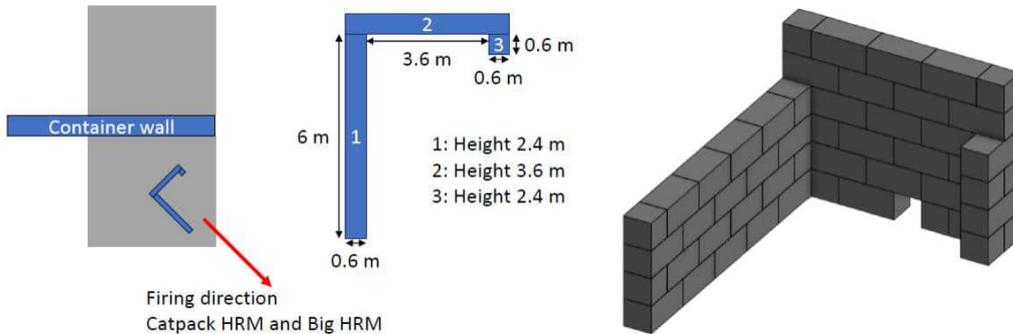


Figure 3 Typical Link Block Walls Test Stand 1A

4.2.2 Test Pad 2

Test Pad 2 is located at Latitude: 19°57'25.23" S Longitude: 148° 6'45.70" E. The layout of Test Pad 2 is presented in Figure 4 and the typical link block walls are shown in Figure 5. Test Pad 2 will be for testing engine types Small LRE and Big LRE. The firing direction is 17°, i.e. to the NE. Test Pad 2 is primarily intended for Small LRE and Big LRE engine tests.

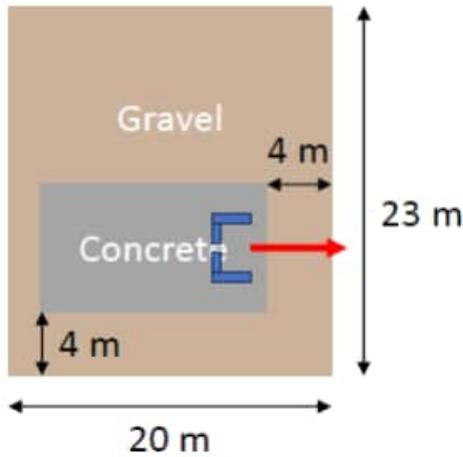


Figure 4 Test Pad 2 Showing Test Stand and Link Block Walls

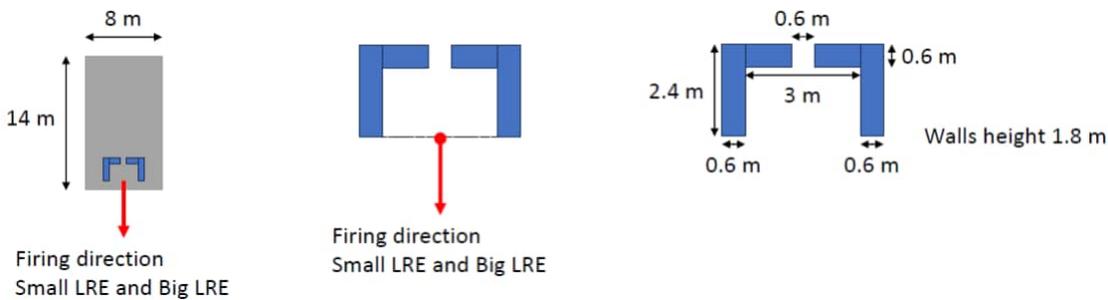


Figure 5 Test Pad 2 Link Block Walls Description

Each pad is contained within a designated fenced area and incorporates a raised hardstand, vehicle access ramp and thrust structure. Each test pad is configurable to support a variety of tests. Test engines are fired horizontally.

4.2.3 Testing Regime

Engine tests may be performed as a part of a verification / qualification activity in support of a launch campaign or as a separate experimental or developmental activity. These activities may be conducted over very short durations of 1-3 seconds or full burn durations of up to 2-4 minutes. All engine tests are carried out during the day, 7am to 6pm. These activities are typically nested within test campaigns lasting from days to weeks.

The probable maximum testing regimes are presented in Table 6. Seven alternative engine test options were modelled with up to 6 engine test firings in a day (Option 4b).

Table 6 Engine test plans

Test Day Options	Engine Tests
Option 1	1 Big HRE test for 120 sec
Option 2a	3 Catpack tests for 30 sec each + 1 Small LRE test for 240 sec
Option 2b	3 Catpack tests for 30 sec each + 2 Big RCS tests for 60 sec each
Option 3a	2 Small HRE tests for 120 sec each + 1 Small LRE test for 240 sec
Option 3b	2 Small HRE tests for 120 sec each + 2 Big RCS tests for 60 sec each
Option 4a	4 Big RCS tests for 60 sec each + 1 Small LRE test for 240 sec
Option 4b	4 Big RCS tests for 60 sec each + 2 Big LRE tests for 5 sec each

4.3 Noise sources

Short-term increases in noise would result from the use of heavy equipment during construction and development of the site and eventual rocket launches / tests. Construction noise is largely limited to the site being developed, will be typical of road and industrial building construction and is unlikely to carry to nearby sensitive receptors (SEG 2021).

Rocket noise is generated from both the combustion process and the turbulent mixing of the exhaust flow with the surrounding air.

At the launch facility, a water deluge system will be employed on lift off, introducing high volume flows of water into the rocket exhaust to dissipate sound energy. This is intended to protect the Launch Pad, its infrastructure, and the launch vehicle itself from the sound energy occurring on lift off. While it will slightly lower the noise generated in the environment for the first five or so seconds of engine burn it will rapidly become ineffective as the vehicle accelerates clear of the Launch Pad.

Noise generated on launch is directly related to the amount of thrust generated: the mitigation of rocket noise beyond the initial few seconds of launch is not practicable.

Temporary mechanical noise will be produced in the lead-up to each launch (see noise associated with construction).

Noise production resulting from all engines and engine combinations have been modelled, assessed, and compared with the environmental site license (SEG 2023). There are several instances where noise levels produced during engine tests are modelled to exceed 110 dB(A) at nearby environmental receptor sites including testing of Catpack, Big HRE, Small LRE and Big LRE under a range of meteorological conditions (SEG 2023). Whilst noise generated during testing will contribute significantly to the immediate noise environment all testing will readily comply with license conditions at residential and commercial sensitive receptors (SEG 2023). Proposed management measures for environmental receptors are presented in the Flora and Fauna Management Plan (Terra Solutions 2024)

4.4 Vibration sources

Two potential sources of ground vibration will be generated during a launch activity, which are the ignition pulse and conversion of air-borne acoustical energy into ground vibration (SEG 2021). Other sources of vibration associated with onsite work will be negligible.

The ignition pulse is generated from the high velocity jet and rocket motor exhaust which directly impacts the ground during the ignition phase of the launch. The proposed hybrid rocket motors do not produce a significant peak (or pulse) on ignition, the thrust develops gradually and maintains a relatively constant

pressure on the concrete launch pad. Consequently, it is not anticipated the ignition component of the launch will generate any noticeable vibration pulse into the ground (SEG 2021).

The transmission of acoustic energy over the surface of the launch pad and launch structure is chaotic and variable over time and will reduce rapidly after ignition as the launch vehicle gains altitude (SEG 2021). By way of guidance, most acoustic energy is reflected from a solid impervious surface, however even a small fraction of transmissibility could cause vibration in the structures close to the rocket motors (SEG 2021).

To address the operational issues associated with vibrations caused by high acoustic levels during launch, the launch facility adopts a water deluge system to attenuate high acoustic levels during the initial phase of the launch, which is expected to reduce the sound power by approximately 38 dB (Panda et al 2014 cited in SEG 2021).

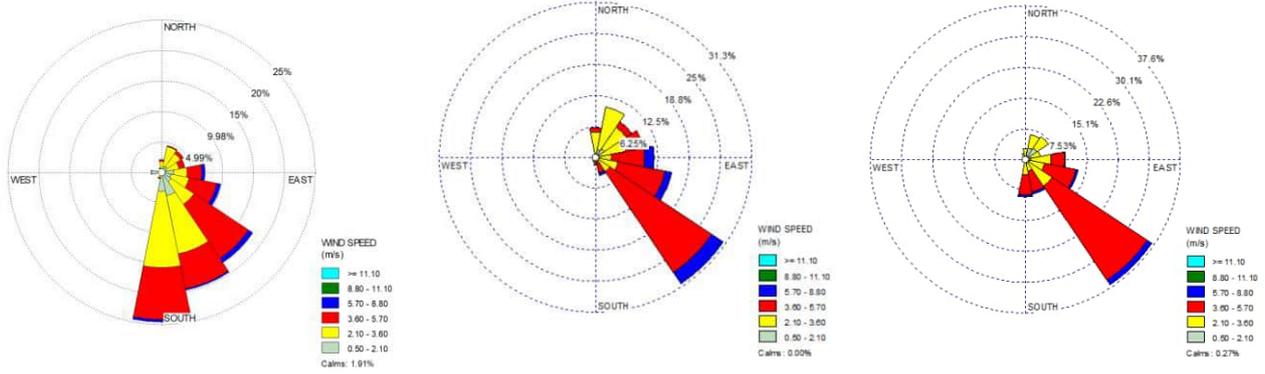
Sound power which may be transmissible to vibration at the launch pad location is expected to be attenuated by approximately 78 dB by the combined effects of a water deluge, and the transmissibility effects. The source sound power level from the rocket exhaust is expected to be approximately 180 dB, which may result in a modelled incident vibration of up to 102 dB (SEG 2021).

When considering the high acoustic noise levels at a macroscale, there will not be large areas of in-phase or resonance vibrations and consequently environmental effects from this effect would be limited. It is conservatively estimated PPV ground vibrations at 100 m from the launch pad would be below 10 mm/s (SEG 2021).

Ground vibrations during engine testing are expected to be negligible as the ignition pulse and air-borne acoustical energy will be directed through the air due to the horizontal arrangement of the engines.

4.5 Prevailing wind

The wind rose data show the frequency of occurrence of winds by direction and strength (Appendix A: Windrose for Site). The predominant wind direction during the year is from the north-east through to the south-east.



5 NOISE AND VIBRATION MONITORING PROGRAM

5.1 Background and context

Launch activities will result in a noise signature throughout the launch profile (on the ground and in flight) and the maximum noise level will be dependent on receptor location, prevailing meteorological and launch profiles.

Sound power level measurements from Hybrid Rocket Testing undertaken by SEG (2021) determined the source sound power level for the Gilmour Space Technologies hybrid motor of 179 dB(A). Subsequent noise modelling of these measurements predicts the following noise levels at the following sensitive receptors during launch events (SEG 2021) (also refer to Table 7):

- Saltwater creek, beach areas to the north of the launch site and the quarry is calculated to be exposed to high impact noise levels of 120 dB(A), 105 dB(A) and 115 dB(A) respectively.
- Abbott Point Coal Terminal is predicted to have low noise impact (based on the SEL) and a maximum noise level of 98 dB(A).
- The closest group of dwellings, to the east of the launch site is calculated to be exposed to a maximum noise level between 90 dB(A) and 94 dB(A). The SEL indicates the site would be exposed to a borderline low to moderate noise impact.
- The noise level at Queens Beach and Bowen is likely to be exposed to a maximum noise level of 78 dB(A) and the SEL indicates no adverse impacts.
- The noise level at R6 the school is likely to be exposed to a maximum noise level of 83 dB(A) and the SEL indicates borderline no adverse impacts to low adverse impacts.

Noise modelling indicates that ground-level sound levels will naturally dissipate as the launch vehicle reaches higher altitudes, with levels falling below 90 dB(A) approximately 42 seconds after launch (5-kilometre altitude). Whilst noises of the magnitudes in Table 7 are characterised as very loud, they will be infrequent and of very short duration (approximately 20 seconds of intense sound per launch) which will limit noise exposure and thus the level of impact to sensitive receptors.

Sonic booms are not expected to occur over any populated areas.

Table 7 Calculated launch noise levels at selected receptors (from SEG 2021)

Receptor	Calculated LA _{max} [dB(A)]	Calculated SEL [dB(A)]	Impact category
R1 – Dwelling	94	105	Low – Moderate
R2 – Dwelling	92	104	Low – Moderate
R3 – Dwelling	91	103	Low – Moderate
R4 – Dwelling	90	101	Low – Moderate
R5 – Dwelling	78	94	No impact
R6 – Dwelling	83	96	Nil – Low
R7 – Dwelling	78	94	No impact
R8 – Industrial – Abbot Point Bulk Coal	85	98	Low
R9 – Northern boundary and Saltwater Creek	120	124	High
R10 – Beach north of launch pad	104	112	High
R11 – Industrial – Quarry	115	119	High

During the launch / test there is a very short period when vibrations will affect the launch vehicle support structure and into the ground. Vibrations propagate in a predictable way and are not influenced by meteorological conditions. Vibrations are expected to be very low and only measurable above the background vibration near the launch / test site. Once the launch vehicle is in flight the potential to generate vibrations is virtually nil.

The range of calculated noise levels identified in the *Bowen Orbital Spaceport - Engine Test Facilities Report* (SEG 2023) are outlined in Table 8. The varying L_{Amax} and SEL values are dependent on engine type, daily use options and meteorological conditions.

All L_{Amax} and DNL values in Table 7 are derived from modelling the Big HRE engine noise which is tested for a maximum of 120 seconds. Assuming a constant sound output over 120 seconds, SEL will be 21 dB(A) higher at each sensitive receptor.

Table 8 Calculated test noise levels range at selected receptors (from SEG 2023)

Receptor	Calculated L_{Amax} [dB(A)]	Calculated DNL [dB(A)]	Estimated SEL [dB(A)]	Impact category
R1 – Dwelling	62	33	83	No impact
R2 – Dwelling	52	23	73	No impact
R3 – Dwelling	48	20	69	No impact
R4 – Dwelling	41	13	62	No impact
R5 – Dwelling	58	29	79	No impact
R6 – Dwelling	45	16	66	No impact
R7 – Dwelling	52	23	73	No impact
R9 – Northern boundary and Saltwater Creek	121	92	142	High
R10 – Beach north of launch pad	106	78	127	High
R11 – Industrial - Quarry	91	59	112	Moderate

5.2 Outline of Monitoring Program

The primary purpose of the monitoring program is to inform the noise and vibration levels occurring during launch, test, and ground preparation activities.

The monitoring program will focus on the zone likely to experience the highest noise levels during the launch / test and occupied by people. The locations selected represent sensitive receptors in that zone and commercial receptors with significant staff. Additionally, measurements close to the BOS facility will capture near field effects and the effects on foreshore and wetland areas.

The measures are designed to obtain noise and vibration profile during the launch / test. These measurements will be used by the Gilmore Space as an input into future launch / test profile planning and engine design. The measurements will be available to regulators to confirm that rocket launches / tests are meeting performance specifications and to assist with development planning in the Bowen Area. Furthermore, the measurements will be made available to the affected community so they may contextualise past noise events with future launch / test events.

The noise levels will be recorded on a second-by-second basis to permit correlation of the measured noise levels with rocket launch / test and to assist with rejection of noise events associated with non-launch / test noise sources. The L_{Amax} goal is particularly problematic since there are numerous noises in the environment that regularly exceed the acoustic quality objectives. For instance, bird calls located close to the microphone

recording device, car horns, gardening equipment are examples of common noise sources in the environment.

As vibration from launch / test activities are expected to be localised the monitoring of vibration will be restricted to the site only.

A meteorological station capable of monitoring wind speed and direction, humidity, temperature, and precipitation will be installed at MS05 (refer to Air Quality Management Plan) to contextualise noise and vibration results with consideration of meteorological data at the time of monitoring.

5.3 Applicable standards and guidelines

The following noise and vibration guidelines are relevant to this monitoring program:

- QLD Noise Measurement Manual (2020)
- AS IEC 61260.1:2019 Acoustics – Octave-band and fractional-octave-band-filters.
- Environmental Protection Act 1994, Queensland Government
- Standards Australia AS 1055:2018 Acoustics – Description and measurement of environmental noise.
- Standards Australia AS/NZS IEC61672.1:2019 Electroacoustics – Sound Level Meters – Specifications.
- Standards Australia AS IEC 61672.2:2019 Electroacoustics - Sound level meters - Pattern evaluation tests.
- Standards Australia AS 1633-1985 Acoustics – Glossary of terms and related symbols.
- Standards Australia AS 2659 – Guide to the use of sound measuring equipment.
- AS 2606–1993 Vibration and shock—vocabulary.
- AS 2670.1–2001 Evaluation of human exposure to whole-body vibration. Part 1: General requirements.
- AS 2670.2–1990 Evaluation of human exposure to whole body vibration. Part 2: Continuous and shock induced vibration in buildings (1 to 80 Hz).
- AS 2670.3–1990 Evaluation of human exposure to whole body vibration. Part 3: Evaluation of exposure to whole body x axis vertical vibration in the frequency range 0.1 to 0.63 Hz.
- AS 2775–2004 Mechanical vibration and shock—Mechanical mounting of accelerometers
- AS 3658–1989 Vibration and shock—Mechanical vibration and shock affecting humans— vocabulary.
- BS 6472–1984 Evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz).
- BS 6472–1992 Guide to evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz).
- BS 7482–1991 Parts 1 and 3: Instrumentation for the measurement of vibration exposure of human beings.

5.4 Acoustic quality objectives

The acoustic quality objectives as detailed in the Development Permit are presented in Table 9. The analysis of noise levels obtained at the locations and frequencies outlined in the following sections will be undertaken to ascertain compliance or otherwise of Gilmour’s operations with these relevant limits.

The units of measurement conditioned in the Development Permit and their purpose are outlined below:

- L_{Amax} is the maximum value (max sub-index) A-weighted (A sub-index) sound pressure level reached during a measurement period. The measurement is expressed in dB(A) and considered an appropriate

measurement for community noise assessment of a single event such as a rocket launch (SEG 2021). L_{Amax} is typically used to assess the level of interference from a noise event (i.e. conversation, TV or radio listening, sleep etc.). Although the L_{Amax} provides some measure of a noise event, it does not capture the total event, because it does not incorporate the period of the event (SEG 2021).

- Sound exposure level (LAE or SEL-a) is a more complete noise metric which includes the sound level and the duration of exposure and is therefore a suitable measure for noise events that vary in intensity over time. SEL provides an overall impact of noise event and allows sound exposures of different duration to be compared in terms of total acoustic energy for transient noise (e.g. aircraft flyover).
- Day-Night Average Sound Level (DNL) represents an average of the sound levels from a noise source, along with all other noise sources at a location, over a 24-hour period.

Table 9 Noise and vibration objectives

Noise level dB(A) measured as:	Sensitive place	Commercial place
L_{Amax}	96	115
L_{AE} (SEL)	110	115
DNL	70	80
Vibration	10 mm/s	15 mm/s

5.5 Monitoring locations and frequency

The proposed noise and vibration monitoring locations are included in Table 10 and Figure 6.

Noise and vibration monitoring will be undertaken over a period of 48-hours around launch / test events (24 hours prior and 24 hours following). Noise recording intervals will consist of second-by-second recordings of L_{Aeq} (converted to SEL) and L_{Amax} over the 48-hour period. Vibration recording intervals will be second-by-second recordings in mm/s over the 48-hour period.

It is proposed to provide noise monitoring at R9 for all launch activities over the life of the project and at R1 and R8 for the first 2 launches. R8 is already a substantial source of noise, and it is considered noise monitoring at this location will be significantly influenced by intermittent rail and coal handling noise forming the primary component of the noise profile in this area.

Vibration monitoring will be undertaken at R9 for the first two launches. Since the attenuation of vibration is predictable and unlikely to vary substantially between launch events, monitoring shall be discontinued at one or both sites if vibration from launch activities is not detected during the first two launch events.

Table 10 Noise monitoring locations for launch and test facility

Receptor ID	Easting	Northing	Description	Noise monitoring	Vibration monitoring
R01	619066	7790126	Sensitive receptor, Dwelling	✓	✓
R08	613417	7798848	Industrial Use, Abbott Point Coal Terminal	✓	
R09	616749	7793118	Environmental receptor (Saltwater Creek) and northern property boundary	✓	✓



LEGEND

- ▲ Launch Pad
- NVMP Monitoring Sites
- BOS Site
- Subject allotments
- ⊢⊢⊢ Railway line
- ⊢⊢⊢ Private / Restricted Road

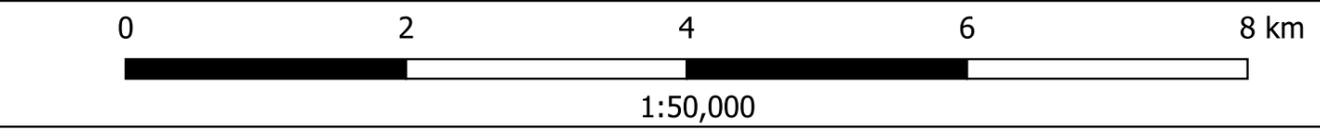


CLIENT: GILMOUR SPACE TECHNOLOGIES

FIGURE 6: NVMP MONITORING SITES

Credits:
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DOCUMENT: 202108-3_NVMP monitoring locations
 DATE: 01/10/2022 AUTHOR: A.Fitzaerald



Coordinate system: GDA94 / MGA zone 55 EPSG:28355

5.6 Monitoring equipment

Noise monitoring data will be collected using a Type 1 sound monitoring device (i.e. Joey 139 or similar). The measurements will be recorded on a second-by-second basis to measure the L_{Aeq} (60 second running) L_{Aeq} and L_{Amax} in each one second period. The SEL is calculated from the L_{Aeq} after the rocket launch / test is complete. The sound monitoring equipment is to be permanently deployed and shall be provided with high quality outdoor protection to avoid water ingress onto the microphone cartridge. All systems (temporary and permanent) shall have effective windscreens. Ideally, the noise loggers will provide the data in real-time to the cloud. The logger will be positioned at least 20 m from any vertical (wall) or diagonal (roof) reflecting surface.

It is recommended the sound level meter be configured to record the 60 second running L_{Aeq} (60 seconds), i.e. each second the L_{Aeq} from the previous 60 seconds is calculated. Since the noise from a rocket launch lasts for approximately 30 seconds and the noise from the rocket launch is much greater than the ambient noise, then the SEL is the L_{Aeq} (60 second) plus $10 \cdot \log(60)$ (+17.8 dB). This approach would not be valid if the ambient noise is within 20 decibels of the maximum noise from the launch.

The vibration monitoring equipment is to comprise a Texcel GTM Ground Vibration Monitor consisting of a highly sensitive geophone and a data recording system.. Performance characteristics for the measurement instrumentation should meet the requirements set out in BS 6841 and BS 7482 Parts 1 and 3. A minimum dynamic range of 40 dB is assumed. The geophone transducer will be firmly mounted to ensure the ground vibration is accurately measured, See Australian Standard AS 2775–2004 Mechanical vibration and shock—Mechanical mounting of accelerometers.

To ensure data quality and accuracy all monitoring equipment shall be deployed at the proposed sites by a person with experience in the calibration and use of the monitoring equipment specified or under instruction by a person with that experience.

5.7 Monitoring program summary

Presented in Table 11 is a summary of the BOS NVMP.

Table 11 Summary of noise and vibration monitoring program

Monitoring Location	Monitoring Equipment	Monitoring Equipment Code	Analysis Frequency	Analysis Suite
R1	Type 1 noise logger	N01	24 hours preceding and following all launch events, including the launch event	Second-by-second measurements of L_{Aeq} (converted to SEL) and L_{Amax}
R8	Type 1 noise logger	N02	24 hours preceding and following the first two launch events	Second-by-second measurements of L_{Aeq} (converted to SEL) and L_{Amax}
R9	Type 1 noise logger	N03	24 hours preceding and following all test and launch events, including the launch event	Second-by-second measurements of L_{Aeq} (converted to SEL) and L_{Amax}
	Geophone	V02	24 hours preceding and following all launch events, including the launch event	Minimum second-by-second measurements vibration in mm/s

6 REPORTING

6.1 Acoustic quality monitoring event summaries

Acoustic data will be evaluated after each monitoring event to confirm that modelled data accurately represents the on ground acoustic data and meets the limits stipulated in the development conditions. The analytical data will be compiled in tables and the quality assurance and quality control (QA/QC) checks undertaken. If the QA/QC checks reveal that the data has been affected in any way, the effects will be summarised. Each monitoring event will be summarised in a technical memorandum for future reference.

Provided that instrumentation has been deployed in accordance with the requirements of Section 5.4, noise and vibration datasets from deployed instruments may be readily downloaded by Gilmour personnel and provided for analysis by a suitably qualified noise and vibration engineer. Most of the time, reporting can be undertaken by Gilmour engineering staff. Occasionally there may be events requiring additional analysis (i.e. events that fall outside the normal parameters, such as very long duration launch events or noisy ambient levels at the time of launch).

The following information will be summarised as a minimum:

- Date(s) of the monitoring event
- Brief methodology of what field work was conducted and how (e.g. in accordance with this NVMP)
- Include a brief description of any deviations from the NVMP, standards or guidelines
- Table of what was analysed and the results of the analysis
- Summary of any QA/QC issues and consequences for the data collected
- Summary of any site conditions or other relevant issues that may influence the data throughout the monitoring period

6.2 Acoustic quality monitoring report

The annual report will include as a minimum, but is not limited to, the following:

An introduction stating the objectives of the monitoring program and the scope of work carried out during the reporting period.

- A brief discussion of the monitoring network
- A brief description of the methodologies used - referring to relevant standards, guidelines, monitoring plans, where necessary
- Discussion of any deviation to the DVMP or changes to monitoring since the previous annual report
- The results of the air quality sampling

6.3 Trigger level exceedance reporting

Exceedance of acoustic quality limits at monitored residential dwellings or commercial places will be reviewed by the site manager to determine whether the exceedance event was due to Gilmore Space or external sources. The prevailing wind direction will also be reviewed to assist with the determination. If an exceedance event due to Gilmore Space operations has been established as likely, the data shall be referred to a noise and vibration expert to determine whether any sensitive receptor is likely to have been adversely affected. Should the noise and vibration expert consider that an exceedance event has occurred at

a sensitive receptor then the results of the investigation will consist of a report to the reviewing authority. Further investigations should consider the following as required:

- the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems
- the qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to sleep, study or learn and/or be involved in recreation including relaxation and conversation
- the qualities of the acoustic environment that are conducive to protecting the amenity of the community

7 ACOUSTIC QUALITY AND VIBRATION MANAGEMENT

To ensure ongoing compliance with noise and vibration objectives detailed in Table 9, a number of management measures are proposed. The measures cited below are primarily adaptive, to be implemented where it has been identified through monitoring and independent noise assessment that regular exceedances of the noise criteria occur due to launch activities and affected landowners requests such measures. Where required the proposed measures may include one or more of the following:

- Refinement of on-site noise mitigation measures and operating procedures, where it is identified through monitoring that prevailing weather conditions are impacting on capacity to comply with noise criteria
- Discussions with relevant landowners to assess concerns
- Development of private noise agreements, where acceptable to the impacted landholder
- Installation of feasible and reasonable acoustic mitigation at receivers (which may include window glazing, insulation and/or air conditioning)
- Launch / test activities to minimise, where possible, noise levels at sensitive receptors by considering the prevailing meteorological conditions via an onsite weather station and forecasts.
- Rocket launch / test windows are communicated to nearby sensitive receptors and to the community generally via news releases, social media, and direct contact with neighbours. It is expected the launch will generate significant interest in the community. Since the event will be notified and the expected noise levels are similar in magnitude to other noises already experienced in areas throughout Queensland, it is expected the community will not be adversely impacted by the introduction launch operations and the noise impacts would be acceptable.
- To address the operational issues associated with vibration and high acoustic levels during launch, the site will be adopting a water deluge system to attenuate high acoustic levels during the initial phase of the launch. The suppression system is highly effective at reducing these effects while the launch vehicle exhaust is incident on the pad and is expected to reduce the sound power by approximately 38 dB.
- To address operational issues associated with vibration and high acoustic levels during test activities block walls are constructed adjacent to the primary engine stand. Additionally, test pad 1 contains a container wall (two rows of 40 ft containers) and a sandbag wall (three meters tall by 20 m long). The test pads firing direction has been positioned to reduce noise related impacts to residential and commercial sensitive receptors.

Appendix D Stormwater Management Plan





Stormwater Management Plan Report

Gilmour Orbital Space Project Bowen

Reference No: GSP-001

Prepared for Terra Solutions Pty Ltd

23 September 2022

Document Control

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Table of Contents

1	Introduction	5
1.1	Purpose of this Report	5
1.2	Scope of Works	5
1.3	Information and Data	5
1.4	Existing Site Description (Pre-Development)	6
1.5	As- Constructed BOS Site Description (Post-Development)	6
2	Hydrologic and Hydraulic Assessment	8
2.1	DRAINS Modelling	8
2.1.1	DRAINS Model Rainfall Inputs	8
2.1.2	Hydrological Model Inputs	8
2.1.2.1	Storage Routing Hydrological Model	8
2.1.2.2	Horton/ ILSAX Hydrological Model	9
2.1.3	Catchments	9
2.1.3.1	Pre-Development Catchment Assessment	9
2.1.3.2	Post-Development Catchment Assessment	9
2.1.4	Cross Drainage	12
2.2	DRAINS Assessment and Results	12
2.2.1	Modelling Approach	12
2.2.2	DRAINS Modelling Results and Discussion	12
2.3	Lawful Point of Discharge	14
2.4	Impacts to the Newlands rail System Corridor	14
2.5	Flow Gauging Station	14
2.6	Stormwater Monitoring Sites	15
2.6.1	Monitoring program methodology	16
2.6.1.1	Sampling methods	16
2.6.1.2	Locations	16
2.6.1.3	Frequency and duration	16
2.6.1.4	Parameters	16
2.6.2	Stormwater infrastructure inspections	16
3	Stormwater Quality Assessment	17
3.1	MUSICX Modelling	17
3.1.1	MUSICX Model Inputs	17
3.1.1.1	Climate Data	17
3.1.1.2	Catchments	17
3.1.1.3	Source Nodes	17
3.1.2	MUSICX Layout Schematics	19
3.1.2.1	Pre-development Schematic	19
3.1.2.2	Post-development Schematic	19
3.1.3	Treatment Nodes	19
3.1.3.1	Vegetated Swales	19
3.1.3.2	Rainwater Tanks	21
3.1.4	MUSIC Results Discussion and Comparison	21

Appendices

Appendix A	Assessment of Performance Outcomes	22
Appendix B	DRAINS Modelling Results	23
Appendix C	MUSIC Modelling Results	24

List of Tables

Table 1: BoM rainfall depth data	8
Table 2: Pre-development catchment characteristics	9
Table 3: Post-development catchment characteristics – external catchment	9
Table 4: Post-development catchment characteristics – BOS development footprint	9
Table 5: Peak flow comparisons for pre-development and post-development scenarios	12
Table 6: Stormwater monitoring sites details.....	15
Table 7: MUSICX vegetated swale inputs	19
Table 8: MUSICX mean annual load results	21

List of Figures

Figure 1: Existing Site with BOS launch facility and access road infrastructure overlay.....	7
Figure 2: Pre-Development Catchments Plan.....	10
Figure 3: Post-Development Catchments Plan	11
Figure 4: Pre-development Catchment2, 1% AEP hydrograph	13
Figure 5: Post-development Catchment 2, 1% AEP hydrographs	13
Figure 6: Flow gauging station location (Station no. 121004A)	15
Figure 7: Launch facility area MUSICX catchments and infrastructure layout	18
Figure 8: MUSICX schematic layout for the pre-development scenario.....	19
Figure 9: MUSICX model post-development schematic layout	20

1 Introduction

Terra Solutions has engaged Civil IQ to prepare a Stormwater Management Plan (SWMP) to accompany Terra Solutions' Overarching Environmental Management Plan (OEMP) for the Bowen Orbital Spaceport (BOS) project. The project specific OEMP is being prepared to satisfy conditions set by the Office of the Coordinator-General (OCG) in its Decision Notice issued to Milford Planning (Ref AP2021/007) for a material change of use for a high impact industry (launch facility) within the Abbot Point State Development Area (SDA).

1.1 Purpose of this Report

The purpose of this report is to address all operational phase requirements for stormwater quantity and quality in a SWMP, specifically in reference to the requirements of the OCG Decision Notice Condition 12.1 Environmental Management Plan, and specifically Part (f) Stormwater Management. Specifically, the assessment is to be undertaken relative to As-Constructed works completed to date, for determination of stormwater quality and quantity impacts relative to the existing scenario.

1.2 Scope of Works

The scope of works for the SWMP is defined by the OCG Decision Notice, Condition 12.1 – Environmental Management Plan, Part (f) – Stormwater Management, which is further referenced to Enclosure 6 of the Decision Notice. The specific operational phase conditions of Enclosure 6 required to be addressed in the SWMP are summarised below:

- Conditions (f) to (m) – address numerous conditions relative to assessment of changes to the flow regime and water quality impacts associated with the as-constructed works
- Condition (n) – address the requirements of the State Development Access Provisions (SDAP) Module 18.2 'Stormwater and Drainage Impacts on State Transport Infrastructure State Transport Infrastructure Code'. The Performance Outcomes and Acceptable Outcomes provided in Table 18.2.1 of this document is specifically in reference to the existing railway. The purpose of Section 18.2 is to ensure that stormwater events, including peak discharges, flood levels, frequency/ duration of flooding, flow velocities, water quality, ponding, sedimentation and scour effects associated with development are minimised and managed to avoid creating any adverse impacts on a state transport corridor
- Condition (o) – Demonstrate that the management of stormwater, both quality and quantity, post development achieves a no worsening impact relative to the pre-development condition, for events up to the 1% Annual Exceedance Probability (AEP). This clause also references impacts to the railway, which is similar to the requirements of Item (n) above
- Condition (p) – Undertake hydraulic and hydrological analysis to determine:
 - Design flood peak discharges for the site and surrounding prior to development (pre-development) for the 50%, 20%, 10%, 5%, 2% and 1% Annual Exceedance Probability (AEP) storm events
 - Design flood peak discharges for the site after the development (post- development) for the 50%, 20%, 10%, 5%, 2% and 1% Annual Exceedance Probability (AEP) storm events
- Condition (q) – A series of conditions are required to be addressed inclusive of:
 - Identify all relevant legal points of discharge
 - Identification of overland flowpaths, an assessment of maintaining conveyance
 - Flood storage is maintained on the site

Conditions specifically referencing SDAP provisions are also included throughout these conditions, which is repetition of Condition (n) requirements, and have not been repeated. A comprehensive response and referencing to where this report addresses the requirements of these conditions is provided in Appendix A.

1.3 Information and Data

The following information and data were provided by Gilmour Space for preparation of the SWMP:

- SDA application - Decision Notice – Application Reference No: AP2021/007
- Bowen Orbital Space Port, Bulk Earthworks, Access Road and Stormwater Drawings, (i³ Consulting, February 2022) – SDA Approval Reference: AP2021/007
- Site Classifications and Geotechnical Recommendations Report, Ref: CQ20875. (CQ Soil Testing, April 2022)

- As- Constructed Survey, Bowen Orbital Spaceport, Access Road and Pad, Reference: 401750. (Veris, 6 September 2022). Dwg file only.
- Geoscience Australia elevation and depth data – Sourced 09/08/2022 by Civil IQ
- Unmanned Aerial Vehicle (UAV) As Built footage files dated 29 August 2022.

1.4 Existing Site Description (Pre-Development)

The Bowen Orbital Space (BOS) launch facility and access road is located approximately 15 km north-west of Bowen, as shown in Figure 1, within the Whitsunday Local Government Area (LGA). The footprint of the project is located primarily on Lot 10 SP295408, with the western extent of the access road located on Lot 9 SP295408. An existing quarry on Lot 44 HR 1599 is located immediately north of the access road. The footprint of the project is located on flat terrain, with the previous land use predominantly consisting of cattle grazing. The access road aligns with an existing track for a portion of its length. To the south the existing terrain consists of largely forested catchment and steep slopes for approximately 1 km, with one Stream Order 1 watercourse, and associated gullies, intersecting the proposed project footprint. To the north, downstream of the project site, the terrain grades towards Saltwater Creek, a Stream Order 3 watercourse.

1.5 As- Constructed BOS Site Description (Post-Development)

The footprint of the BOS launch facility and access road is shown in Figure 1. The extent of the works was determined through review of As-Constructed survey data and review of UAV footage. The access road connects to the existing quarry access road at its western extent. The access road is approximately 1.16 km and has three associated culverted crossings over its length. The road has been constructed as an unsealed pavement for its length. At the eastern extent, the access road connects to the launch facility infrastructure pad. The launch facility is fully impervious, consisting of building and associated civil infrastructure, and unsealed gravel material for the remainder of the surface area.



Figure 1: Existing Site with BOS launch facility and access road infrastructure overlay

2 Hydrologic and Hydraulic Assessment

A hydrologic and hydraulic assessment has been undertaken to address the stormwater quantity requirements specified in the project OCG Condition 12.1, Enclosure 6. The key driver for assessment is to determine whether the post development scenario achieves a no worsening impact relative to the pre-development scenario.

2.1 DRAINS Modelling

DRAINS is a leading practice Australian industry rainfall runoff routing model which incorporates the latest requirements of Australian Rainfall and Runoff (ARR) 2019 guidelines. DRAINS hydrologic and hydraulic modelling has been undertaken for this project for comparison of discharges for the pre-development and post-development scenarios, in accordance with Conditions requirements.

ARR 2019 procedures incorporated into the DRAINS model utilises sets of ensembles of rainfall patterns and recommends ensembles of 10 patterns over single design storms. In accordance with ARR 2019, results for storm events in DRAINS references a median storm in critical AEP ensembles.

2.1.1 DRAINS Model Rainfall Inputs

Rainfall depth data was extracted from the Bureau of Meteorology (BoM) website as shown in Table 1. The data was extracted for the following coordinates representing the project site:

- -19.96 degrees (S) Latitude
- 148.11 degrees (E) Longitude

Table 1: BoM rainfall depth data

Duration	50% AEP	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
1 min	2.87	3.89	4.53	5.12	5.86	6.39
2 min	5.1	6.87	7.95	8.92	10.1	11
3 min	7.13	9.63	11.2	12.6	14.3	15.6
4 min	8.98	12.2	14.1	16	18.2	19.8
5 min	10.7	14.5	16.9	19.1	21.8	23.7
10 min	17.6	23.8	27.8	31.5	36	39.2
15 min	22.7	30.8	35.9	40.6	46.4	50.6
20 min	26.9	36.4	42.4	47.9	54.7	59.6
25 min	30.4	41.1	47.9	54.1	61.8	67.3
30 min	33.4	45.2	52.6	59.5	67.9	73.9
45 min	40.6	55.1	64.2	72.6	83	90.5
1 hour	46.1	62.8	73.3	83.1	95.3	104
1.5 hour	54.4	74.7	87.8	100	115	127
2 hour	60.6	84.1	99.4	114	132	146
3 hour	70.2	99	118	136	160	178
4.5 hour	80.8	116	140	164	195	219
6 hour	89.1	130	159	187	224	253

Temporal pattern data was extracted from the ARR Data Hub.

2.1.2 Hydrological Model Inputs

Two hydrological models within DRAINS have been utilised for the project due to the variance in catchment characteristics associated with the external natural undeveloped catchments, and the impervious nature of the BOS footprint.

2.1.2.1 Storage Routing Hydrological Model

The storage routing hydrological model was setup within DRAINS for the external undeveloped largely forested catchment areas. The XP-RAFTS hydrological model type was selected, due to its applicability for rural catchments

,with Initial Loss (IL) and Continuing Loss (CL) data sourced from the ARR Data Hub, for the project location coordinates discussed in Section 2.1.1. The XP-RAFTS hydrological model inputs are:

- IL – 60 mm
- CL – 3.6 mm/hr

2.1.1.2 Horton/ ILSAX Hydrological Model

The ILSAX/ Horton hydrological model was setup within DRAINS for the post-development scenario impervious areas associated with the BOS As-Constructed infrastructure works. The ILSAX/ Horton hydrological model type was selected due to its applicability for predominantly impervious areas in the urban environment. Inputs applicable to this model are:

- Impervious area depression storage – 1 mm
- Supplementary area depression storage – 1 mm
- Pervious area depression storage – 5 mm

2.1.3 Catchments

The pre-development and post-development catchment areas associated with the BOS project footprint are shown in Figure 2 and Figure 3.

2.1.3.1 Pre-Development Catchment Assessment

Four distinct pre-development catchment areas are located to the south of the site as shown in Figure 2. The catchments include the BOS launch facility and access road footprint extents as undeveloped to replicate the existing scenario before construction. DRAINS model catchment inputs are summarised in Table 2.

Table 2: Pre-development catchment characteristics

DRAINS Catchment Inputs	Pre-Development Catchment				
	1	2-1	2-2	3	4
Area (Ha)	16.9	28.8	32.1	7.38	9.8
Impervious Area (%)	0	0	0	0	0
Sub-Catchment Slope (%)	13.6	30.0	2.0	9.3	3.2
Manning's n	0.08	0.08	0.08	0.08	0.08

2.1.3.2 Post-Development Catchment Assessment

The post-development catchment areas are shown in Figure 3. The external catchments exclude the BOS launch facility and access road footprint extents. DRAINS model catchment inputs are summarised in Table 3.

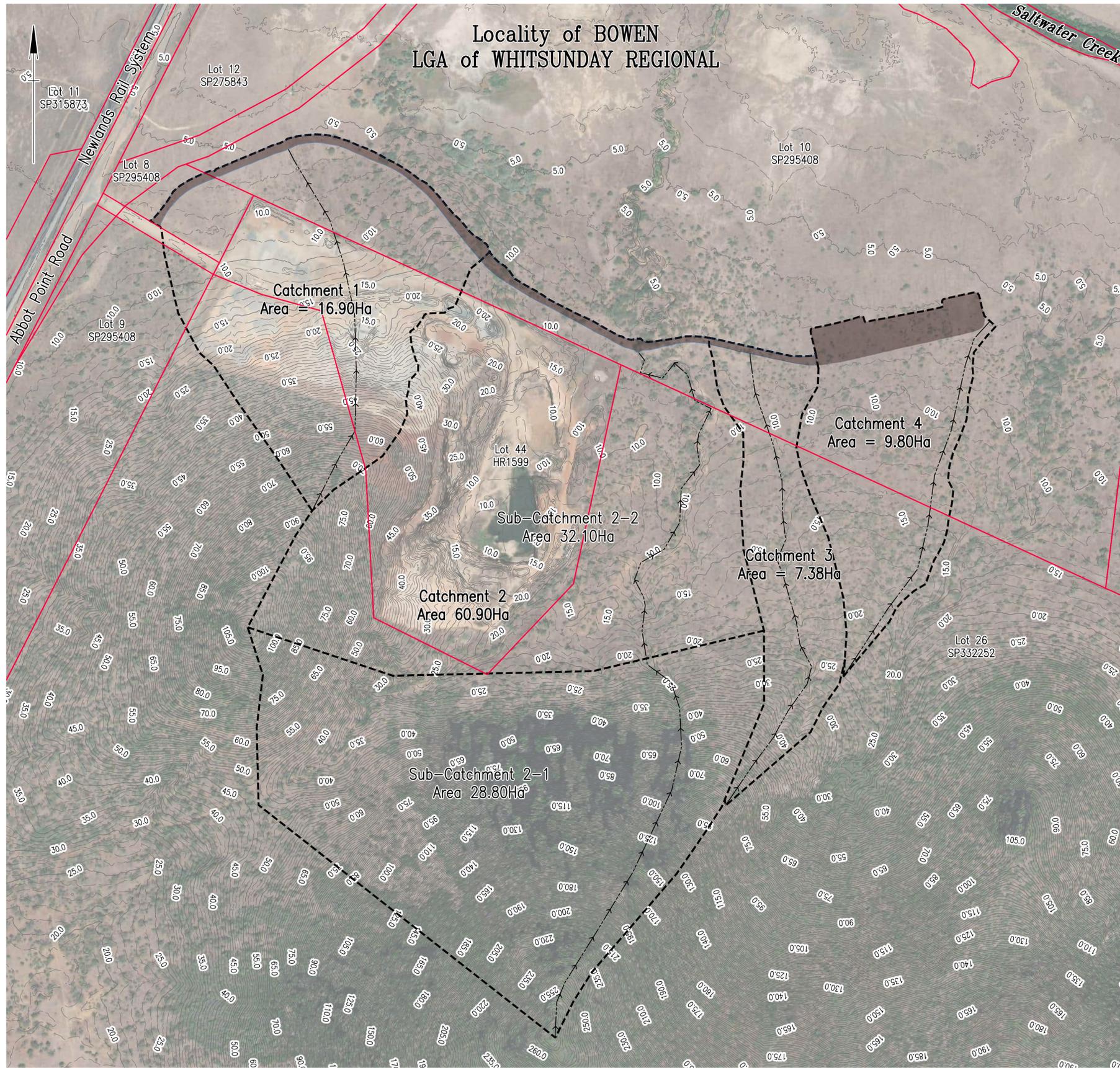
Table 3: Post-development catchment characteristics – external catchment

DRAINS Catchment Inputs	Post-Development Catchment - External				
	1	2-1	2-2	3	4
Area (Ha)	16.4	28.8	31.8	7.27	8.62
Impervious Area (%)	0	0	0	0	0
Sub-Catchment Slope (%)	13.6	30.0	2.0	9.3	3.2
Manning's n	0.08	0.08	0.08	0.08	0.08

The BOS launch facility and access road footprint extents have been modelled as 100% impervious, with DRAINS model catchment inputs summarised in Table 4.

Table 4: Post-development catchment characteristics – BOS development footprint

DRAINS Catchment Inputs	Post-Development Catchment - BOS footprint			
	Road 1	Road 2	Road 3	BOS Pad
Area (Ha)	0.48	0.30	0.12	1.18
Impervious Area (%)	100	100	100	100
Time of Concentration (min)	5.0	5.0	5.0	5.0

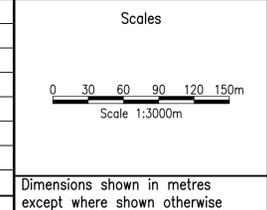


LEGEND:

	Existing Surface Contour (Major)
	Existing Surface Contour (Minor)
	Existing Property Boundary
	Existing Catchment Areas
	Existing Catchment Flow Path
	Development Area Footprint

Last Modified: 15 Sep 2022 3:17pm

Rev	Revision Description	Certification	Date



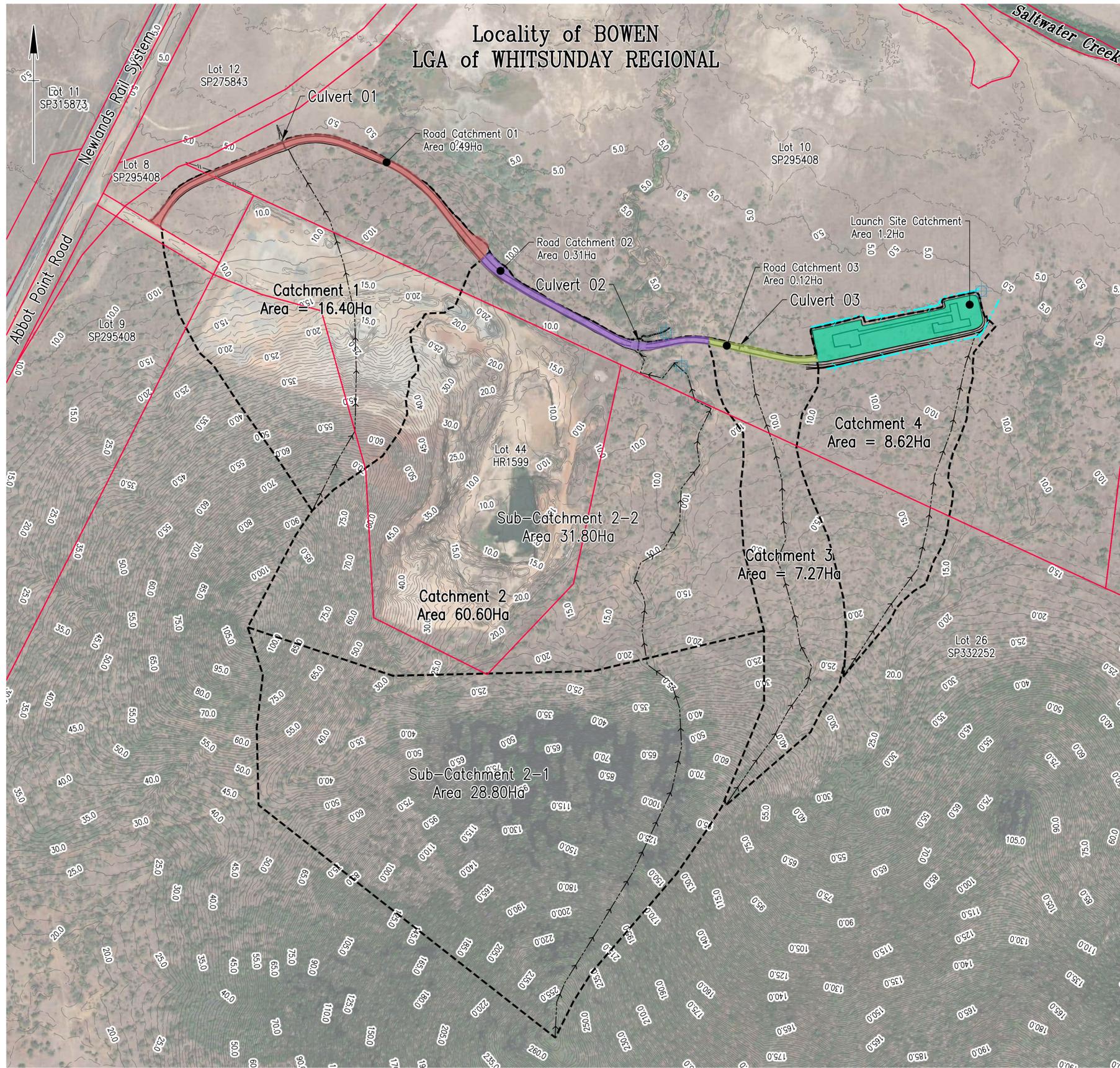
Client

GILMOUR SPACE

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Title		GILMOUR SPACE BOWEN ORBITAL SPACE PORT STORMWATER MANAGEMENT FIGURE 2 – PRE-DEVELOPMENT CATCHMENTS PLAN			
Drawn M.SMITH	ENGINEERING CERTIFICATION (RPEQ)				
	ENG. AREA	NAME	SIGNATURE	NO.	DATE
Designed P.GIBSON					

Job No.	GSP-001
Drawing No.	FIG-02
Revision	
Series Number	1 OF 3

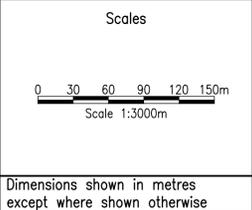


LEGEND:

- 105.0— Existing Surface Contour (Major)
- - - Existing Surface Contour (Minor)
- Existing Property Boundary
- - - Existing Catchment Areas
- - - Existing Catchment Flow Path
- Existing Vegetated Swale (Denotes Flow Direction)
- - - Existing Access Road Culverts
- ⊕ Stormwater Monitoring Points
- Road Catchment 01
- Road Catchment 02
- Road Catchment 03
- Existing Launch Facility

Last Modified: 1: Sep 20, 2022 - 7:58am

Rev	Revision Description	Certification	Date



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Title		GILMOUR SPACE BOWEN ORBITAL SPACE PORT STORMWATER MANAGEMENT FIGURE 3 – POST-DEVELOPMENT CATCHMENTS PLAN			
Drawn	M.SMITH	ENGINEERING CERTIFICATION (RPEQ)			
Designed	P.GIBSON	ENG. AREA	NAME	SIGNATURE	NO. DATE

Job No.	GSP-001
Drawing No.	FIG-03
Revision	
Series Number	2 OF 3

2.1.4 Cross Drainage

Cross drainage infrastructure details were referenced from the As-Constructed drawings for input into DRAINS as summarised below:

- Catchment 1 – 1200 mm x 300 mm Reinforced Concrete Box Culvert (RCBC)
- Catchment 2 – 2400 mm x 900 mm RCBC
- Catchment 3 – 2x 375 mm diameter Reinforced Concrete Pipe (RCP)

2.2 DRAINS Assessment and Results

DRAINS models were developed for the pre-development and post-development scenarios to determine the critical median flows for the 50%, 20%, 10%, 5%, 2% and 1% AEP storm events

2.2.1 Modelling Approach

The modelling approach adopted to demonstrate compliance with the OCG Condition 12.1, Enclosure 6 requirements was to prepare pre-development and post-development DRAINS models. The DRAINS models have been developed to enable comparison of pre-development and post-development scenarios, for assessment of hydraulic impacts throughout the catchments, and as associated with discharge to the receiving environment to Saltwater Creek.

In reference to Figure 2, the pre-development DRAINS model catchments incorporate the footprint of the BOS launch facility and access road extents in its natural state prior to construction works.

In reference to Figure 3, the post-development DRAINS model catchments allow for the footprint of the BOS launch facility and access road extents, to represent the site in its developed state with 100% impervious catchments.

Catchments are delineated to replace the relative sections in comparison to the pre-development DRAINS.

Both models have been setup with a combined outflow node representing overall discharge to the received environment at Saltwater Creek. This is the key comparison and reporting location in the DRAINS model used for this assessment. The pre-development and post-development DRAINS model layouts are provided in Appendix B.

2.2.2 DRAINS Modelling Results and Discussion

The DRAINS modelling results for peak flows at the combined outflow node for the pre-development and post-development scenarios are provided in Table 5.

Table 5: Peak flow comparisons for pre-development and post-development scenarios

Storm Event	Peak Flows Critical Median Storm Flow Ensembles (m ³ /s)	
	Pre-Development Scenario	Post-Development Scenario
50% AEP	5.7	5.7
20% AEP	9.8	9.7
10% AEP	13.1	12.6
5% AEP	16.9	16.7
2% AEP	21.0	20.7
1% AEP	23.8	23.4

As an overall summary of the peak flows' comparison, the post-development flows are equal to or slightly less than the pre-development peak flows, demonstrating a no worsening impact associated with the project development footprint. Detailed DRAINS results for all storm events are provided in Appendix B.

A comparison of the catchment flow hydrographs results, between the pre-development and post-development scenarios, is key to understanding the results. Catchment 2 DRAINS hydrograph results for the 1% AEP storm event have been compared for the assessment below.

Figure 4 shows the pre-development flow hydrograph for Catchment 2 for the 1% AEP, resulting in a peak flow of 14.2 m³/s from the external catchment of 61.0 Ha. Figure 5 shows the post-development flow hydrographs for the significantly larger external catchment, with a slightly reduced catchment compared to pre-development of 60.6 Ha. The BOS access road catchment is 0.3 Ha, with a sharp peaky hydrograph resulting in a peak flow of 0.228 m³/s. Peak flows from the impervious access road are significant lower and discharge from the site substantially earlier than the external catchment. This is demonstrated by the resulting hydrograph with a peak flow of 14.3 m³/s, showing there is

no significant impact on peak flows due to order of magnitude differences in catchment size and time of concentration.

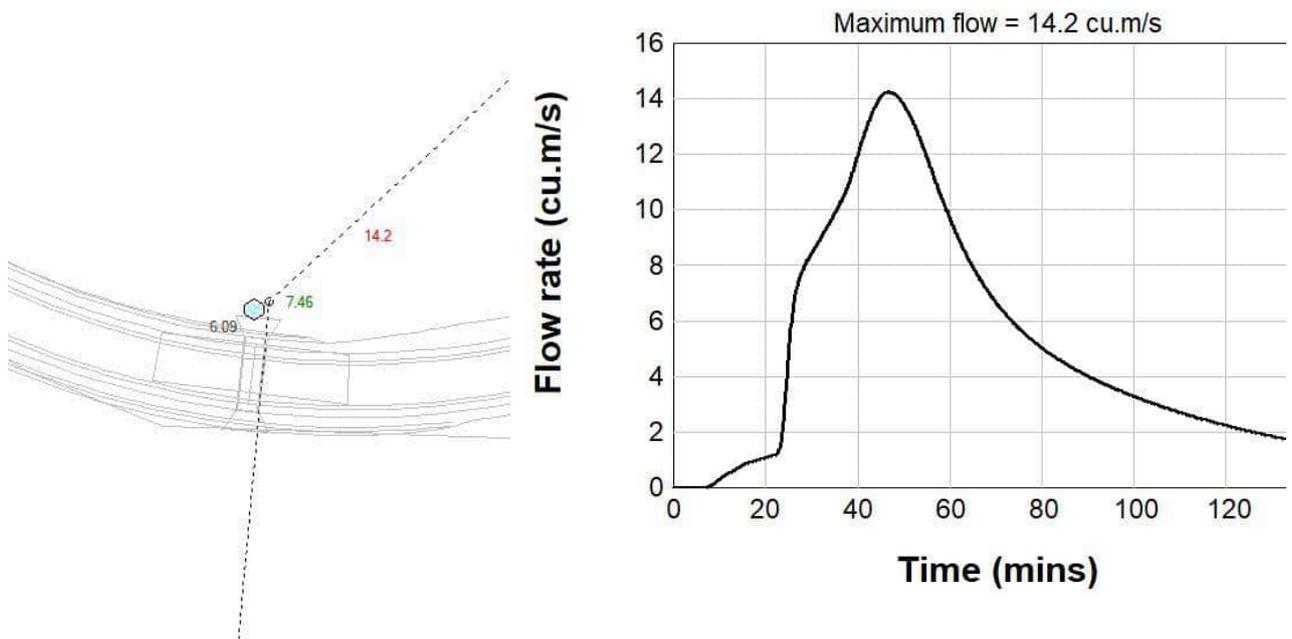


Figure 4: Pre-development Catchment 2, 1% AEP hydrograph

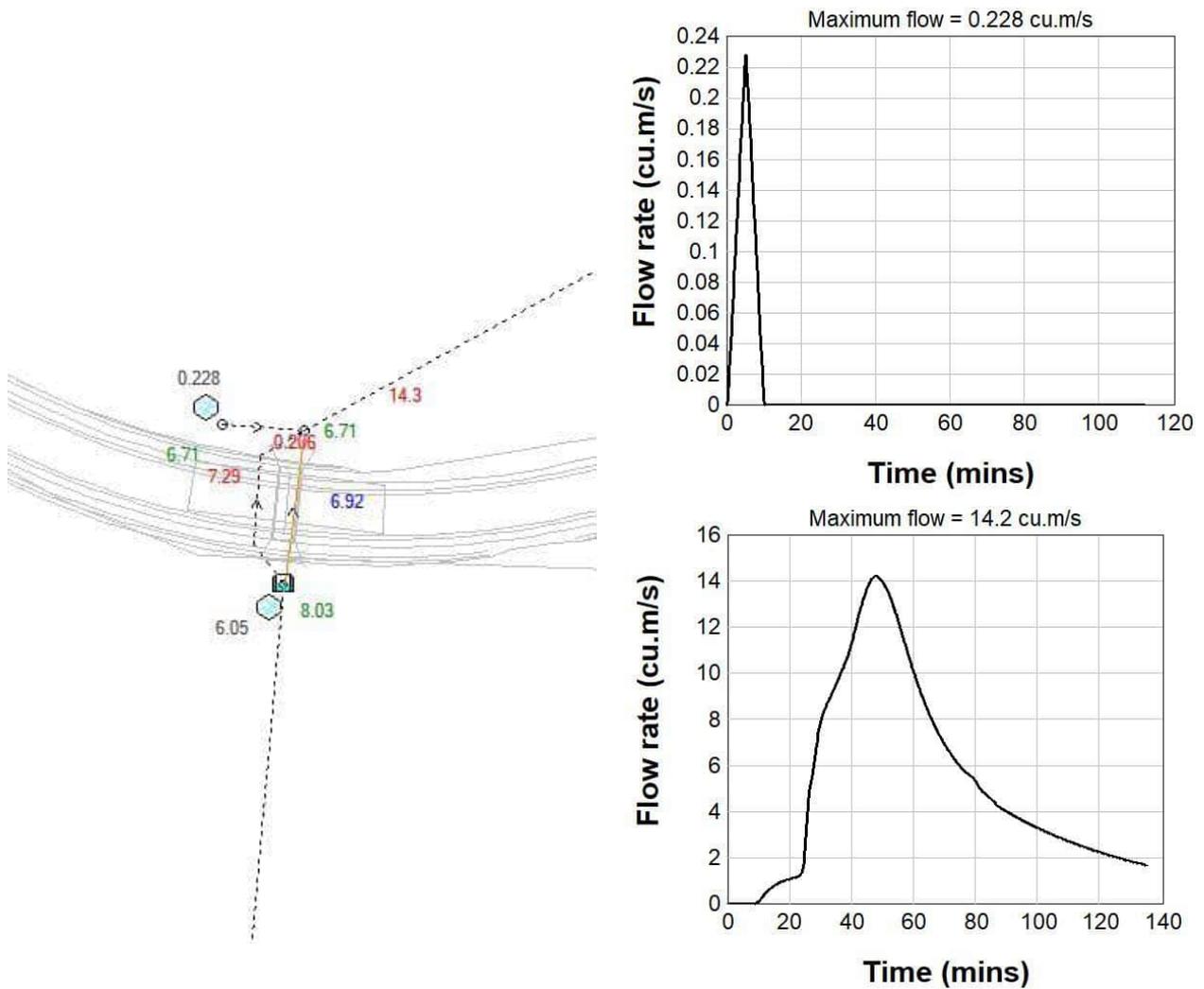


Figure 5: Post-development Catchment 2, 1% AEP hydrographs

This comparison is similar to what is occurring in all other catchments associated with the project. The differences in peak flows is a result of the routing of flows through the DRAINS model network and the time of concentration associated with retardance of surface type and relative sizes of pre-development and post-development catchments. The dominating peak flows occur from the external which are significantly larger than the BOS launch facility and access road development footprint. The slight reduction in peak flows in the post-development scenario is primarily explained by the minor reduction in the external catchment area size, which is offset by the impervious development footprint.

2.3 Lawful Point of Discharge

The OCG Condition 12.1, Enclosure 6, Item (q)(i) requires that *'all relevant legal points of discharge for the development site are identified'*. Section 3.9 of the Queensland Urban Drainage Manual (QUDM), Fourth Edition (IPWEA Queensland, 2017) describes that the lawful point of discharge must comply with all laws (Federal, State, Local and common law), and is the developer's responsibility that it is compliant to all laws in carrying out stormwater and development works including not causing a nuisance. However, Section 3.9.1 of QUDM also states that the term 'lawful point of discharge' has no prescribed legal meaning, but states a process for determination of the lawful point of discharge as:

- Whether the proposed development will alter the site's stormwater discharge characteristics in a manner that may substantially damage a third-party property:
 - If not, then no further steps are required to obtain tenure for a lawful point of discharge

Therefore, from the outcomes of the DRAINS modelling and assessment undertaken in this Section, the proposed BOS launch facility and access road does not impact the flow regime for all storm events up to the 1% AEP upon discharge to Saltwater Creek at the receiving environment. This results in a no worsening outcome relative to the existing scenario and is hence a lawful point of discharge for the project.

2.4 Impacts to the Newlands rail System Corridor

The Newlands Rail System corridor is located to the west of the BOS project site, as shown in Figure 3. The western extent of the access road joins to the existing quarry access road, which is approximately 120 m offset from the railway corridor extents.

Catchment 1 upstream of the rail corridor discharges to the new cross drainage structure consisting of a 1200 mm x 300 mm RCBC. Comparison of the peak 1% AEP flows in the pre-development and post-development scenarios downstream of this culvert are summarised below

- Pre-development 1% AEP peak flow – 5.8 m³/s
- Post-development 1% AEP peak flow – 5.7 m³/s

The minor reduction in peak flows is due to the minimal attenuation that occurs at the culvert in major storm events, therefore, demonstrating a no worsening of hydraulic impacts downstream of the culvert, and relative to the Newlands Rail System corridor. Terrain downstream of the culvert and access road becomes flatter and falls away from the Newlands Rail System corridor and ultimately discharges to Saltwater Creek as the lawful point of discharge and receiving environment.

2.5 Flow Gauging Station

The nearest flow gauging location is located to the south east of the site on Euri Creek at Koonandah (station no 121004A) as shown in Figure 6. Site based operations shall include frequent monitoring of streamflow data from this station, as well as regional weather information from the BoM. and the Queensland Government Water Monitoring Information Portal, particularly during the wet season.



Figure 6: Flow gauging station location (Station no. 121004A)

2.6 Stormwater Monitoring Sites

Enclosure 6(g) of the approval conditions requires the identification of an unspecified number of stormwater monitoring points. Three appropriate sites have been identified (1 x reference site upstream of impacts and 2 x impact sites downstream of operational activities). The coordinates of each of the three monitoring sites are presented in Table 6.

Table 6: Stormwater monitoring sites details

Site ID	Treatment	Description	Easting	Northing
SW01	Reference	Main onsite tributary upstream of access road	616112	7792683
SW02	Impact	Main onsite tributary downstream of access road	616088	7792734
SW03	Impact	Swale downstream of launch facility	616568	7792797

2.6.1 Monitoring program methodology

2.6.1.1 Sampling methods

Water sampling is to be undertaken in accordance with the protocols specified in the Australian Standard for water quality sampling - AS/NZS 5667.1:1998 and the Monitoring and Sampling Manual Environmental Protection (Water) Policy 2009 including sample preservation and quality assurance (QA)/ quality control (QC) procedures.

2.6.1.2 Locations

Sites to be monitored are presented in Table 6.

2.6.1.3 Frequency and duration

Monitoring shall be undertaken following any onsite spills that occur during launch activities or other onsite operations.

2.6.1.4 Parameters

Water quality parameters to be measured at each site include *in situ* and laboratory analysed parameters. *In situ* parameters shall be measured using a calibrated water quality instrument whilst samples for laboratory analysis are to be collected in appropriate sample containers for subsequent analysis at a National Association of Testing Authorities (NATA) accredited laboratory. *In situ* parameters include:

- pH
- Temperature
- Conductivity
- Dissolved oxygen (DO)
- Turbidity

Laboratory analysed parameters include:

- Total suspended solids (TSS)
- Hydrocarbons

2.6.2 Stormwater infrastructure inspections

Inspections of blockage, due to natural debris and other flow impediments, shall be undertaken as part of ongoing maintenance activities associated with the BOS launch facility and access road. This is inclusive of the following:

- Cross drainage culverts and associated rock rip rap and concrete causeway works
- Vegetated/ grassed swales
- Rock rip rap flow spreading structures at vegetated/ grassed swale outlet to the receiving environment.

3 Stormwater Quality Assessment

A stormwater quality assessment has been undertaken to address the stormwater quantity requirements specified in the project OCG Condition 12.1, Enclosure 6. The key driver for assessment is to determine whether the post development scenario achieves a no worsening impact relative to the pre-development scenario.

3.1 MUSICX Modelling

MUSICX is Australia's leading practice model for urban stormwater improvement conceptualisation for water sensitive urban design. MUSICX modelling has been undertaken for this project for comparison of nutrient and suspended solids loads for the pre-development and post-development scenarios.

3.1.1 MUSICX Model Inputs

3.1.1.1 Climate Data

Meteorological inputs into the MUSICX model were sourced from the MUSICX database for the wet tropics region inclusive of:

- Pluviograph rainfall data in 6-minute timesteps sourced from Bowen Airport, with location coordinates:
 - -20.02 degrees (S) Latitude
 - 148.22 degrees (E) Longitude
- Potential Evapotranspiration (PET) data sourced from Table A1-1 of the MUSIC Modelling Guidelines, (Healthy Land and Water, 2018), for Station number 33257 at Bowen Airport

3.1.1.2 Catchments

The development of the MUSICX model layout for the pre-development and post-development scenarios was undertaken in review of the As-Constructed Drawings and the UAV data output.

The pre-development catchment areas are the same as the adopted areas in DRAINS modelling shown in Figure 3, and summarised as:

- Road catchment 1 – 0.49 Ha
- Road catchment 2 – 0.31 Ha
- Road catchment 3 - 0.12 Ha
- Launch facility – 1.20 Ha

The post-development catchment areas are the same as pre-development, however, the launch facility catchment areas have been further split based on the As-Constructed grades associated with surface flows off the site. The catchment areas and associated infrastructure is shown on Figure 7.

3.1.1.3 Source Nodes

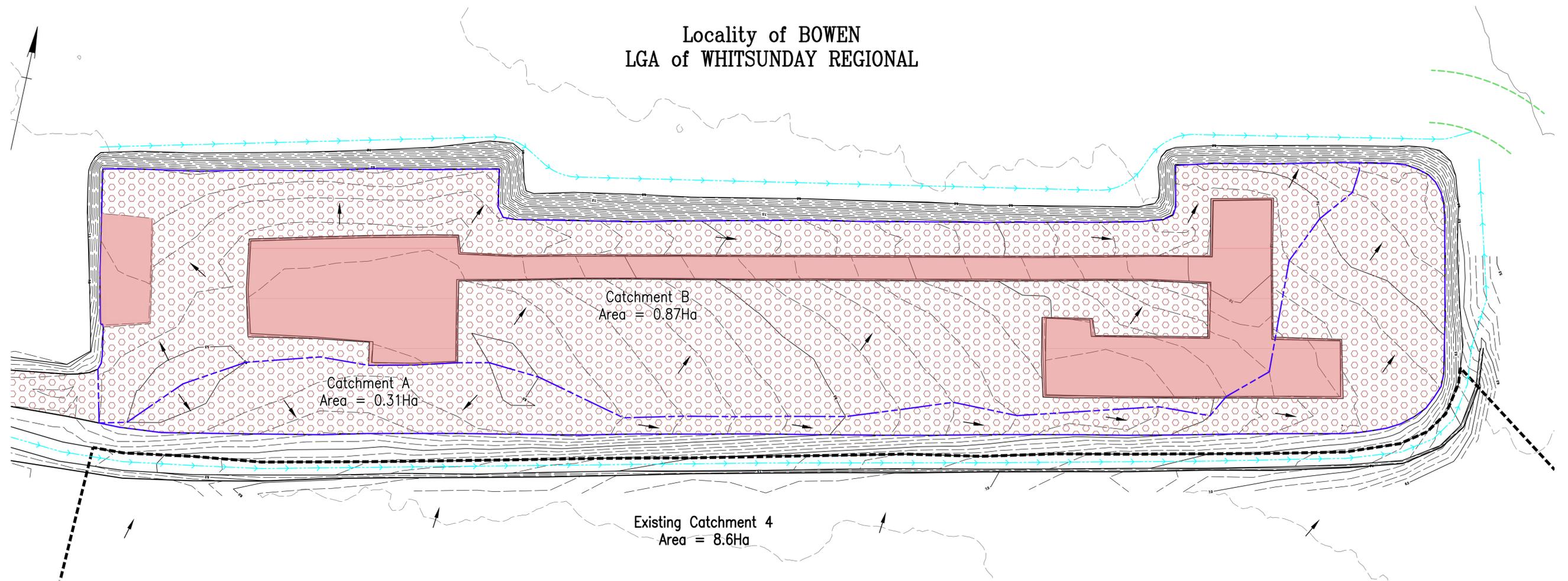
The land uses and percentage imperviousness adopted for source nodes in the MUSICX model is relative to the Effective Impervious Area (EIA), which is defined as the directly connected impervious area and is input into MUSICX as a percentage of the total surface area (TSA).

For the pre-development scenario, the BOS launch facility and access road predominantly coincides with historical grazing land and has therefore been nominated as an agricultural land source node. The impervious percentage, in reference to MUSIC guidelines, is 5% of TSA.

For the post-development scenario, there are numerous land uses applied for source nodes as documented below, in reference to MUSIC guidance:

- Access roads consist of unsealed pavement, therefore, have been designated an impervious percentage of 50% of TSA
- The launch facility site surface is nominated as mixed urban source nodes, with variable surface material including sealed pavement, concrete slabs and unsealed gravel. An impervious percentage of 50% of TSA has been applied.
- Building roof areas have been designated as urban roof source node, with an impervious percentage of 100% of TSA

Locality of BOWEN
LGA of WHITSUNDAY REGIONAL

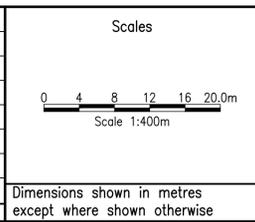


LEGEND:

- █ Existing Catchment Areas
- 8.0 — Existing Surface Contour Major (LiDAR)
- - - Existing Surface Contour Minor (LiDAR)
- 8.0 — Existing Surface Contour Major (As Constructed)
- - - Existing Surface Contour Minor (As Constructed)
- Extent of Batter
- Launch Facility Outline
- >—>—> Vegetated Swale Drain
- — — Launch Pad Catchment Areas
- - - Rock Check Dams
- Flow Direction
- Site Infrastructure
- Impervious Areas

Last Modified: Sep 17, 2022 - 10:52am

Rev	Revision Description	Certification	Date



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Title		ENGINEERING CERTIFICATION (RPEQ)				
GILMOUR SPACE BOWEN ORBITAL SPACE PORT STORMWATER MANAGEMENT FIGURE 7 – STORMWATER QUALITY PLAN		ENG. AREA	NAME	SIGNATURE	NO.	DATE
Drawn	M.SMITH					
Designed	M.HAUSFELD					

Job No.	GSP-001
Drawing No.	FIG-07
Revision	
Series Number	3 OF 3

3.1.2 MUSICX Layout Schematics

3.1.2.1 Pre-development Schematic

The MUSICX model pre-development schematic layout is shown in Figure 8.

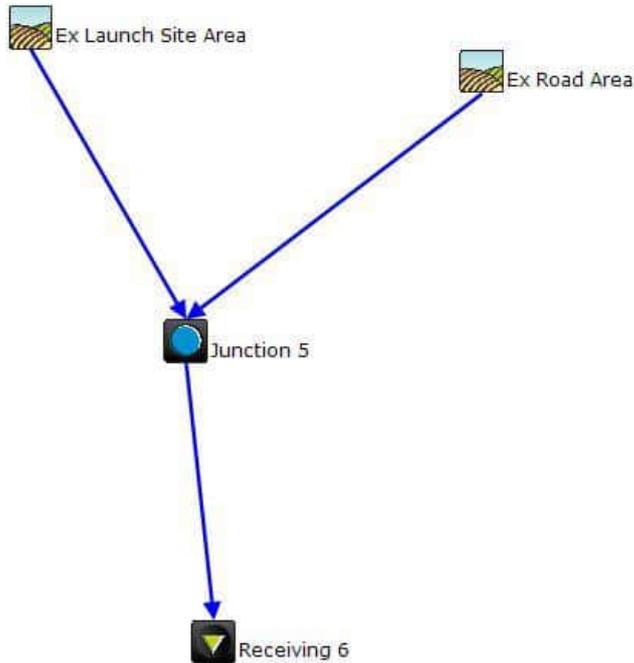


Figure 8: MUSICX schematic layout for the pre-development scenario

3.1.2.2 Post-development Schematic

The MUSICX model post-development schematic layout is shown in Figure 9.

3.1.3 Treatment Nodes

Treatment nodes for the site consist of vegetated swales and rainwater tanks for the BOS project footprint as discussed in this section.

3.1.3.1 Vegetated Swales

Vegetated swales are defined as a shallow, open, channel that is vegetated and primarily conveys stormwater in a longitudinal manner. The vegetated swales have varying sizing based on details referenced in the As-Constructed drawings and from review of UAV data, and as summarised in Table 7, with reference to swale names in Figure 9.

Table 7: MUSICX vegetated swale inputs

Input	Swale Treatment Node				
	Launch Cat A	Launch Cat B	Road 1 Swale	Road 2 Swale	Road 3 Swale
Length (m)	330	330	580	400	165
Bed Slope (%)	0.7	0.5	0.5	0.5	0.5
Base Width (m)	2.5	10	2.0	2	2
Top Width (m)	20	10	25	25	25
Depth (m)	0.3	0.1	0.3	0.3	0.3
Vegetation Height (m)	0.1	0.1	0.1	0.1	0.1

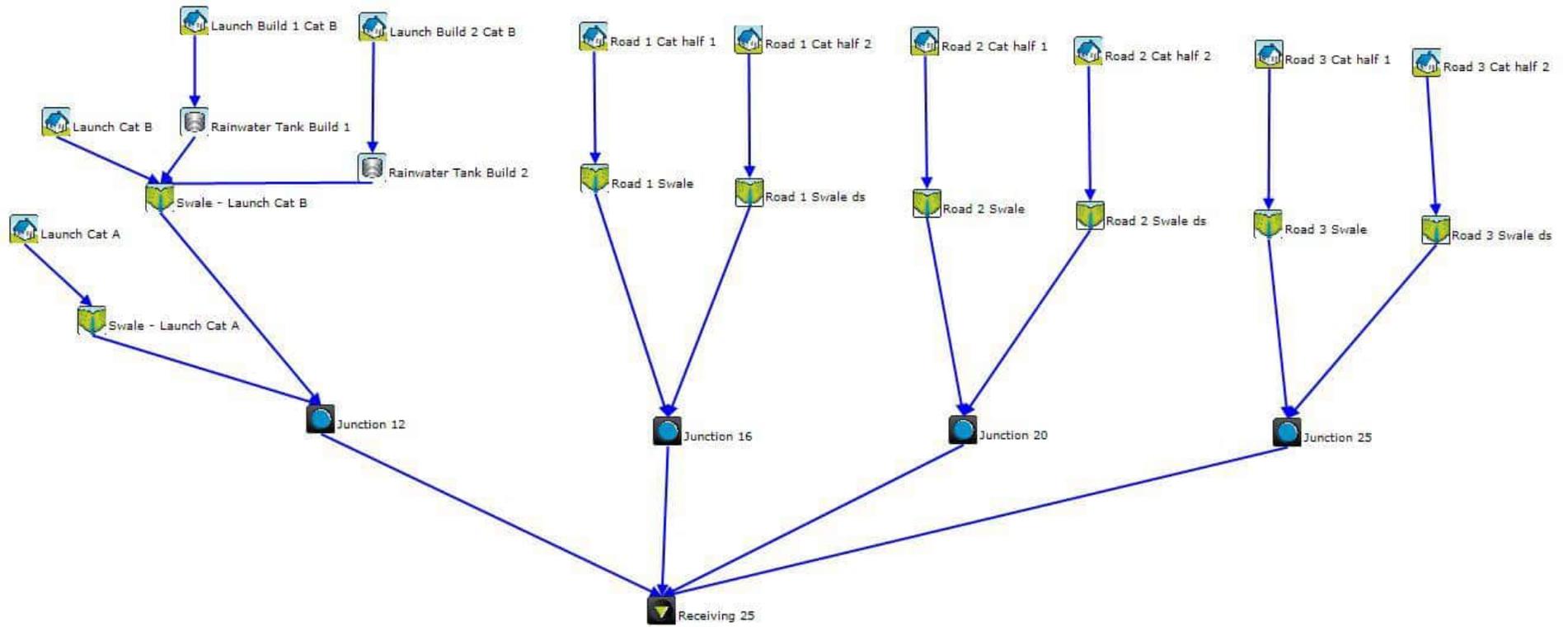


Figure 9: MUSICX model post-development schematic layout

Vegetation height has been conservatively set at 0.1 m and would normally be associated with frequent a maintenance regime and therefore less treatment capacity. This has been adopted based on the lack of vegetation post construction in the current scenario, however, is likely to consist of tall grasses over time, as is predominant with the existing catchment. Hydromulching is to be applied to all embankment batters.

‘Swale Launch Cat A’ is located on the upstream southern extent of the launch facility, as shown in Figure 7. From review of As-Constructed drawings, it was determined to have a minimum depth of 0.3 m. However, the swale has significant hydraulic capacity as it interfaces with the existing terrain on the southern side of the swale.

‘Swale – Launch Cat B’ is located on the downstream northern extent of the site, as shown in Figure 7. From review of the UAV data, this swale replicates a broad shallow treatment swale. Both launch facility swales discharge to a significant area of flattened surface terrain, where flows are returned to sheet flow via two long rows of rock check dams.

Road Swale 1 to 3 are located on the southern upstream side of the raised access road. Similar to ‘Swale Launch Cat A’, these vegetated swales interface with the road embankment and existing terrain and have significant hydraulic capacity.

Road Swales 1 to 3, with suffix nominated as ‘ds’ in reference to the MUSICX schematic notation in Figure 9, are located on the downstream northern side of the access road. Surface flows typically achieve treatment through discharge over the hydromulched road embankments and variable existing grasses. This essentially replicates a buffer strip type treatment, which has been replicated in MUSICX by use of a Vegetated Swale treatment node, with a depth of 0.1m, vegetation height of 0.1m, and top width of 2m.

3.1.3.2 Rainwater Tanks

Rainwater tanks have been utilised for the two buildings located on the launch facility site. The roof areas from the building each discharge to two 20kL poly tanks.

3.1.4 MUSIC Results Discussion and Comparison

The results of the MUSICX model are summarised in Table 8. Outputs from the MUSICX model for mean annual loads has been undertaken to determine the relative difference in pollutant loads between the pre-development and post-development scenarios.

Table 8: MUSICX mean annual load results

MUSICX Mean Annual Loads	Pre-Development Loads	Post-Development Loads	% Difference
Total Suspended Solids (kg/yr)	1,532	653	-57%
Total Phosphorus (kg/yr)	4.19	1.84	-56%
Total Nitrogen (kg/yr)	28.8	18.5	-33%

The results show a reduction in pollutant loads in comparison to the pre-development scenario. The vegetated swales predominantly provide the majority of treatment and pollutant removal that improves the water quality discharge when compared to the pre-development scenario. Therefore, this assessment of stormwater quality demonstrates that there is a no worsening impact to pollutant loads discharging to the immediate downstream receiving environment of Saltwater Creek. MUSICX modelling results are provided in Appendix C.

Appendix A **Assessment of Performance Outcomes**

Performance outcomes	Acceptable outcomes	Response
Condition 12 - Environmental Management Plan		
12.1 Prepare and submit to the Coordinator-General and Whitsunday Regional Council, a detailed project specific Environmental Management Plan (EMP) addressing both the construction and operational phases of the project. The EMP must be certified by an independent suitably qualified third-party confirming the adequacy of the EMP in accordance with current best practice. The EMP must include the following matters: (e) surface water and groundwater management (f) stormwater management (refer to enclosure 6)	-	There is no specific Enclosure reference for (e) surface water and groundwater management. Refer to (f) stormwater management (Enclosure 6) requirements within
Enclosure 6		
To demonstrate compliance with condition 12.1 of this development approval, prepare a site based stormwater management plan (by a suitably qualified person) that addresses the following:	-	Items (a) to (e) are excluded as associated with the construction phase of the project only
(f) prevention of ponding or other significant effect on other properties, watercourses, creeks or lakes to ensure stormwater does not adversely affect the values of the receiving environment	No acceptable outcome is nominated.	There is no significant impact on the flow regime associated with the development. Refer to Section 2 of the report
(g) the location and number of stormwater monitoring points	No acceptable outcome is nominated.	There are three stormwater monitoring points proposed for the site as shown on Figure 3 within Section 2.6 of the report.
(h) confirmation of the number and location of meteorological monitoring stations and flow gauging stations on key watercourses that would affect flooding in proximity to the site	No acceptable outcome is nominated.	The flow gauging station in closest proximity to the site for weather and flood monitoring purposes is located on Euri Creek. Refer to Section 2.5 of the report.
(i) confirmation of destination of water collected in the sediment basin where proposed and monitoring measures to be established to ensure any overflows are addressed	No acceptable outcome is nominated.	No sediment basins are proposed as part of operation phase components of the project
(j) confirmation of measures to be implemented to prevent sediment and pollutants from entering the waterways and groundwater supply	No acceptable outcome is nominated.	There is no impact with sediment and pollutants associated with the proposed development in context of permanent stormwater management infrastructure. Refer to Section 3 of the report.
(k) monitoring of stormwater management devices	No acceptable outcome is nominated.	Monitoring of the three stormwater monitoring points proposed for the site as shown on Figure 3 within Section 2.6 of the report.
(l) confirmation of destination of water collected in the sediment basin where proposed and monitoring measures to be established to ensure any overflows are addressed	No acceptable outcome is nominated.	No sediment basins are proposed as part of operation phase components of the project

<p>(m) contaminants must not be directly or indirectly released to waters</p>	<p>No acceptable outcome is nominated.</p>	<p>Pollutant loads for the operational phase have been modelled in MUSICX and are less than the existing scenario. Refer to Section 3 of the report.</p>
<p>(n) be prepared having regard to Module 18.2 – Stormwater and Drainage Impacts on State Transport Infrastructure State Code of the State Development Assessment Provisions (available at https://dsdmipprd.blob.core.windows.net/general/sdap-1-10-module-18.pdf).</p>	<p>No acceptable outcome is nominated.</p>	<p>Refer to Section containing the State Development Assessment Provisions - Module 18.2 below</p>
<p>(o) demonstrate that the management of stormwater (quantity and quality) post development can achieve a no worsening impact (on the pre-development condition) for all flood and stormwater events that exist prior to development and up to a 1% Annual Exceedance Probability (AEP) (equivalent to 1/100 year Average Recurrence Interval ARI). Stormwater management for the proposed development must ensure no worsening to the railway, including rail transport infrastructure, caused by peak discharges, flood levels, frequency/duration of flooding, flow velocities, water quality, sedimentation and scour effects</p>	<p>No acceptable outcome is nominated.</p>	<p>The SWMP in Section 2 comprehensively documents the assessment of post-development stormwater impacts relative to the pre-development scenario. The assessment incorporates the evaluation of 6 storm events up to the 1% AEP storm event, and demonstrates a no worsening impact. Refer to peak flow comparison table in Section 2.2.2 of the report.</p> <p>Section 2.4 of the report addresses the hydraulic impacts associated with the Newlands Rail System corridor, and demonstrates a no worsening impact.</p>
<p>(p) incorporate appropriate hydraulic and hydrological analysis demonstrating: (i) design flood peak discharges for the site and surrounding area which exist prior to the development for all flood and stormwater events up to a 1% Annual Exceedance Probability (AEP) (equivalent to 1/100-year Average Recurrence Interval (ARI)). This should include at least the following flood and stormwater events: 50%, 20%, 10%, 5%, 2% and 1% AEP (equivalent to 2, 5, 10, 20, 50 and 100-year ARI events) (ii) design flood peak discharges for the site after the development has occurred for all flood and stormwater events up to a 1% Annual Exceedance Probability (AEP) (equivalent to 1/100-year Average Recurrence Interval (ARI)). This should include at least the following flood and stormwater events: 50%, 20%, 10%, 5%, 2% and 1% AEP (equivalent to 2, 5, 10, 20, 50 and 100-year ARI events).</p>	<p>No acceptable outcome is nominated.</p>	<p>The SWMP in Section 2 comprehensively documents the assessment of post-development stormwater peak flow impacts relative to the pre-development scenario. The assessment incorporates the evaluation of the 50%, 20%, 10%, 5%, 2% and 1% AEP storm events, and demonstrates a no worsening impact. Refer to peak flow comparison table in Section 2.2.2 of the report.</p>

<p>(q)</p> <p>ensure the following are addressed, where applicable:</p> <p>(i) all relevant legal points of discharge for the development site are identified.</p> <p>(ii) overland flow paths are identified, and hydraulic conveyance is maintained on the site as part of the proposed development</p> <p>(iii) flood storage capacity is maintained on the site as part of the proposed development</p> <p>(iv) the adverse impacts from sheet flow on the railway are prevented</p> <p>(v) the proposed development does not cause a concentration of stormwater (including floodwater) flows discharging on the railway during construction or thereafter</p> <p>(vi) retaining structures, filling/excavation, landscaping, construction activities or any other works to the land have been designed to include provision for drainage so as not to adversely impact on the railway</p> <p>(vii) the proposed development does not impede or interfere with any drainage, stormwater or floodwater flows from the railway</p> <p>(viii) stormwater or floodwater flows have been designed to maintain the structural integrity of the rail transport infrastructure</p> <p>(ix) existing stormwater drainage infrastructure on the railway is not interfered with or damaged by the proposed development such as through concentrated flows, surcharging, scour or deposition</p> <p>(x) the quality of stormwater discharging onto the railway is not reduced through erosion and sedimentation.</p>	<p>No acceptable outcome is nominated.</p>	<p>The report address the multiple items listed specifically as addressed below:</p> <p>i) Section 2.3 of the report documents discharge is compliant with lawful point of discharge requirements</p> <p>ii) Figure 3 in the report identifies all overland flow paths. Section 2.2.2 of the report provides comparison of peak flows to demonstrate hydraulic conveyance is maintained</p> <p>iii) Flood storage capacity is not applicable to this project, as it does not exist in the pre-development scenario</p> <p>iv) Refer to Section 2.4 of the report. There are no hydraulic impacts to the railway</p> <p>v) Refer to Section 2.4 of the report. There are no hydraulic impacts to the railway</p> <p>vi) Refer to Section 2.4 of the report. There are no hydraulic impacts to the railway</p> <p>vii) Refer to Section 2.4 of the report. There are no hydraulic impacts to the railway</p> <p>viii) Refer to Section 2.4 of the report. There are no hydraulic impacts to the railway</p> <p>ix) The proposed works do not impact any existing infrastructure associated with the railway as documented in Section 2.4</p> <p>x) Refer to Section 3 of the report. There are no water quality impacts to the project and therefore the railway</p>
<p>(r)</p> <p>include details of the mitigation measures proposed to address any potential stormwater impacts (including flooding impacts) of the proposed development. The design flood peak discharges should be shown for the mitigated case to demonstrate there is no worsening impact on the railway.</p>	<p>No acceptable outcome is nominated.</p>	<p>The SWMP in Section 2 comprehensively documents the assessment of post-development stormwater impacts relative to the pre-development scenario. The assessment incorporates the evaluation of 6 storm events up to the 1% AEP storm event, and demonstrates a no worsening impact. Refer to peak flow comparison table in Section 2.2.2 of the report.</p> <p>Section 2.4 of the report addresses the hydraulic impacts associated with the Newlands Rail System corridor, and demonstrates a no worsening impact.</p>

18.2 Stormwater and drainage impacts on state transport infrastructure state code

Table 18.2.1: All Development

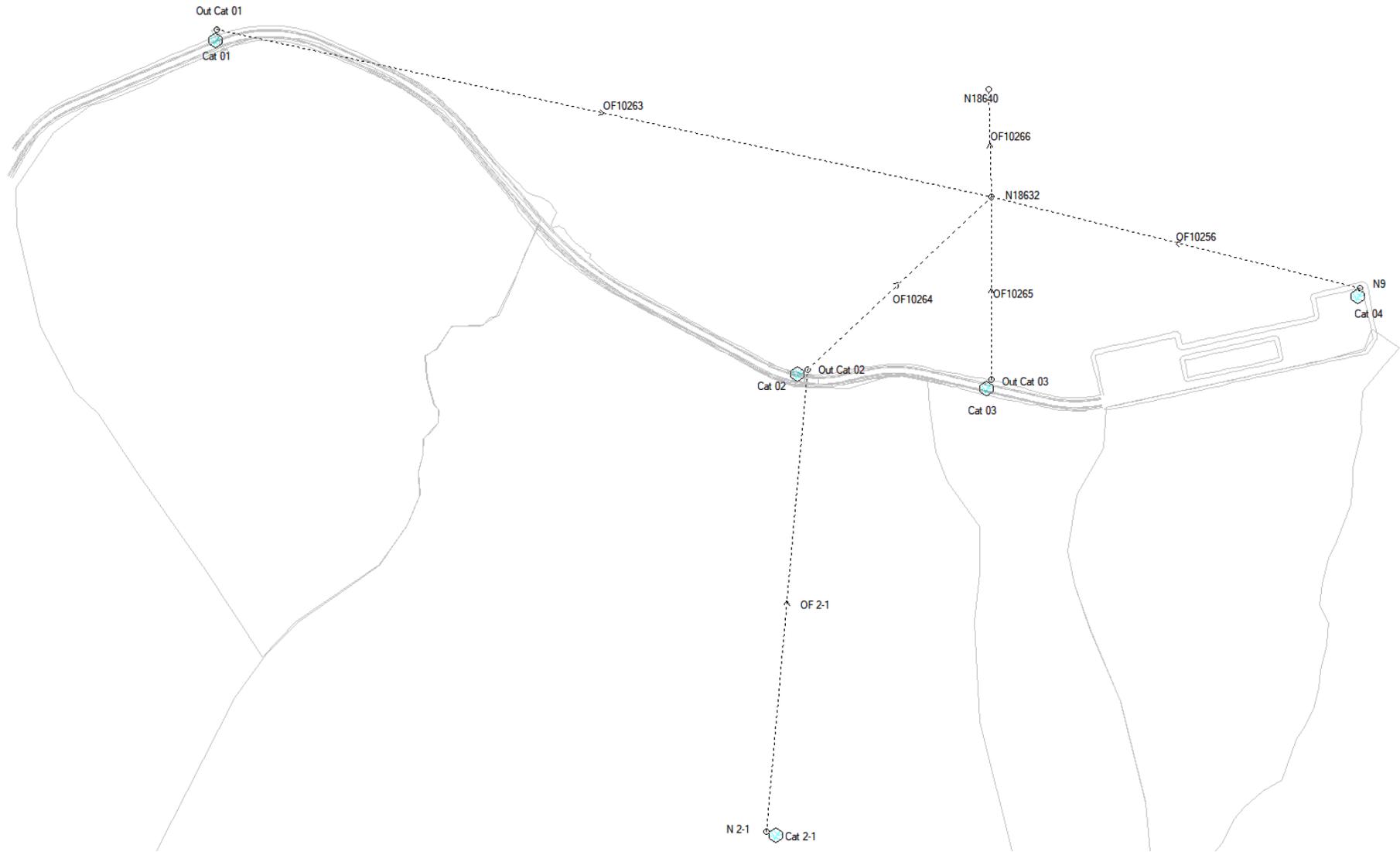
Stormwater and drainage management

<p>PO1</p> <p>Stormwater management for the development must ensure there is no worsening of, and no actionable nuisance in relation to peak discharges, flood levels, frequency or duration of flooding, flow, velocities, water quality, ponding, sedimentation and scour effects on an existing or future state transport corridor for all flood and stormwater events that exist prior to development, and up to a 1 per cent annual exceedance probability.</p>	<p>A01.1</p> <p>The development does not result in stormwater or drainage impacts or actionable nuisance within an existing or future state transport corridor. Editor's note: It is recommended that basic stormwater information is to be prepared to demonstrate compliance with AO1.1. OR</p>	N/A
	<p>A01.2</p> <p>A stormwater management statement certified by an RPEQ demonstrates that the development will achieve a no worsening impact or actionable nuisance on an existing or future state transport corridor. OR</p>	N/A
	<p>A01.3</p> <p>A stormwater management plan certified by an RPEQ demonstrates that the development will achieve a no worsening impact or actionable nuisance on an existing or future state transport corridor. OR</p>	The RPEQ certified SWMP report documents no worsening impacts for stormwater quantity and quality for the project in Sections 2 and 3 of the report respectively. Section 2.4 of the report demonstrates a no worsening impact to the Newlands Rail System corridor.
	<p>A01.4</p> <p>For development on premises within 25 metres of a railway, a stormwater management plan certified by an RPEQ demonstrates that:</p> <ul style="list-style-type: none"> (1) the development will achieve a no worsening impact or actionable nuisance on the railway (2) the development does not cause stormwater, roofwater, ponding, floodwater or any other drainage to be directed to, increased or concentrated on the railway (3) the development does not impede any drainage, stormwater or floodwater flows from the railway (4) stormwater or floodwater flows have been designed to: <ul style="list-style-type: none"> (a) maintain the structural integrity of the rail transport infrastructure (b) avoid scour or deposition (5) additional railway formation drainage necessitated by the development is located within the premises where the development is carried out (6) retaining structures for excavations abutting the railway corridor provide for drainage. 	N/A

Lawful point of discharge		
PO2 Stormwater run-off and drainage are directed to a lawful point of discharge to avoid adverse impacts on a future or existing state transport corridor.	A02.1 Where stormwater run-off is discharged to a state transport corridor, the discharge is to a lawful point of discharge in accordance with section 3.4 of Queensland urban drainage manual, Department of Energy and Water Supply, 2013. OR	Section 2.3 and 2.4 of the report demonstrate that the project discharges to lawful points of discharge. The SWMP references the latest version of the Queensland Urban Drainage Manual 4th Edition 2017, with lawful point of discharge reference to Section 3.9 of this document
	A02.2 For development on premises within 25 metres of a railway, approval from the relevant railway manager for the railway, as defined in the Transport Infrastructure Act 1994, schedule 6 has been gained to verify the lawful point of discharge for stormwater onto the railway. AND	N/A
	A02.3 Development does not cause a net increase in or concentration of stormwater or floodwater flows discharging onto the state transport corridor during construction or thereafter. AND	N/A
	A02.4 Development does not create any additional points of discharge or changes to the condition of an existing lawful point of discharge to the state transport corridor	N/A
Lawful point of discharge		
PO3 Run-off from upstream development is managed to ensure that sedimentation and erosion do not cause siltation of stormwater infrastructure in the state transport corridor	A03.1 Development with a high risk of erosion incorporates erosion and sediment control measures. Editor's note: For a state-controlled road where a development has a high risk of erosion, an erosion and sedimentation control plan should be provided to support a stormwater management statement or stormwater management plan. Section 1 of the Stormwater guideline for environmentally relevant activities, Department of Environment and Heritage Protection, 2014, defines development considered to have a high risk of erosion.	There is no impact with sediment and pollutants associated with the proposed development in context of permanent stormwater management infrastructure. Refer to Section 3 of the report. Sediment and erosion control measures as part of the construction phase of the project is not documented in the operations phase SWMP.

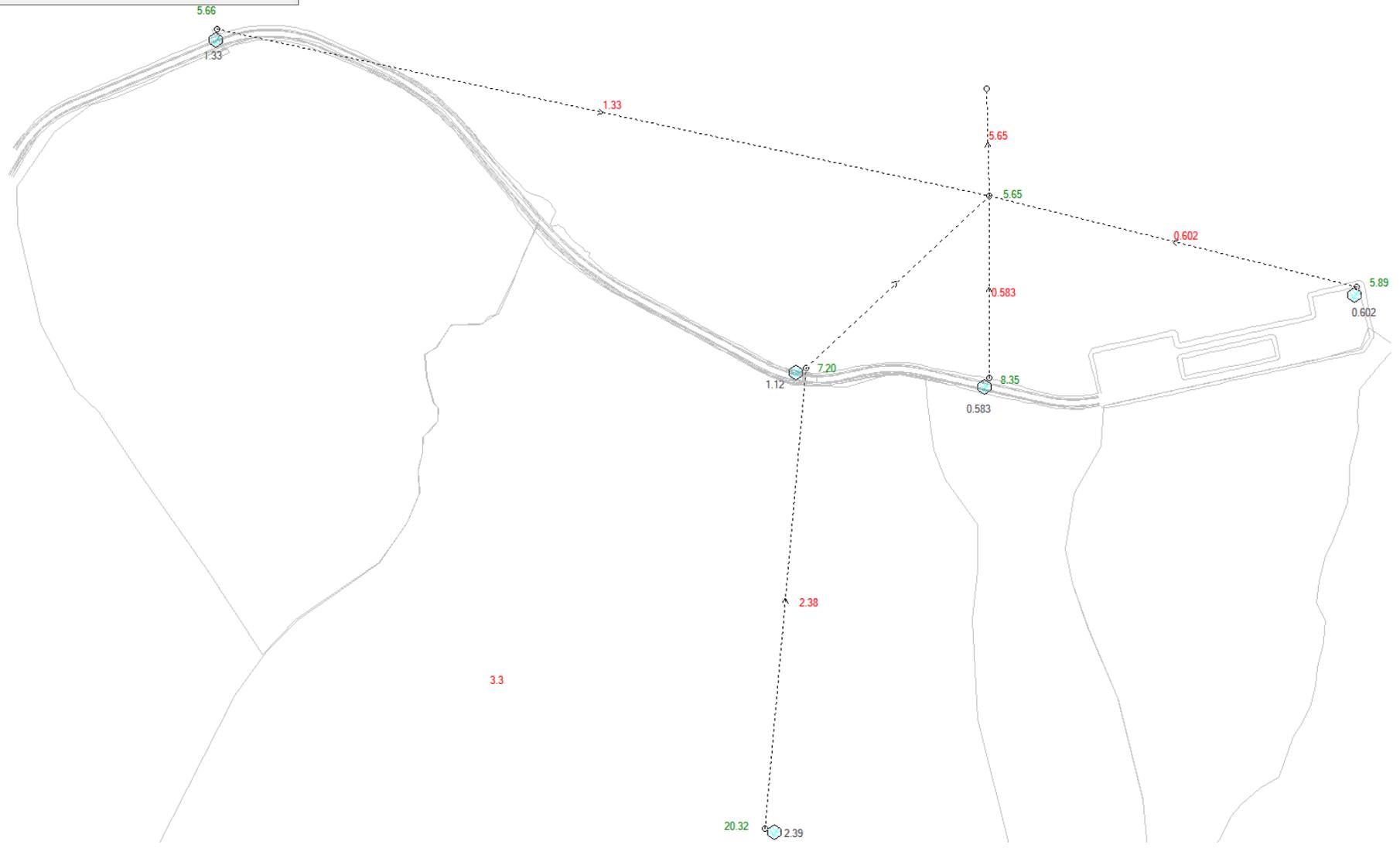
Appendix B **DRAINS Modelling Results**

Pre-Development DRAINS Model Layout



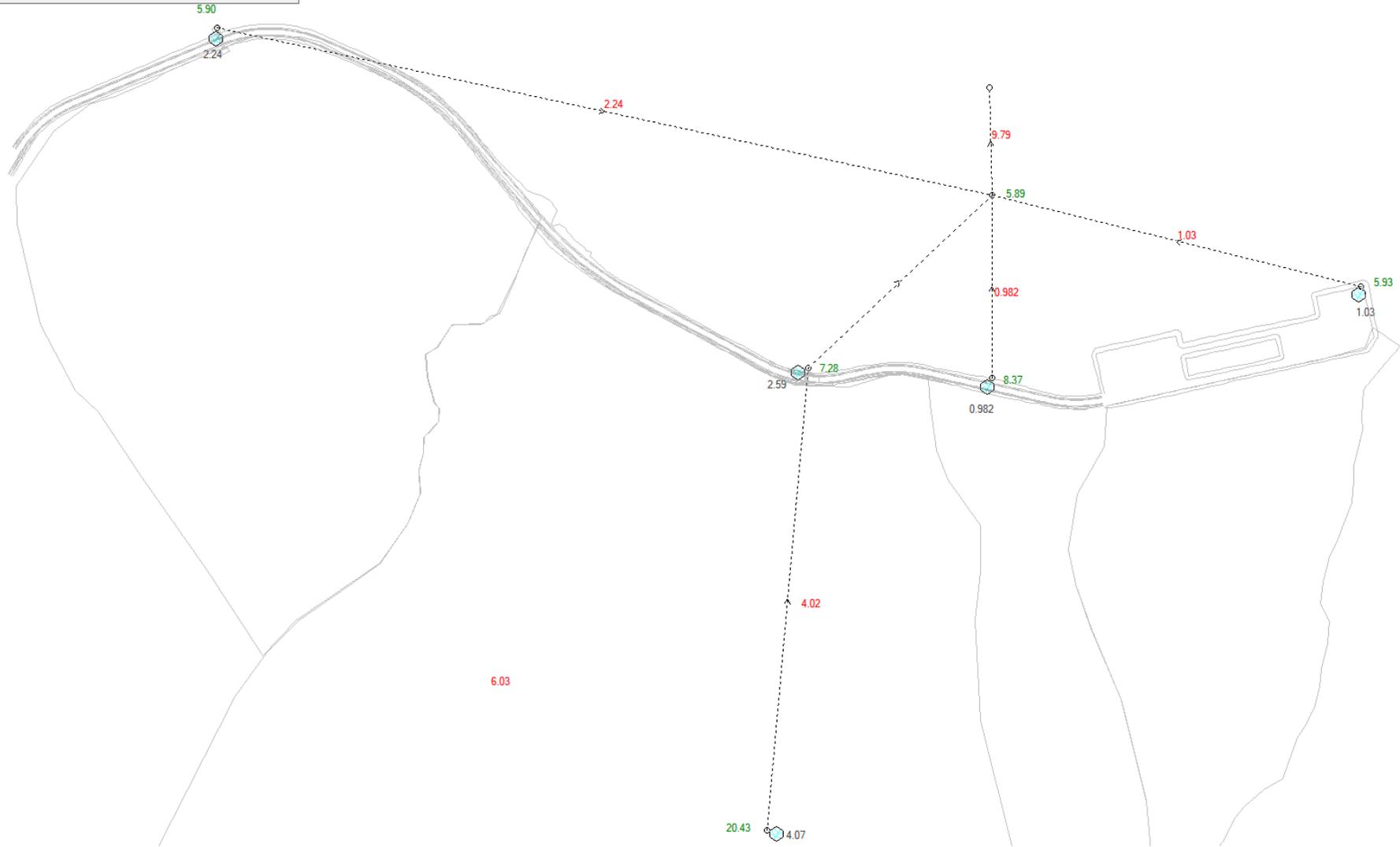
Pre-Development DRAINS Model Results – 50% AEP Peak Flows

Results for median storm in critical 50% AEP ensembles using Full Unsteady hydraulic model.



Pre-Development DRAINS Model Results – 20% AEP Peak Flows

Results for median storm in critical 20% AEP ensembles using Full Unsteady hydraulic model.



Pre-Development DRAINS Model Results – 10% AEP Peak Flows

Results for median storm in critical 10% AEP ensembles using Full Unsteady hydraulic model.



Pre-Development DRAINS Model Results – 5% AEP Peak Flows

Results for median storm in critical 5% AEP ensembles using Full Unsteady hydraulic model.



Pre-Development DRAINS Model Results – 2% AEP Peak Flows

Results for median storm in critical 2% AEP ensembles using Full Unsteady hydraulic model.



Pre-Development DRAINS Model Results – 1% AEP Peak Flows

Results for median storm in critical 1% AEP ensembles using Full Unsteady hydraulic model.

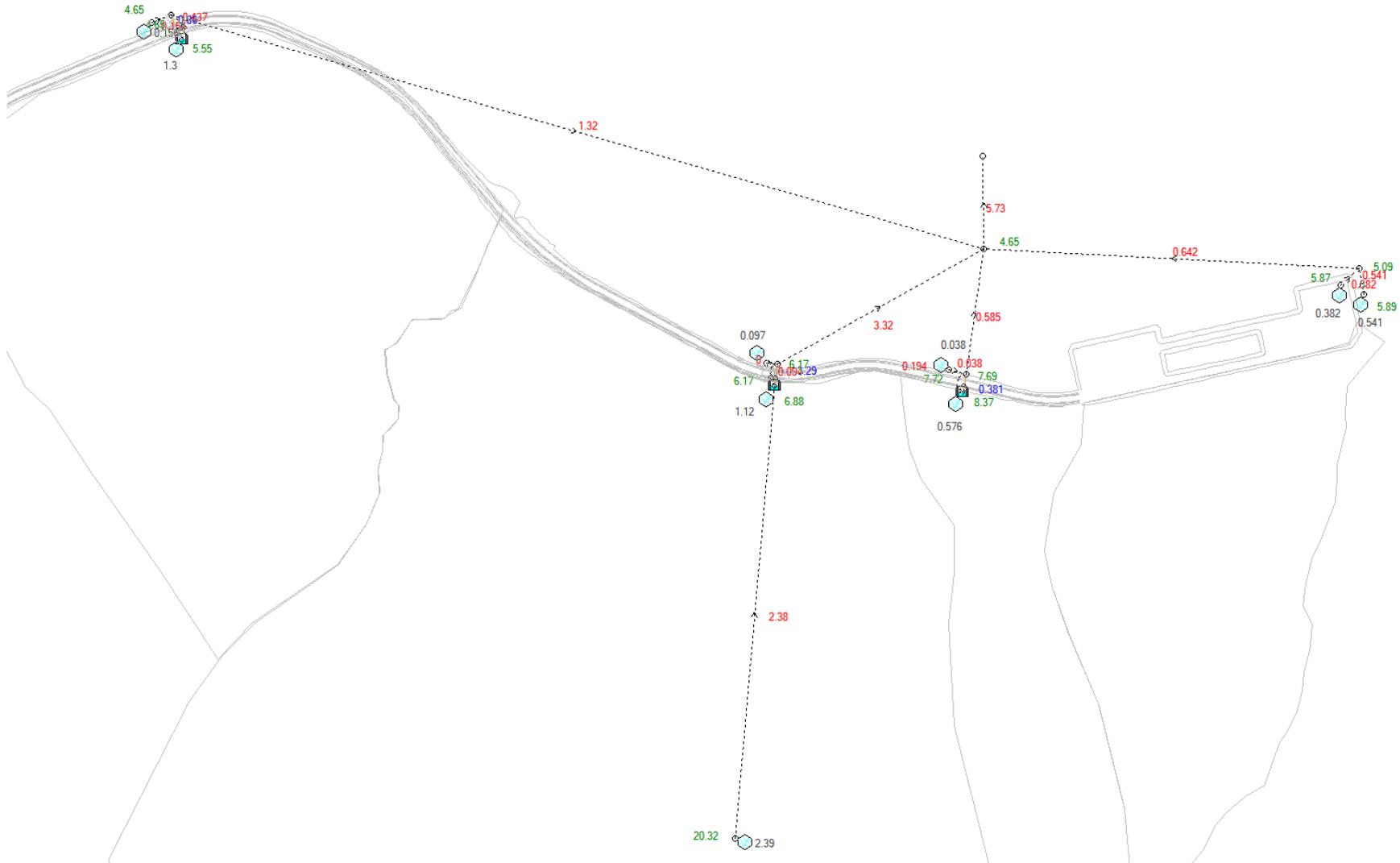


Post-Development DRAINS Model Layout



Post-Development DRAINS Model Results – 50% AEP

Results for median storm in critical 50% AEP ensembles using Full Unsteady hydraulic model.



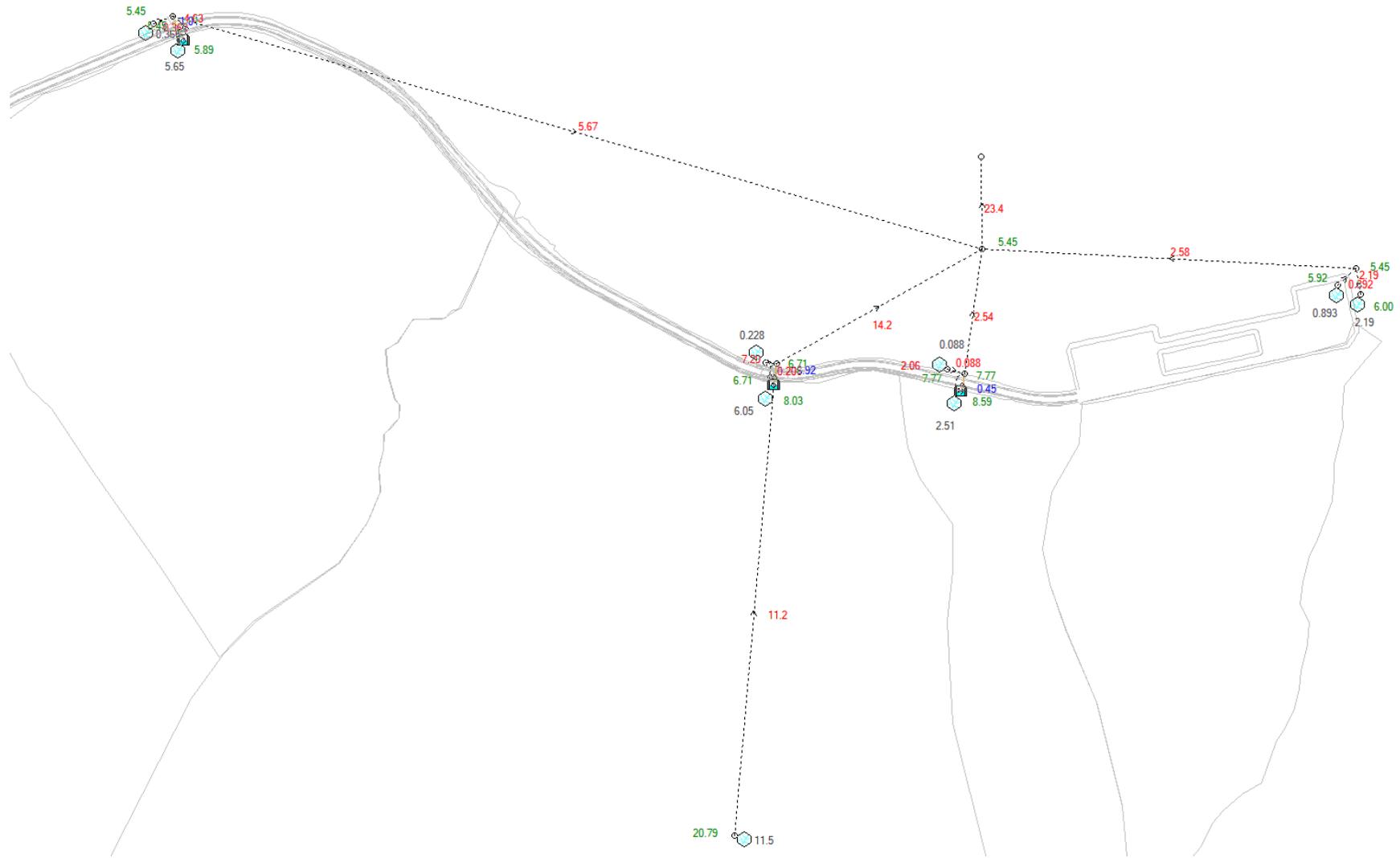
Post-Development DRAINS Model Results – 10% AEP

Results for median storm in critical 10% AEP ensembles using Full Unsteady hydraulic model.



Post-Development DRAINS Model Results – 1% AEP

Results for median storm in critical 1% AEP ensembles using Full Unsteady hydraulic model.



Appendix C MUSIC Modelling Results

Pre-Development Scenario MUSIC outputs

	Inflow	Outflow	% Reduction
Flow (ML/yr)	7.445	7.445	0
Total Suspended Solids (kg/yr)	1532	1532	0
Total Phosphorus (kg/yr)	4.186	4.186	0
Total Nitrogen (kg/yr)	28.78	28.78	0
Gross Pollutants (kg/yr)	41.73	41.73	0

Post-Development Scenario MUSIC outputs

	Inflow	Outflow	% Reduction
Flow (ML/yr)	12.51	12.51	0
Total Suspended Solids (kg/yr)	653.3	653.3	0
Total Phosphorus (kg/yr)	1.84	1.84	0
Total Nitrogen (kg/yr)	18.47	18.47	0
Gross Pollutants (kg/yr)	0	0	0

Appendix E Waste Management Plan





Bowen Orbital Spaceport

Waste Management Plan

Document ID: LAUNCH-358547011-1689

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Table of Contents

1	Introduction	4
1.1	Purpose	4
1.2	Scope	4
1.3	Legislation, Standards and Guidelines	4
2	Roles and Responsibilities	5
3	Waste Management Policy	6
3.1	Waste Management Strategy	6
3.1.1	Waste Avoidance.....	6
3.1.2	Waste Reduction	6
3.1.3	Waste Reuse	6
3.1.4	Waste Recycling	6
3.1.5	Waste Treatment	7
3.1.6	Waste Disposal.....	7
4	Waste Generation.....	8
4.1	Regulated or Hazardous Waste.....	8
4.2	Disposable General Waste.....	9
4.3	Recyclable General Waste	9
5	Waste Management Practices	10
5.1	Anticipated Waste Flows	10
5.1.1	Regulated, Listed, Hazardous, Controlled and Trackable Waste	10
5.1.2	General Disposable Waste	10
5.1.3	General Recyclable Waste.....	11
5.2	Waste Tracking Procedures.....	11
5.2.1	Regulated, Listed, Hazardous, Controlled and Trackable Waste	11
5.2.2	General Disposable Waste	11
5.2.3	General Recyclable Waste.....	11
5.2.4	Tracking Documentation	11
6	Training.....	12
7	Compliance Management	13
7.1	Planning	13
7.2	Auditing and Reporting.....	13
7.3	Evaluation and Review	13
	Abbreviations.....	14



List of Tables

Table 1 - Regulated or Hazardous Waste.....	8
Table 2 - Disposable General Waste.....	9
Table 3 - Recyclable General Waste	9
Table 4 - Regulated, Listed, Hazardous, Controlled and Trackable Waste Flow	10
Table 5 - General Disposable Waste Flow.....	10
Table 6 - General Recyclable Waste Flow	11

List of Figures

Figure 1 - Waste Management Hierarchy.....	6
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1 Introduction

Gilmour Space is committed to achieving sovereign orbital launch capabilities for Australia. The Australian space sector represents a small but significant sector of the Australian economy with significant growth potential. The establishment of an operational orbital launch facility will enable greater market participation for Australian space companies in both domestic and international markets.

1.1 Purpose

The Bowen Orbital Spaceport (BOS) will generate waste during the ongoing operation of the facility. The responsible management of waste will safeguard the important environmental values of the areas surrounding the launch facility and reduce the risk of impacts to persons and property. This Waste Management Plan (WMP) documents the requirements and activities to sustain a compliant and responsible management of waste streams generated by the construction and operation of the BOS.

Key elements of this management plan include:

- Accountabilities and responsibilities for waste management.
- A description of generated waste streams.
- A compliant and practical waste management strategy

1.2 Scope

This WMP provides an overview of the waste management considerations relevant to support the construction and operational phases of the Bowen Orbital Spaceport.

1.3 Legislation, Standards and Guidelines

States and Territories have the primary responsibility for regulating and administering waste in Australia. The Queensland government framework requires the local governments to be responsible for waste management within their local areas. This project is within the Whitsunday Regional Council (WRC) area and as such waste must be compliant with the framework established by the WRC as well as any state and commonwealth legislations. A summary of the key legislations relevant to the generation and management of waste are below:

Commonwealth Legislation:

- **Department of Agriculture, Water, and the Environment**
 - National Waste Policy 2018
 - Recycling and Waste Reduction Act 2020

State Legislation:

- **Department of Environment and Science**
 - Waste Reduction and Recycling Act 2011
 - Waste Reduction and Recycling Regulation 2011
 - Environment Protection Act 1994
 - Environment Protection Regulation 2019
 - Environmental Protection (Water and Wetland Biodiversity) Policy 2019

Local Legislation:

- **Whitsunday Regional Council**
 - Local Law No. 3 (Community and Environmental Management) 2014
 - Local Law No. 7 (Waste Management) 2020



2 Roles and Responsibilities

All employees and contract staff and visitors are responsible for conducting waste management practises. This includes complying with relevant approval / permit requirements and that all reasonable and practical measures to prevent or minimise the harm are taken for all activities.

Contractors and Employees – All Phases

- Assess the workplace and work activities for opportunities to reduce waste generation.
- Ensure that generated waste is handled appropriately.

Launch Site Supervisor – All Phases

- Ensure employees, contractors and visitors have sufficient knowledge and training in waste management practices while on site at the Bowen Orbital Spaceport facility.
- Ensure that all waste generated at the site is identified and treated in accordance with the WMP and any associated plans.
- Regularly review and update the WMP as required.

Engineering Discipline Managers – All Phases

- Assess operational activities for opportunities to reduce generation of waste.
- Ensure waste streams generated by work streams are treated in accordance with this plan.

Workplace Health and Safety Officer – All Phases

- Provide guidance and facilitation for assessment of waste treatment related risks and ensure appropriate controls for those risks are implemented.
- Supervise audits and verifications on the storage and disposal of generated waste.



3 Waste Management Policy

3.1 Waste Management Strategy

Gilmour Space seeks to sustainably deal with all waste generated at the BOS. The Recycling and Waste Reduction Act of 2020 introduces the waste management hierarchy. This hierarchy is used below to explain the Gilmour Space waste management strategy.



Figure 1 - Waste Management Hierarchy

3.1.1 Waste Avoidance

Waste avoidance is primarily achieved at a planning level and includes the optimisation of resource input to the facility, selection of more energy efficient design and fitout where possible and selection and contracting of service providers with inclusion of provisions relating to waste reduction targets. Waste avoidance achieves cost effectiveness in the planning stage.

3.1.2 Waste Reduction

Waste reduction may occur at any phase of operations through review of current resource inputs and processes to reduce waste generation or energy use. Waste avoidance is a continual optimisation activity. Waste reduction will reduce the cost of operation through reduction in resource cost and reduction in the cost of waste disposal.

3.1.3 Waste Reuse

Waste that can be re-used with minimal treatment (decanted propellant or oxidiser) or returned to the supplier for re-use (packaging materials or bulk containers) will be employed where available and will in turn generate cost savings and reductions in waste generation.

3.1.4 Waste Recycling

Wastes that are recyclable will be sorted and stored on site for collection by a waste transport services provider. Recycling will provide raw materials for input to different processes. BOS will identify a suitable waste transport provider for all identified recyclable waste streams.



3.1.5 Waste Treatment

Waste treatment will be required for some waste streams generated at the BOS. Oxidisers may be treated on site to de-nature for dispersal in accordance with BOS operating procedures.

Any spills or leakage of fluids kept on site will be treated in accordance with the BOS Emergency / Incident Response Plan.

Waste waters for the LCC and the VAB will be treated via compliant sewage systems (approved septic pit or bio) with processed liquids and solids removed by contractor or treated and dispersed for land care use.

3.1.6 Waste Disposal

Wastes that cannot be otherwise re-used, recycled, or treated will be separated and stored appropriately in designated waste storage areas for collection by an authorised and contracted provider. BOS will identify a suitable waste disposal provider and implement contracted support for waste disposal from the site.



4 Waste Generation

The primary purpose of the Bowen Orbital Spaceport is to support the safe execution of launch missions which are typically campaigned as 60-90 day long activities supported by a team of approximately 20 engineers and technicians, involving the key phases below:

- **Transport** - Transport, and receipt of launch vehicle stages and rocket ancillaries at the BOS.
- **Inspection** - Inspection and repairs (where required) of the transported launch vehicle stages.
- **Assembly** - Cleaning, manufacture, assembly, verification, and testing of launch vehicle and fluids.
- **Launch Ops** - Erection of launch vehicle on launcher, connection, and testing of launch fluid systems.
- **Launch** - Range safety, fluids filling and launch.
- **Recovery** - Inspection and remediation of the facility in readiness for next launch mission.
- **Operations** - General activities associated with the maintenance and operation of a facility and site.

Waste material is generally material that has been used to its useful life or is the result of a process or is the surplus to a process. For this WMP we will classify waste into three streams:

- **Regulated.**
- **Disposable.**
- **Recyclable.**

4.1 Regulated or Hazardous Waste

Table 1 - Regulated or Hazardous Waste

Waste Name	Waste Description	Phase
Metal Swarf	Metal Chips / Filing	Inspection / Assembly
Carbon Fibre Swarf	Carbon Fibrous Waste	Inspection / Assembly
Graphite Swarf	Graphite Dust / Chips	Inspection / Assembly
IPA	Liquid Isopropyl Alcohol	Inspection / Assembly
Hydrogen Peroxide	Liquid High Purity H ₂ O ₂	Assembly / Launch Ops
RP-1 / D60	Liquid High Purity Kerosene	Assembly / Launch Ops
Diesel	Liquid Diesel	All Activity Phases
CitriSurf 3050	Passivation Agent	Inspection / Assembly / Launch Ops
Extreme Power Green	Cleaning agent	Manufacture / Assembly / Launch Ops
Contaminated PPE	PPE with residue from any of the substances above as solid waste	All Activity phases



4.2 Disposable General Waste

Table 2 - Disposable General Waste

Waste Name	Waste Description	Activity
Green Waste	Vegetation removed during maintenance or clearing.	Operations
Putrescible and other domestic waste	Food scrap, food wrappers, textile materials, plastic wrapping, aluminium wrapping, waxy paper and cardboard, non-recyclable plastics.	Operations
Sewage	Sewage from Ablutions.	Operations

4.3 Recyclable General Waste

Table 3 - Recyclable General Waste

Waste Name	Waste Description	Activity
Domestic Recyclables	Pet bottles, cardboard and paper packaging, glass, metal packaging.	Operations
Grey water	Water utilised for domestic purposes.	Operations



5 Waste Management Practices

BOS induction process will ensure that all employees and contractors are aware of the waste management hierarchy, the three categories of waste identified and the appropriate treatment for wastes generated by their business unit's activities.

5.1 Anticipated Waste Flows

The normal operational activity of the BOS will encompass the management of waste streams through an understanding of waste volumes, sources, and destinations.

5.1.1 Regulated, Listed, Hazardous, Controlled and Trackable Waste

Table 4 - Regulated, Listed, Hazardous, Controlled and Trackable Waste Flow

Waste Name	Waste Source	Volume/annum	Waste Destination
Metal Swarf	VAB	<25kg	Recycle via Contractor
Carbon Fibre Swarf	VAB	<25kg	Disposal via Contractor
Graphite Swarf	VAB	<25kg	Recycle via Contractor
IPA	VAB	300L	Disposal via Contractor
High Test Peroxide	LPAD	10000L	Treatment on Site or shipping to Helidon test site for re-use
RP1(D60)	LPAD	600L	Disposal via Contractor or ship to Helidon test site for re-use
Diesel	BOS	Less than 50L	Disposal via Contractor
Citri-surf 3050	VAB	500L	Disposal via Contractor
Extreme Power Green	VAB	500L	Disposal via Contractor
Contaminated PPE	VAB/LPAD	100kg	Disposal via Contractor

5.1.2 General Disposable Waste

Table 5 - General Disposable Waste Flow

Waste Name	Waste Source	Volume/annum	Waste Destination
Green Waste	VAB LCC	72m ³	Disposal Via Contractor
Putrescible and other domestic waste	VAB LCC	9500kg	Disposal via Contractor
Sewage	LCC	10kL	Treated on site
Sewage	VAB	180kL	Treated on site



5.1.3 General Recyclable Waste

Table 6 - General Recyclable Waste Flow

Waste Name	Waste Source	Volume/annum	Waste Destination
Recyclable domestic waste	VAB LCC	3800kg	Disposal via Contractor
Grey water	LCC	10kL	Treated on site
Grey water	VAB	180kL	Treated on site

5.2 Waste Tracking Procedures

In line with the requirements of the Recycling and Waste Reduction Act, the BOS will seek to avoid the creation of waste and increase the circular flow of the waste streams generated by BOS activity. To track and target waste reductions, the BOS will regularly record waste generation by use of registers and contractor invoices for recycling and re-use and regularly review progress towards reduction in waste.

5.2.1 Regulated, Listed, Hazardous, Controlled and Trackable Waste

Regulated waste will be recorded upon each interaction with removal for disposal or recycling by the contractor.

5.2.2 General Disposable Waste

General disposable waste will be estimated on a regular basis based upon the frequency of full containers removed by contractors

5.2.3 General Recyclable Waste

General recyclable waste will be estimated on a regular basis based upon the frequency of full containers removed by contractors

5.2.4 Tracking Documentation

Documentation on waste quantities will be reviewed by BOS management on a regular basis to inform reduction activities.



6 Training

Gilmour Space employees, contractors or visitors who wish to access the Bowen Orbital Spaceport area will be required to complete site safety inductions prior to being approved for site access. It is a requirement that all personnel on site are inducted and/or trained to a level proportionate to the responsibilities and level of risk of their individual work activities. Inductions and training will include for managing the disposal of waste streams depending on the individual requirements.



7 Compliance Management

7.1 Planning

Management of waste streams is an ongoing process requiring day to day as well as long-term planning by site supervision and management. This includes having adequate registers, checks and processes, and contracts available for waste management of all waste streams.

This plan is to be informed by a bi-annual evaluation and management review of the efficacy of this plan.

7.2 Auditing and Reporting

Ad-hoc annual internal auditing on waste compliance will be implemented by the site Workplace Health and Safety Officer and the Site Supervisor. These audits will be reported to management to ensure that waste generation and management practices meet business objectives.

Incidents involving the generation or management of waste at the Bowen Orbital Spaceport are to be reported to site supervision and logged the incident management system immediately upon identification for investigation and remediation where appropriate.

7.3 Evaluation and Review

This plan will be evaluated on a bi-annual basis for compliance by the Site Supervisor. This management plan will be reviewed as required but at least annually and at the completion of any significant launch campaign to confirm the plans continued suitability.



Abbreviations

Abbreviation	Definition
1080	Sodium Fluoroacetate
ACH	Aboriginal Cultural Heritage
ADG Code	Australian Code for the Transport of Dangerous Goods by Road and Rail
AMSA	Australian Maritime Safety Authority
APSDA	Abbot Point State Development Area
ASA	Australian Space Agency
AusSpOC	Australian Space Operations Centre
BOM	Bureau of Meteorology
BOS	Bowen Orbital Spaceport
CSMP	Coral Sea Marine Park
DA	Development Application
DFO	Distant Focusing Overpressure
DGR	Dangerous Goods Regulations
EAA	Emergency Assembly Area
EC	Emergency Controller
ECG	Emergency Control Group
ECSS	European Cooperation for Space Standardization
EDQ	Economic Development Queensland
EMP	Environmental Management Plan
EP Act	Environmental Protection Act
ERA	Environmentally Relevant Activity
ERP	Emergency Response Plan
ESC	Erosion and Sediment Control
ESCP	Erosion and Sediment Management Plan
EW	Emergency Warden
EWLCC	LCC Emergency Warden
EWLPAD	LPAD Emergency Warden
EWVAB	VAB Emergency Warden
FMECA	Failure Modes, Effects, and Criticality Analysis
FMP	Facilities Management Plan
FSS	Flight Safety System
GBRMP	Great Barrier Reef Marine Park
GBRMPA	Great Barrier Reef Marine Park Authority
GP	General Public
GST	Gilmour Space Technologies
H ₂ O	Water
H ₂ O ₂	Hydrogen Peroxide
HDGMP	Hazardous and Dangerous Goods Management Plan
IAASS	International Association for the Advancement of Space Safety
IATA	International Air Transport Association



IIP	Instantaneous Impact Point
IMDGC	International Maritime Dangerous Goods Code
Kero	Kerosene
LCC	Launch Control Centre
LDMG	Local Disaster Management Group
LEO	Low Earth Orbit
LMP	Land Management Plan
LOx	Liquid Oxygen
LPAD	Launch Pad
MCU	Material Change of Use
MEDQ	Minister for Economic Development of Queensland
MSDS	Material Safety and Data Sheets
NASA	National Aeronautics and Space Administration
NEW	Net Explosive Weight
NOBP	North Queensland Bulk Ports
O ₂	Oxygen
PCBU	Person Conducting a Business or Undertaking
PPE	Personal Protective Equipment
QFES	Queensland Fire and Emergency Services
QPOL	Queensland Police Open Learning
QPS	Queensland Police Service
RHD	Rabbit Haemorrhagic Disease
SDA	State Development Area
SDS	Safety Data Sheet
SO	Safety Officer
SPP	State Planning Policy
SSP	Site Security Plan
TAP	Transport and Access Plan
TBC	To be Confirmed
TNT	Trinitrotoluene
UN	United Nations
VAB	Vehicle Assembly Building
VMR	Volunteer Marine Rescue
WHS	Workplace Health and Safety
WMP	Waste Management Plan
WRC	Whitsunday Regional Council



Appendix F Hazardous and Dangerous Goods Management Plan





Bowen Orbital Spaceport

Hazardous and Dangerous Goods Management Plan

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Table of Contents

1	Introduction	3
1.1	Purpose	3
1.2	Scope	3
1.3	Legislation, Standards and Guidelines	3
2	Roles and Responsibilities	5
3	Hazardous Substances Management	6
3.1	Risk Assessments.....	6
3.2	Receipt of Hazardous Substances.....	6
3.3	Hazardous Substances Register and SDS.....	7
3.4	Storage of Hazardous Substances.....	7
3.5	Labelling.....	7
3.6	Hazard Pictograms and ADG Code Class Labels	8
3.7	Inventory Management	8
3.8	Fire Protection	8
3.9	Removing and Disposing of Hazardous Substances	8
4	Emergency Response	9
4.1	Emergency Response Plan	9
5	Launch Site Hazardous Substances	10
6	Training	13
	Abbreviations	14

List of Tables

Table 1 - Construction Materials	10
Table 2 - Operational Materials	10

List of Figures

Figure 1 - Hierarchy of Controls.....	6
Figure 2 - Hazardous and Dangerous Goods Storage Areas Layout for VAB.....	12
Figure 3 - Hazardous and Dangerous Goods Storage Areas Layout for Launch Pad and Storage Pads.....	12



1 Introduction

Gilmour Space is committed to achieving sovereign orbital launch capabilities for Australia. The Australian space sector represents a small but significant sector of the Australian economy with significant growth potential. The establishment of an operational orbital launch facility will enable greater market participation for Australian space companies in both domestic and international markets.

1.1 Purpose

This Hazardous and Dangerous Goods Management Plan (HDGMP) seeks to demonstrate the framework used for the transport, receipt, storage, use and handling, as well as disposal of hazardous and dangerous goods at the Bowen Orbital Spaceport (BOS).

The HDGMP aims to minimise the potential impacts on human health, property, and the natural environment, while also complying with the objectives within various legislation, standards, and codes of practice.

1.2 Scope

This document will address operations specifically related to the construction and operation of the Bowen Orbital Spaceport.

1.3 Legislation, Standards and Guidelines

International Codes and Standards:

- **International Maritime Organization**
 - The International Maritime Dangerous Goods Code (IMDGC)
- **International Air Transport Association**
 - International Air Transport Association (IATA) Dangerous Goods Regulations (DGR)

Commonwealth Legislation:

- **National Transport Commission**
 - Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code)

State Legislation:

- **Worksafe Queensland**
 - Work Health and Safety Act 2011
 - Work Health and Safety Regulation 2011
 - Managing risks of hazardous chemicals in the workplace code of practice 2021
 - Labelling of workplace hazardous chemicals code of practice 2021
 - Preparation of safety data sheets for hazardous chemicals code of practice 2021

Australian Standards:

- **Standards Australia**
 - AS ISO 31000:2018 Risk Management Principals and Guidelines
 - AS/NZS 1940:2017 The storage and handling of flammable and combustible liquids
 - AS 1894:1997 The storage and handling of non-flammable cryogenic and refrigerated liquids
 - AS 2444:2001 Portable Fire Extinguishers and Fire Blankets – Selection and Location
 - AS/NZS 3833:2007 Storage and Handling of Mixed Classes of Dangerous Goods in Packages and Bulk Containers



- AS/NZS 4326:2008 Storage and Handling of Oxidisers
- AS 2030.1:2009 the verification, filling, inspection, testing and maintenance of cylinders for the storage and transport of compressed gases
- AS 3780:2008 The storage and handling of corrosive substances



2 Roles and Responsibilities

All employees and contract staff are responsible for the safe handling of hazardous and dangerous goods at the BOS. This includes complying with relevant approval / permit requirements and ensuring that all reasonable and practical measures to prevent or minimise harm are taken for all activities.

Contractors and Employees – All Phases

- Assess the workplace and work activities for hazardous substances before commencing any work.
- Ensure that for any hazardous substances identified, that the relevant SDS for the substance has been reviewed by the work party.
- Ensure that the risks of using hazardous substances are assessed and that appropriate controls are in place for risks prior to initiating work.

Launch Site Supervisor – All Phases

- Ensure employees and contractors have sufficient knowledge and training in the handling of hazardous substances that will be encountered.
- Ensure that the SDS register is updated and that SDS are available to all workers and work parties.
- Ensure that all hazardous substances brought to site are approved and are registered in the hazardous substance register.
- Maintain an Emergency Response Plan for the Launch Site incorporating responses to incidents involving hazardous or dangerous goods.

Workplace Health and Safety Officer – All Phases

- Provide guidance and facilitation for assessment of the risks relating to hazardous substances, and that appropriate controls for those risks are implemented.
- Supervise audits and verifications on the storage and use of hazardous substances.
- Own and maintain hazardous substances and SDS storage registers.



3 Hazardous Substances Management

3.1 Risk Assessments

A documented risk assessment shall be conducted prior to working with hazardous substances. Documented risk assessments are to be kept available and should be updated whenever the scope of the work activity involving a hazardous substance or the environmental conditions for which the risk assessment was conducted changes.

Risk assessments are to be conducted in line with the Gilmour Space risk management procedure, which follows a 5-step process of:

- **Identifying the Risk** – Identify hazards presented by project, task, or activity.
- **Assessing the Risk** – Qualify or quantify the consequence and likelihood.
- **Making Risk Decisions** – Determine controls or actions from hierarchy of controls.
- **Implementing Controls** – Assign ownership and timing to controls or actions.
- **Supervision** – Risk acceptance and review.

The hierarchy of controls shown in figure 1 below should be used when determining controls or actions.

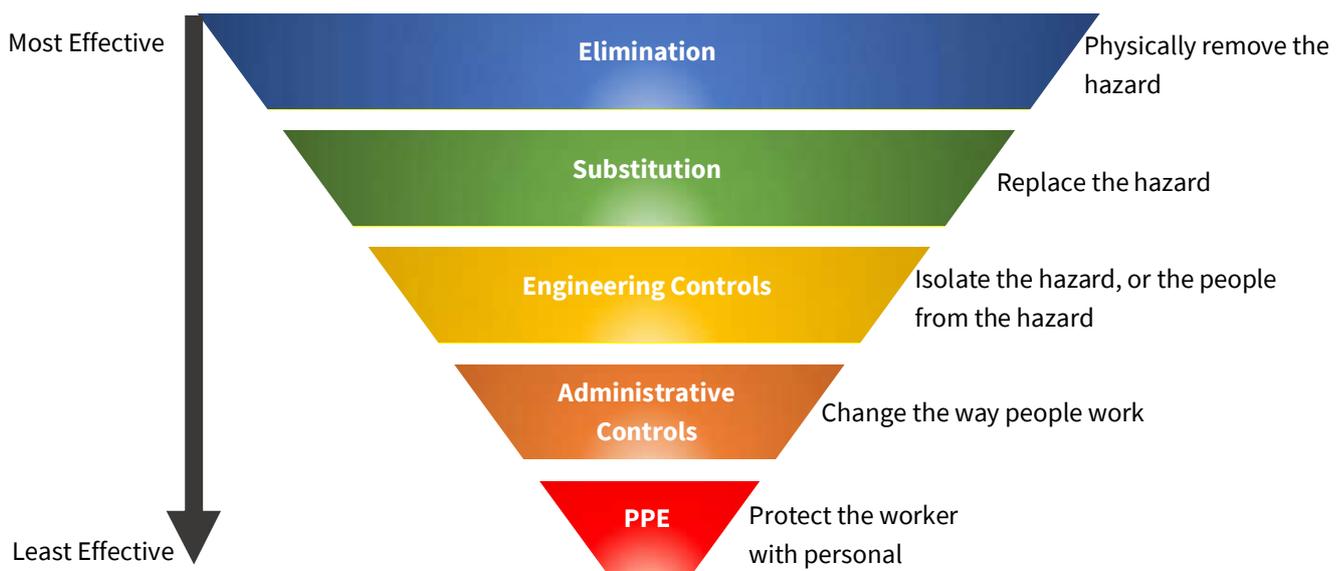


Figure 1 - Hierarchy of Controls

3.2 Receipt of Hazardous Substances

The receipt of hazardous substances at the BOS requires persons receiving to ensure that:

- All deliveries are labelled in accordance with labelling requirements in this HDGMP.
- Any damages or concerns are immediately identified via receiving an inspection and reported to Site Supervisor.
- Risks associated with the transport and handling of the hazardous substances or dangerous goods are known.



- Receiving personnel are trained and knowledgeable about the handling and storage of the hazardous substance or dangerous goods to be received.
- Receiving personnel are trained and knowledgeable in how to respond to incidents involving the hazardous substance or dangerous goods to be received.
- All equipment for loading and unloading, required power and utilities, necessary storage and ullage area, and PPE is available for receipt.
- Spillages or leaks are immediately responded to and reported to the Site Supervisor and Environment Health and Safety Coordinator.

3.3 Hazardous Substances Register and SDS

The hazardous substances register will be utilised at the site throughout construction and operations. The hazardous substances register will include the following information:

- Substance Name
- Chemical Composition
- Storage Method (Package, IBC, Self-bunded Tank, ISO Tank)
- Storage Safe Fill Level (L, m³, %, kg)
- Storage Max capacity (L, m³, %, kg)
- Storage Quantity (L, kg, m³)
- State (solid, liquid, gas)
- Hazardous Substance / Dangerous Goods Classification

The hazardous substances register is required to be updated whenever receipt of an existing hazardous substance is received or whenever a new substance is to be added.

All substances added to the register must also be accompanied with a corresponding SDS. Copies of SDSs must be maintained at the location of storage and in the Gilmour SDS register.

3.4 Storage of Hazardous Substances

Storage facilities shall comply with the managing risks of hazardous chemicals in the workplace code of practice 2021.

Wherever required, storage areas and compounds shall be adequately compounded and banded to ensure containment of any hazardous substance. Separation and segregation and bund construction shall comply with AS/NZS 1940:2017 Flammable Liquids Storage and Handling, or AS/NZS 4326:2008 Oxidizing Agents Storage and Handling, AS 1894:1997 Storage and Handling of Non-flammable Cryogenic and Refrigerated Liquids or any other code or standard applicable.

3.5 Labelling

Hazardous substances will be labelled in accordance with the labelling of workplace hazardous chemicals code of practice 2021 published by Workplace Health and Safety Queensland.

Below are the requirements that a hazardous chemical label must include as per the code (written in English):

- The product identifier.
- The name, Australian address, and business telephone number of either the manufacturer or importer.
- The identity and proportion disclosed, in accordance with Schedule 8 of the WHS Regulation, for each chemical ingredient.



- Any hazard pictogram(s) consistent with the correct classification(s) of the chemical.
- Any hazard statement(s), signal word and precautionary statement(s) that is consistent with the correct classification(s) of the chemical.
- Any information about the hazards, first aid and emergency procedures relevant to the chemical, which are not otherwise included in the hazard statement or precautionary statement.
- The expiry date of the chemical, if applicable. As a person conducting a business or undertaking (PCBU), you may include any information on the label that does not contradict or cast doubt on any other information that is required on the label.

The following additional information should also be included on the label, where available:

- An emergency phone number for specific poisons or treatment advice.
- The overseas name, address and telephone number of the manufacturer or supplier.
- A valid website or internet address.
- Reference to the safety data sheet (SDS), for example a statement on the label that says: 'Additional information is listed in the safety data sheet'.

If an emergency information service or Poisons Information Centre phone number is provided on the label, this arrangement should be confirmed with the service beforehand and copies of the SDS should be provided to them.

3.6 Hazard Pictograms and ADG Code Class Labels

Signage and labelling of dangerous goods storage and use areas should where feasible, align with the Globally Harmonized System of Classification and Labelling of Chemicals.

3.7 Inventory Management

A system for the inspection of bunding and the monitoring of storage levels of hazardous substances is to be implemented to facilitate the identification of loss or leakage.

3.8 Fire Protection

The BOS facility shall have fire extinguishers of suitable types and quantities at locations where the risk of fire is present. The selection and location of fire extinguishers shall be consistent with AS/NZS 2444:2001 Portable Fire Extinguishers and Fire Blankets.

Requirements of AS/NZS 1940:2017 Storage and Handling of Flammable and Combustible Liquids and AS/NZS 4326:2008 Storage and Handling of Oxidisers relating to fire safety shall be observed.

Specialist systems shall be available for the potential for experimental battery fires within the launch vehicle body (N₂ / CO₂ flood systems) when launch vehicles are being assembled.

3.9 Removing and Disposing of Hazardous Substances

All waste or unused hazardous substances must be removed from site in line with legislative and code of practice requirements, as well as the BOS Waste Management Plan.

Documented details of any disposal or removal of waste of unused hazardous substances shall be approved by the Site Supervisor prior to disposal or removal. All documentation must be kept.



4 Emergency Response

4.1 Emergency Response Plan

The Site Supervisor shall maintain an emergency response plan for the BOS facility in order to minimise damage to people, property and the environment as a result of any emergency involving the launch site. The plan will ensure appropriate responses to emergencies or incidents that may arise from launch site activities or other incidents that may impact the integrity or safety of the launch site.

The Emergency Response Plan (ERP) shall dictate the procedures for responding to medical, fire and dangerous goods incidents, will specify notification and reporting procedures for incidents and shall include provisions for appointment of incident investigation teams.

The ERP will be made available to personnel through site induction and copies will be available in all work areas. The plan will be reviewed annually or when any changes are made that may materially affect the plan.



5 Launch Site Hazardous Substances

The hazardous and non-hazardous materials expected to be used during the construction phase of the BOS are shown below in Table 1.

Table 1 - Construction Materials

Product	Use	Proposed Storage Location	Quantity
Cement	Launch pad and vehicle assembly building construction.	At point of use.	TBC
 Diesel	Fuel for machinery and power generation.	Self-bunded storage tanks. Power Generation & Launch Pad.	TBC
 Unleaded Petrol	Fuel for machinery and vehicles.	Self-bunded storage tanks. Power Generation Pad.	TBC
 Lubricants (transmission fluid, engine)	Maintenance of heavy civil machinery.	TBC	TBC
Miscellaneous Cleaning Products	Site maintenance	TBC	TBC

The hazardous and non-hazardous materials expected to be used during the operational phase of the BOS are shown below in Table 2 and the layout of hazardous materials storage and signage areas are show below in Figure 2 and Figure 3.

Table 2 - Operational Materials

Product	Use	Proposed Storage Location	Quantity
 Diesel	Power Generator	Self-bunded storage tanks. Power Generation & Launch Pad.	5,000 L
 Lubricants	Power Generator and launch erector maintenance.	Material store in Vehicle Assembly Building.	TBC



Miscellaneous Cleaning Products	Site Maintenance	Material store in Vehicle Assembly Building.	As required.
Miscellaneous Cleaning Products	Rocket Instrumentation cleaning and assembly	Material store in Vehicle Assembly Building.	As required.
Nitrogen Compressed UN1066 	Cryogenic Proof	Compressed and cryogenic liquid storage pad	
Helium Compressed UN1046 	Rocket pressurisation	Compressed and cryogenic liquid storage pad	
Hydrogen Peroxide – UN2014 UN2015 	Rocket Oxidiser (1 st and 2 nd Stages)	Oxidiser Storage Pad (AS/NZS 4326)	18m ³ per launch
D60(Kerosene) – UN1223 	Rocket Fuel (3 rd Stage)	Fuel Storage Pad (AS/NZS 1940)	0.3m ³ per launch
Liquid Oxygen – UN1073 	Rocket Oxidiser (3 rd Stage)	Oxidiser Storage Pad (AS/NZS 4326)	5 m ³ per launch





Figure 2 - Hazardous and Dangerous Goods Storage Areas Layout for VAB

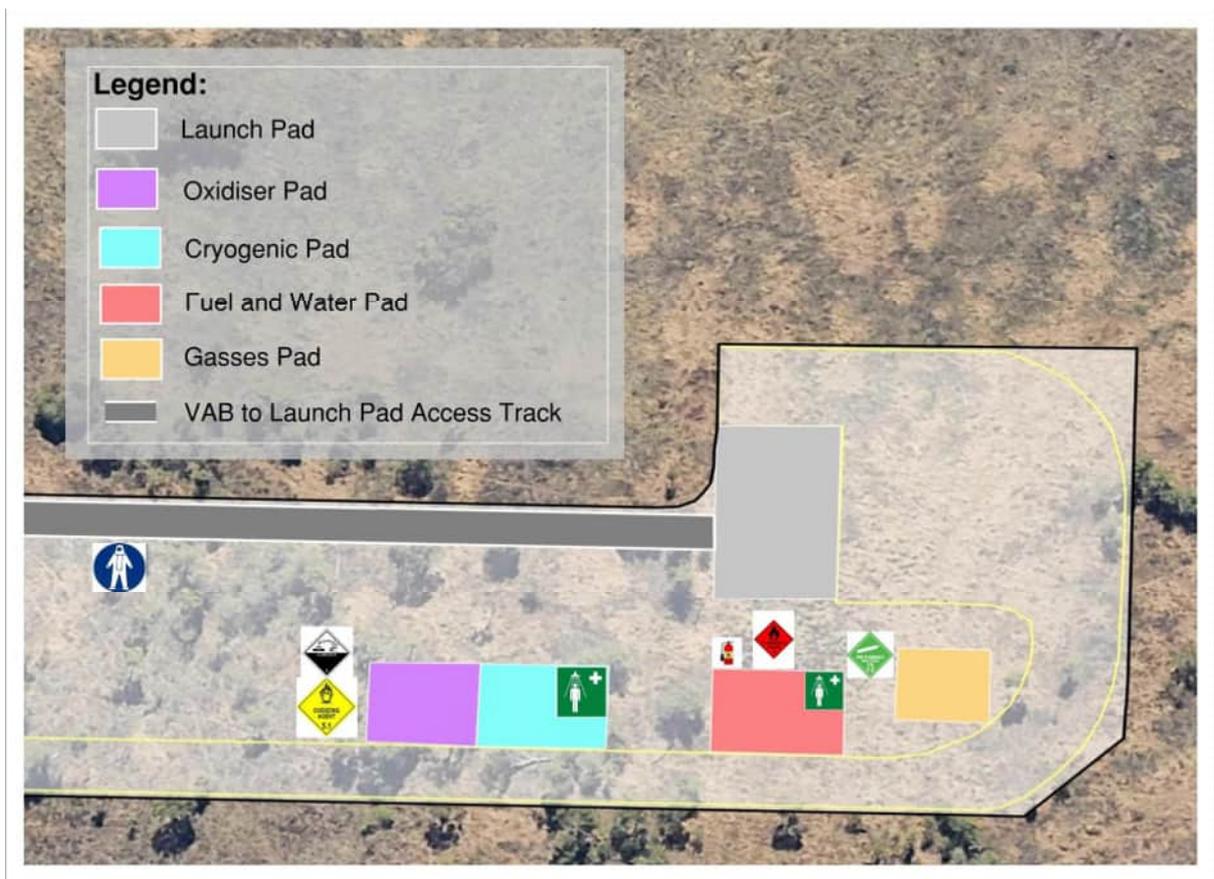


Figure 3 - Hazardous and Dangerous Goods Storage Areas Layout for Launch Pad and Storage Pads



6 Training

All personnel working with hazardous substances shall have suitable training and be assessed as competent by the Site Supervisor and the Workplace Health and Safety Officer. Training shall include elements in the identification, safe use, storage, and handling of hazardous substances in accordance with the relevant SDS for each hazardous substance.

Successful training to enable work with hazardous substances must be recorded by a verification of competency or training assessment record. Training records must be approved by a competent person. Records of training must be obtained and stored by the Workplace Health and Safety Officer prior to a person undertaking work activities.



Abbreviations

Abbreviation	Definition
1080	Sodium Fluoroacetate
ACH	Aboriginal Cultural Heritage
ADG Code	Australian Code for the Transport of Dangerous Goods by Road and Rail
AMSA	Australian Maritime Safety Authority
APSDA	Abbot Point State Development Area
ASA	Australian Space Agency
AusSpOC	Australian Space Operations Centre
BOM	Bureau of Meteorology
BOS	Bowen Orbital Spaceport
CSMP	Coral Sea Marine Park
DA	Development Application
DFO	Distant Focusing Overpressure
DGR	Dangerous Goods Regulations
EAA	Emergency Assembly Area
EC	Emergency Controller
ECG	Emergency Control Group
ECSS	European Cooperation for Space Standardization
EDQ	Economic Development Queensland
EMP	Environmental Management Plan
EP Act	Environmental Protection Act
ERA	Environmentally Relevant Activity
ERP	Emergency Response Plan
ESC	Erosion and Sediment Control
ESCP	Erosion and Sediment Management Plan
EW	Emergency Warden
EWLCC	LCC Emergency Warden
EWLPAD	LPAD Emergency Warden
EWVAB	VAB Emergency Warden
FMECA	Failure Modes, Effects, and Criticality Analysis
FMP	Facilities Management Plan
FSS	Flight Safety System
GBRMP	Great Barrier Reef Marine Park
GBRMPA	Great Barrier Reef Marine Park Authority
GP	General Public
GST	Gilmour Space Technologies
H ₂ O	Water
H ₂ O ₂	Hydrogen Peroxide
HDGMP	Hazardous and Dangerous Goods Management Plan
IAASS	International Association for the Advancement of Space Safety
IATA	International Air Transport Association



IIP	Instantaneous Impact Point
IMDGC	International Maritime Dangerous Goods Code
Kero	Kerosene
LCC	Launch Control Centre
LDMG	Local Disaster Management Group
LEO	Low Earth Orbit
LMP	Land Management Plan
LOx	Liquid Oxygen
LPAD	Launch Pad
MCU	Material Change of Use
MEDQ	Minister for Economic Development of Queensland
MSDS	Material Safety and Data Sheets
NASA	National Aeronautics and Space Administration
NEW	Net Explosive Weight
NOBP	North Queensland Bulk Ports
O ₂	Oxygen
PCBU	Person Conducting a Business or Undertaking
PPE	Personal Protective Equipment
QFES	Queensland Fire and Emergency Services
QPOL	Queensland Police Open Learning
QPS	Queensland Police Service
RHD	Rabbit Haemorrhagic Disease
SDA	State Development Area
SDS	Safety Data Sheet
SO	Safety Officer
SPP	State Planning Policy
SSP	Site Security Plan
TAP	Transport and Access Plan
TBC	To be Confirmed
TNT	Trinitrotoluene
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VAB	Vehicle Assembly Building
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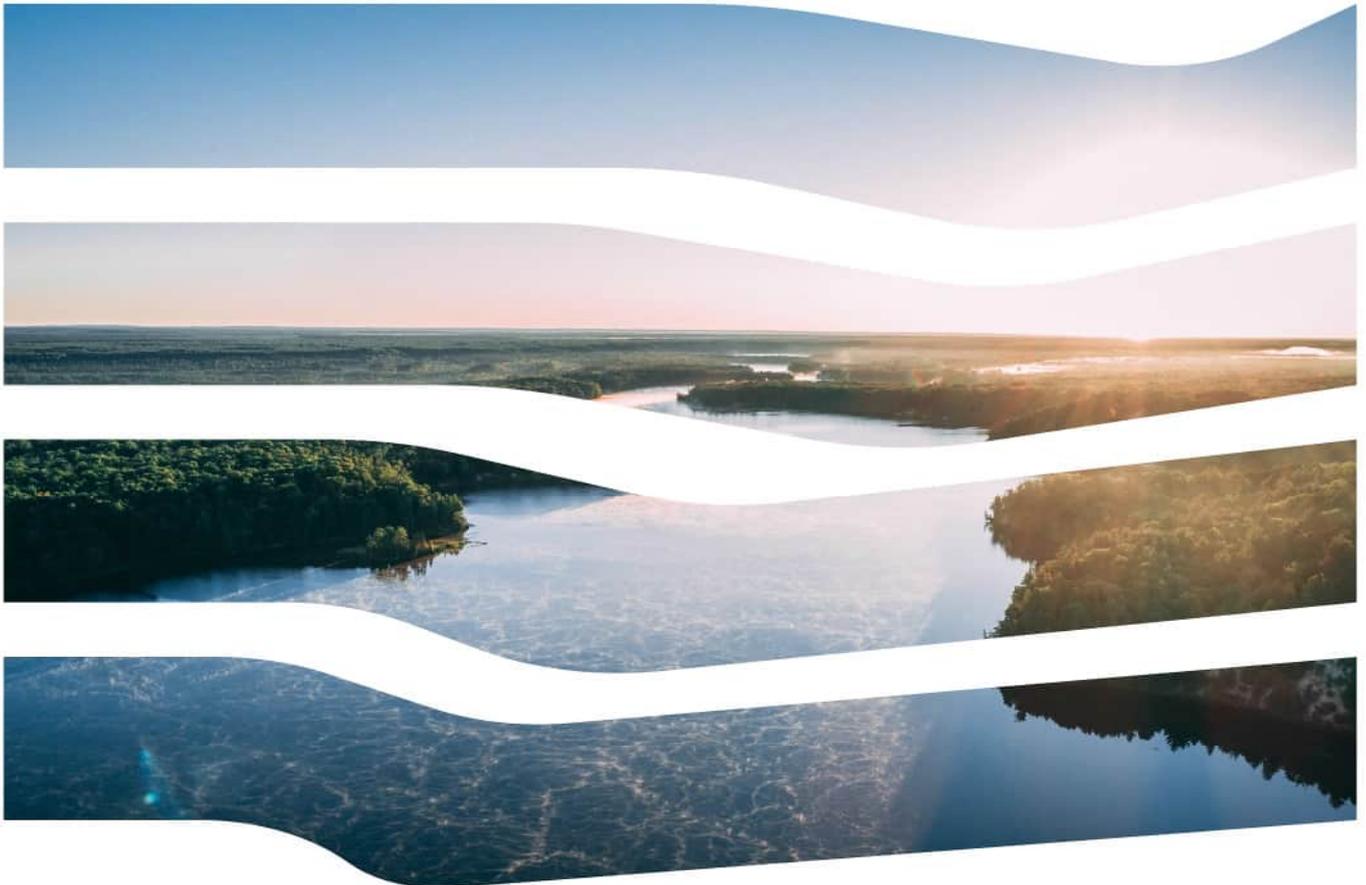


Appendix G Site-based Land and Pest Management Plan



SITE-BASED LAND AND PEST MANAGEMENT PLAN

Gilmour Space Technologies Pty Ltd



202108

Site-based Land and Pest
Management Plan

14/09/2022

Document status

Project No	Version	Document name	Client	Author	Reviewer	Review date
202108	Final	Site-based Land and Pest Management Plan	Gilmour Space Technologies Pty Ltd	A. Fitzgerald	L. Liessmann	14/09/2022

Approval for issue

Approver	Signature	Approval date
A. Fitzgerald		14/09/2022

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Contents

1	INTRODUCTION	1
1.1	Objectives	1
1.2	Responsibility	1
1.3	Timing	1
2	RELEVANT LEGISLATION, GUIDELINES, STANDARDS AND APPROVAL CONDITIONS.....	3
2.1	Legislation.....	3
2.2	Relevant approval conditions.....	4
3	DESCRIPTION OF ACTIVITIES	6
4	EXISTING ENVIRONMENT	8
4.1	Site location and description.....	8
4.2	Vegetation communities	8
4.3	Invasive weeds	11
4.4	Invasive fauna.....	13
5	LAND AND PEST MANAGEMENT PLAN	14
5.1	Pest flora and fauna management.....	14
5.1.1	Pest flora and fauna risk.....	14
5.1.2	Prevention and control.....	14
5.1.3	Records	16
5.2	Rehabilitation	17
5.2.1	Rehabilitation extent and treatment.....	17
5.2.2	Rehabilitation success factors	17
5.2.3	Adaptive management strategies.....	17
5.2.4	Rehabilitation timing and process	19
5.2.5	Planning ground disturbance/clearing	19
5.2.6	Topsoil and subsoil management	19
5.2.7	Soil assessment and amelioration	20
5.2.8	Land stabilisation and erosion management	22
5.2.9	Ripping prior to placement of soil.....	22
5.2.10	Topsoil and vegetation dispersal.....	23
5.2.11	Fauna habitat return	23
5.2.12	Revegetation	23
5.2.13	Site maintenance.....	24
6	MONITORING	26
7	PERFORMANCE AND COMPLETION CRITERIA AND CORRECTIVE ACTIONS.....	27
8	QUALITY REQUIREMENT	28
8.1	Post rehabilitation inspections	28
8.2	Hold points.....	28
9	COMPLETION REPORT	29
9.1	Rehabilitation works completion	29
9.2	Rehabilitation maintenance period completion report.....	29
10	REFERENCES	30

Tables

Table 1	Relevant legislation	3
Table 2	Relevant conditions from DA permits.....	4
Table 3	Regional ecosystems descriptions.....	8
Table 4	Listed and significant weeds recorded	11
Table 5	Invasive fauna species with a potential to occur in the Project area	13
Table 6	Mitigations strategies to control and manage pest flora and fauna	15
Table 7	Topsoil sampling frequency.....	21
Table 8	Suitable plant species for rehabilitation of disturbed areas	24
Table 9	Monitoring requirements.....	26
Table 10	Performance and completion criteria and corrective actions.....	27
Table 11	Monitoring requirements.....	28

Figures

Figure 1	Bowen Orbital Spaceport Location.....	2
Figure 2	BOS Facility layout.....	7
Figure 3	Revised regional ecosystem mapping.....	10
Figure 4	Weed mapping of site and adjacent land	12
Figure 5	Rehabilitation Extent	18

Appendices

Appendix A	DAF weed fact sheets	31
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1 INTRODUCTION

This Site-based Land and Pest Management Plan (LPMP) was prepared by Terra Solutions Pty Ltd (Terra) for Gilmour Space Technologies (Gilmour) for the Bowen Orbital Spaceport (BOS) Launch Operations located on Lots 8, 9 and 10 on SP295408 (the site) in the Abbot Point State Development Area (Figure 1).

The Office of the Coordinator General (OCG) approved a material change of use (MCU) for a high impact industry (launch facility) in accordance with section 84E of the *State Development and Public Works Organisation Act 1971*. The MCU provides this approval from the date of obtaining Commonwealth approval pursuant to the *Space (Launches and Returns) Act 2018*, for a launch facility licence to operate a launch facility on the site.

Relevant conditions of the OCG approval require that a LPMP be implemented to demonstrate compliance with the Development Approval and following conditions are identified in Section 2.2.

1.1 Objectives

The objective of the LPMP is to provide a framework that will ensure appropriate pest management and rehabilitation is undertaken throughout the operational phases in accordance with legislative requirements, conditions of approval, stakeholder interests and industry best practice.

The primary objectives of this LPMP include the following:

- **Pest management** – ensure that the distribution or abundance of invasive species does not increase because of the proposed construction and operational activities, including the spread of invasive species from the site onto adjacent areas.
- **Rehabilitation and maintenance** – within disturbed temporary construction areas return as close as practicable to pre-disturbed conditions and contours, which is currently dominated by pastures for the purpose of cattle grazing.

1.2 Responsibility

Gilmour will be responsible for the projects LPMP. This is supported by the provisions in the lease agreements executed between Gilmour and the OCG prior to the construction commencement.

This DRMP prescribes standard pest management and rehabilitation methods that may be applied to project area as a minimum. The Contractor(s) will be responsible for developing and implementing site and stage-specific pest management and rehabilitation plans as required, taking into consideration detailed staging of works, local environmental and landholder requirements and relevant conditions of development approvals.

1.3 Timing

Should the use cease for a period of more than twelve months, the subject land must be decommissioned and rehabilitated in accordance with the Decommissioning and Rehabilitation Management Plan.

LEGEND

-  Watercourses
-  BOS Site
-  Lake

Road

-  Highway
-  Local
-  Private or Restricted
-  Railway line
-  Subject allotments



CLIENT: GILMOUR SPACE TECHNOLOGIES

FIGURE 1: BOWEN ORBITAL SPACEPORT LOCATION

Credits:
 © State of Queensland (Department of Natural Resources Mines and Energy) 2020, Includes material © State of Queensland (Department of Resources); © Planet Labs Netherlands B.V. reproduced under licence from Planet and Geoplex, all rights reserved, 2022.

DOCUMENT: 202108-3_Site Location

DATE: 08/09/2022 AUTHOR: A.Fitzaerald



1:32,000

Coordinate system: GDA2020 / MGA zone 55 EPSG:7855

2 RELEVANT LEGISLATION, GUIDELINES, STANDARDS AND APPROVAL CONDITIONS

2.1 Legislation

Table 1 provides a summary of the key legislation and policies relevant to the pest management and rehabilitation of the BOS.

Table 1 Relevant legislation

Legislation	Description
<i>Environmental Protection Act 1994 (EP Act)</i>	The object of the EP Act is to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (ecologically sustainable development).
<i>Biosecurity Act 2014 (Biosecurity Act)</i>	The Biosecurity Act is designed to ensure a consistent, modern, risk-based and less prescriptive approach to biosecurity in Queensland. The Act requires all people and organisations in Queensland to manage biosecurity risks under their control under the general biosecurity obligation.
<i>Agricultural Chemicals Distribution Control Act 1966 (ACDC Act)</i>	The ACDC Act regulates distribution and the licensing for the distribution of agricultural chemicals in Queensland. The purpose of the act is to ensure that agricultural chemicals are distributed responsibly to avoid harm to human health, agriculture, livestock or the environment.
<i>Weeds of National Significance (WoNS)</i>	Weeds of National Significance (WoNS) is a list of 32 weeds agreed by Australian governments as requiring prioritisation based on their invasiveness, potential for spread and environmental, social and economic impacts. Landowners and land managers at all levels are responsible for managing WoNS. State and territory governments are responsible for legislation, regulation and administration of weeds. A strategic plan for each WoNS has been developed. The strategies aim to: <ul style="list-style-type: none"> - Prevent spread of new infestations - Reduce adverse impacts of existing infestations - Establish and maintain national commitment - Coordinate management at a national level - Increase community awareness.
<i>National Strategies</i>	National strategies help government, industry and the broader community manage weeds in a coordinated manner at a national level. National strategies include: <ul style="list-style-type: none"> - Australian Pest Animal Strategy 2017 to 2027 (Department of Agriculture and Water Resources) - Australian Weeds Strategy 2017 to 2027 (Department of Agriculture and Water Resources) - Threat Abatement plans.
<i>Queensland Pest Animal Strategy</i>	The Queensland Pest Animal Strategy establishes a state-wide planning framework, providing clear direction to government, community, industry and individuals for the management of pest and problem animals across the state. It gives a common basis for addressing current and potential pest problems that impact on primary industries, ecosystems, human health and the community's enjoyment of our natural resources. It also assists in the development of regional natural resource management planning. The following species or groups of species are covered in the strategy: The Queensland Pest Animal Strategy establishes a state-wide planning framework, providing clear direction to government, community, industry and individuals for the management of pest and problem animals across the state. It gives a common basis for addressing current and potential pest problems that impact on primary industries, ecosystems, human health and the community's

	<p>enjoyment of our natural resources. It also assists in the development of regional natural resource management planning.</p> <p>The following species or groups of species are covered in the strategy:</p> <ul style="list-style-type: none"> - Introduced mammals and reptiles that have pest impact, including animals declared under the Act - Introduced pest birds - Introduced amphibians - Some native species in certain situations, including kangaroos, bats, native rats, native birds and locusts - Exotic pest fishes. <p>The strategy is based on a number of accepted principles of pest management that have been considered for both pest and problem animals and incorporated into the desired outcomes, objectives and strategic action.</p>
Whitsunday Regional Council Biosecurity Plan 2021-2025	The purpose of the Whitsunday Regional Council Biosecurity Plan 2021-2025 is to guide pest management within the Whitsunday Local Government Area. This Biosecurity Plan has been written to comply with the Queensland <i>Biosecurity Act 2014</i> and applies to all land within the jurisdiction of Whitsunday Regional Council.

2.2 Relevant approval conditions

The permits applicable to the activity include the following:

- Decision notice for AP2021/007 – SDA approval for a material change of use for a high impact industry (launch facility) in the Abbot Point State Development Area (SDA)

Requirements of the approval relevant for the development of the DRMP and sections of the DRMP that address the conditions are detailed in Table 2.

Table 2 Relevant conditions from DA permits

Condition Number	Condition	Section addressed
AP2021/007 – SDA approval for a material change of use for a high impact industry (launch facility) in the Abbot Point State Development Area (SDA)		
Condition 12.1	<p>Prepare and submit to the Coordinator-General and Whitsunday Regional Council, a detailed project specific Environmental Management Plan (EMP) addressing both the construction and operational phases of the project.</p> <p>The EMP must be certified by an independent suitably qualified third-party confirming the adequacy of the EMP in accordance with current best practice. The EMP must include the following matters:</p> <p>n) site-based land management (refer to enclosure 12)</p>	This document
38 – Land Management Plan	Condition 40.1: Landscape all disturbed areas during construction, through the planting of native trees, bushes and scrubs, to allow the root network to stabilise the underlying soils.	Section 5.2
	Condition 40.2: Maintain landscaping and replace any failed or failing trees or shrubs	Section 5.2
	Condition 40.3: Implement the pest management plan prepared in accordance with condition 12.1 of this condition document	Section 5.1

Condition Number	Condition	Section addressed
Enclosure 12 – Site Based Land Management Plan	<p>To demonstrate compliance with condition 21.1 of this development approval:</p> <p>a) Prepare a site-based and management plan that includes a site-based pest management plan in accordance with the Department of Agriculture and Fisheries ‘Pest Management Planning’ guidance material that includes, but is not limited to, the following:</p> <ul style="list-style-type: none"> i. a pre-works inspection of the property to locate, map and identify existing pest flora and fauna species ii. training of site personnel in the identification of local pest species likely to occur at the site. iii. No vehicles enter the wetland protection area 50 m buffer zone 	<p>Section 3.2 to 3.4</p> <p>Section 5.1.2.1</p> <p>Section 5.1.2.2</p>
	<p>b) Implement the procedures/ requirements contained in the site-based pest management plan, prepared in accordance with (a).</p>	<p>Section 5.0</p>

3 DESCRIPTION OF ACTIVITIES

The BOS facility comprises a Launch Control Centre and the Launch Facility. The Launch facility incorporates a concreted area which supports all launch infrastructure including a Vehicle Assembly Building (VAB), launch pad and launch fluids and utilities storage pads. A layout of the BOS facility is provided in Figure 2.

The VAB is the primary location for onsite operations. The VAB is approximately 40m x 18m x 7m with large roller doors at the northern and southern ends and internal facilities including air-conditioned clean rooms, cribbing and ablution, open plan office, tooling and equipment and a material storage room. The northern end of the VAB is aligned with the launch pad centre.

The launch pad and utilities storage pads are located north of the VAB and connected via an internal site road. This area contains all infrastructure to support launch activities including a launch pad, fluid storage, acoustic suppression system, fuel transfer lines and spill collection pits. The operation and management of activities on the launch pad follow detailed launch procedures which are developed and maintained for each launch mission.

Launch activity will involve the transport, re-integration, final verification, fuelling and launch of orbital class launch vehicles.

Space launch activity is planned for a frequency of not more than 12 launches per calendar year and this maximum frequency will be reflected in the Launch Facility License granted by the Australian Space Agency.



Terra
SOLUTIONS

DOCUMENT: 202108-3_Launch Facility Site Layout

DATE: 14/09/2022

AUTHOR: A.Fitzaerald

CLIENT: GILMOUR SPACE TECHNOLOGIES

FIGURE 2: BOS FACILITY LAYOUT

0 200 400 600 m

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Coordinate system: GDA2020 / MGA zone 55 EPSG:7855

4 EXISTING ENVIRONMENT

4.1 Site location and description

The BOS Site is located approximately 15 km west of the Bowen township in the Whitsunday Regional Council LGA. The Site is in the north-eastern corner of the Abbot Point State Development Area (APSDA) over three allotments with property descriptions of Lots 8, 9 and 10 on SP295408. Collectively these properties occupy an area of 163.14 ha within an area of the APSDA designated as an industrial use precinct and the facility footprint will be approximately 3 ha.

The facility shares boundaries with:

- Two cattle grazing properties
- An operational hard rock quarry (west of the launch site)
- Intermittent road and rail services along Abbot Point Road corridor and the Newlands System rail which connect the North Queensland Bulk Ports terminal.
- Saltwater creek and dune systems between the site and the coastline

The APSDA provides for a range of existing and future development opportunities including the port facilities precinct which consists of existing port infrastructure, port expansion precinct, restricted development precinct, industry precinct, infrastructure and corridors precinct and environmental management/materials transportation precinct. The launch facility is located within the industry precinct, which is largely undeveloped from an industrial perspective and is still dominated by a grazing land use.

Waters to the west, north and south of the Port of Abbot Point are classified as a General Use Zone under the GBRMP zoning (Map 8 – Cape Upstart). The area of water directly associated with the Port is classified as an exclusion zone within the Great Barrier Reef Marine Park.

4.2 Vegetation communities

Vegetation communities present on the site consist of the following:

- RE 11.1.1 - *Sporobolus virginicus* grassland on marine clay plains
- RE 11.3.30 - *Eucalyptus crebra*, *Corymbia dallachiana* woodland on alluvial plains
- 11.12.1 - *Eucalyptus crebra* woodland on igneous rocks
- RE 11.1.2: Samphire forbland on marine clay plains
- RE 11.3.27e: Freshwater/brackish wetlands fringed with *Melaleuca leucadendra* and *M. dealbata*.

A description of each RE, it's protection status pursuant to the *Vegetation Management Act* 1999 is presented in Table 3 and the extent of each community is presented in Figure 3.

The vegetation communities on the site were observed to be relatively intact with a low abundance of invasive weeds including chinee apple (*Ziziphus mauritiana*), rubber vine (*Cryptostegia grandiflora*) and parkinsonia (*Parkinsonia aculeata*).

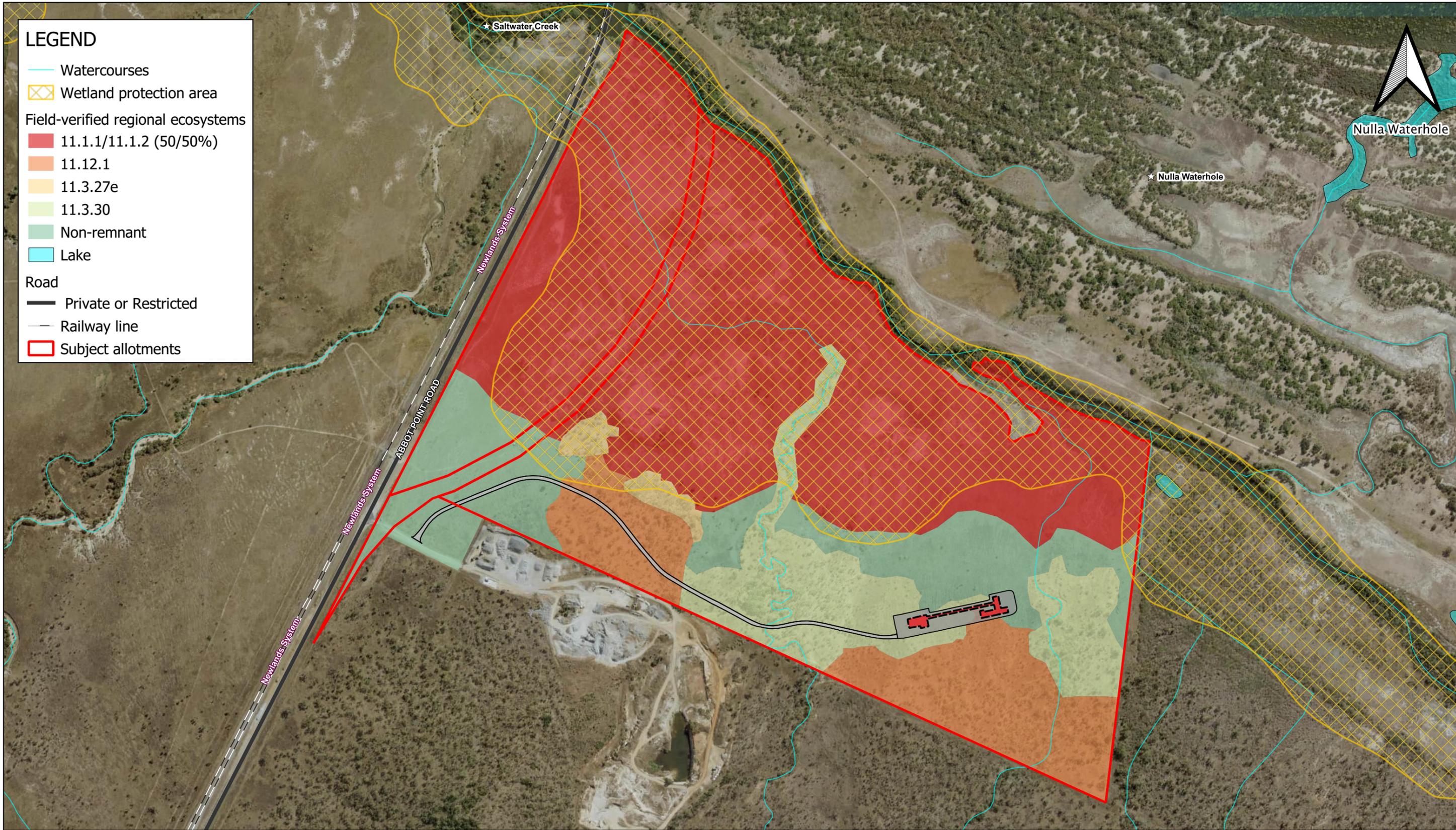
Table 3 Regional ecosystems descriptions

Regional ecosystem	VM Act Status	Description
7.3.8	Least concern	<i>Sporobolus virginicus</i> grassland on marine clay plains
7.3.45	Least concern	<i>Eucalyptus brownii</i> woodland on alluvial plains

Regional ecosystem	VM Act Status	Description
11.3.30	Least concern	<i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains
11.3.32	Least concern	<i>Allocasuarina luehmannii</i> low open woodland on alluvial plains
11.12.1	Least concern	<i>Eucalyptus crebra</i> woodland on igneous rocks

LEGEND

-  Watercourses
-  Wetland protection area
- Field-verified regional ecosystems
 -  11.1.1/11.1.2 (50/50%)
 -  11.12.1
 -  11.3.27e
 -  11.3.30
 -  Non-remnant
 -  Lake
- Road
 -  Private or Restricted
 -  Railway line
 -  Subject allotments

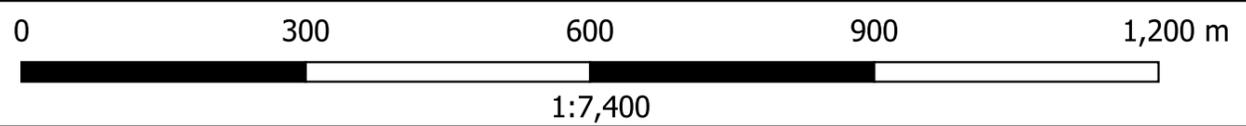


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FIGURE 3: REVISED REGIONAL ECOSYSTEM MAPPING

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DOCUMENT: 202108-3_Field verified vegetation map
 DATE: 14/09/2022 AUTHOR: A.Fitzaerald



Coordinate system: GDA2020 / MGA zone 55 EPSG:7855

4.3 Invasive weeds

All persons in Queensland have a general biosecurity obligation to prevent the spread of weeds and therefore must take all reasonable and practical steps to prevent or minimise biosecurity risk.

Weed species known to occur in the area have been identified via desktop assessment (WildNet database) and on ground ecological assessment (Terra Solutions 2022). Six exotic species listed under the Biosecurity Act and two other important invasive species were confirmed on or immediately adjacent to the site (Table 4), including four species identified by the WildNet database. Each species listed under the Biosecurity Act is classified as a Restricted Category 3 Invasive plant which means that a person must not release the plants into the environment, give away or sell as a plant or sell something infested with its seeds. Three species are also classified as 'Weeds of National Significance' (WoNS) and whilst there are no legislative implications under National law, WoNS are recognised as problematic invasive plants at a National level.

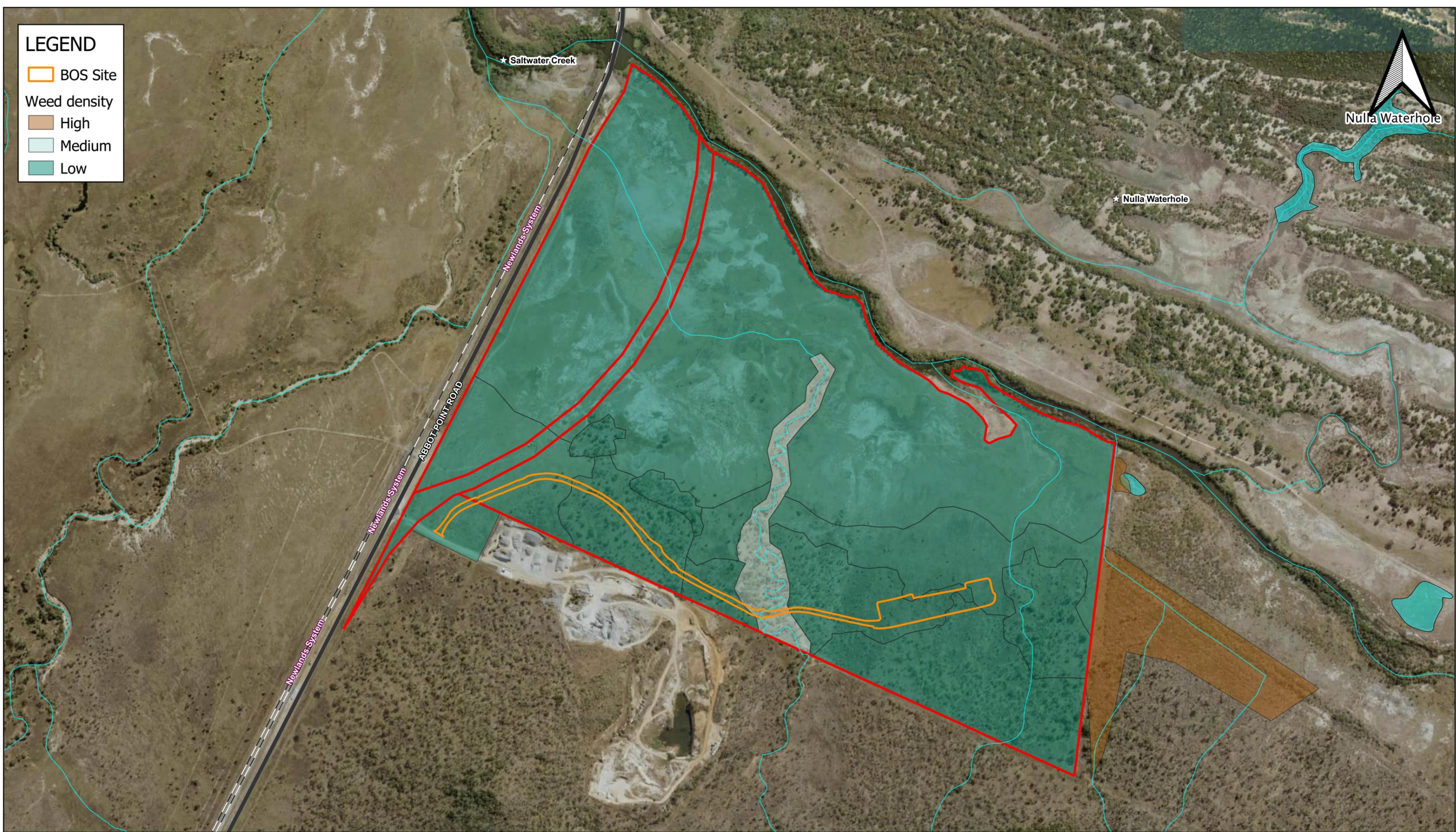
Broad scale weed mapping indicating notable infestations for priority control are presented in Figure 4. The highest weed density is within the overbank flow area (up to 50 m each side) of the main onsite watercourse where rubber vine, parkinsonia, chinee apple, mimosa bush and leucaena are dominant. Weeds over the remaining areas of the site occur as single plants or in small clusters. Rat's tail grass was only identified in one location. The species is often spread by vehicle movements and commonly occurs along access tracks.

A significant infestation of bellyache bush, mimosa bush and potentially prickly acacia (Category 3 and WoNS) is present on the adjacent landholding to the east of the site. In this area bellyache bush occurs as a dense low shrub layer and the prickly bush/bushes form a dense tall shrub layer. There is potential for this infestation to spread on the BOS thereby increasing weed management costs over time. It is the obligation of the adjacent landholder to control this infestation under the GBO, and engagement with this landholder is recommended to prevent the spread of this infestation.

Table 4 Listed and significant weeds recorded

Species	Common Name	Declaration ¹	Confirmed on property
<i>Cryptostegia grandiflora</i>	Rubber vine	- Category 3 - WoNS	Yes
<i>Jatropha gossypifolia</i>	Bellyache bush	- Category 3 - WoNS	Adjacent land
<i>Parkinsonia aculeata</i>	Parkinsonia	- Category 3 - WoNS	Yes
<i>Sporobolus sp.</i>	Rat's tail grass	- Category 3	Yes
<i>Vachellia nilotica</i> *	Prickly acacia	- Category 3 - WoNS	Yes
<i>Ziziphus mauritiana</i>	Chinee apple	- Category 3	Yes
Other important invasive species			
<i>Vachellia farnesiana</i>	Mimosa bush	- Invasive plant	Yes
<i>Leucaena leucocephala</i>	Leucaena	- Invasive plant - Locally declared	Yes

Notes: ¹ Category 3 means a restricted Category 3 invasive plant. WoNS means a Weed of National Significance. Locally declared means declared as a priority weed in the Whitsunday Regional Council – Weed Management Program (2017). * Denotes possibility of presence on land to the east of the site.



LEGEND

- BOS Site
- Weed density
- High
- Medium
- Low

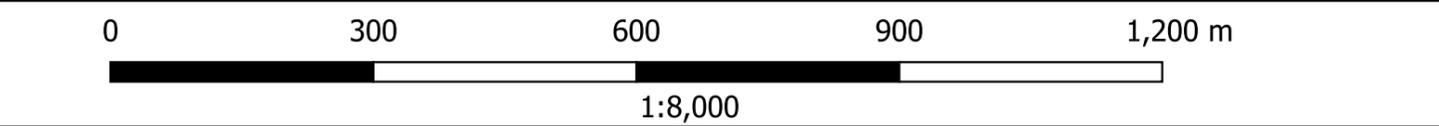


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FIGURE 4: WEED DENSITY MAP

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DOCUMENT: 202108-3_Weed density map
 DATE: 14/09/2022 AUTHOR: A.Fitzaerald



Coordinate system: GDA2020 / MGA zone 55 EPSG:7855

4.4 Invasive fauna

The WildNet database search of the Whitsunday Local Government Area (LGA) returned 14 exotic fauna species that have previously been recorded within the LGA.

A total of eight fauna species are listed under the Biosecurity Act (Table 5) and all have the potential to occur within the project area. No invasive animals of state or national significance were noted as being present on site during the Baseline Condition Assessment (Terra Solutions 2022).

Each species is classified as a Restricted Category 3 invasive fauna under the Biosecurity Act which means that a person must not distribute, either given as a gift, sold, traded or released into the environment unless the distribution or disposal is authorised in a regulation or under a permit.

Table 5 Invasive fauna species with a potential to occur in the Project area

Species name	Common name	State declaration	Likelihood of occurrence
<i>Canis sp.</i>	Wild dog	3, 4, 5, 6	Possible
<i>Vulpes vulpes</i>	Red fox	3, 4, 5, 6	Possible
<i>Felis catus</i>	Cat	3, 4, 6	Probable
<i>Oryctolagus cuniculus</i>	Rabbit	3, 4, 5, 6	Possible
<i>Sus scrofa</i>	Feral pig	3, 4, 6	Probable
<i>Axis axis</i>	Feral chital (axis) deer	3, 4, 6	Possible
<i>Dama dama</i>	Feral fallow deer	3, 4, 6	Possible

5 LAND AND PEST MANAGEMENT PLAN

5.1 Pest flora and fauna management

5.1.1 Pest flora and fauna risk

Operational activities have the potential to increase the abundance and extent of pest flora and fauna in the project area via the following processes:

- Movement of vehicle and equipment
- Importing fill and/or plants to the project area
- Vegetation clearing and disturbance activities
- Vehicle washdown and inspection
- Waste management
- Changes to hydrology including the introduction of areas of ponded water

Construction and operation phases are not expected to cause a net increase in abundance or distribution of any declared pest animal species provided that all rubbish and food scraps are removed from the project area and not left onsite overnight.

5.1.2 Prevention and control

The project has the potential to facilitate dispersal and establishment of pest flora and fauna in areas within the project area and adjacent properties. The following general recommendations will apply to the management of pest flora and fauna throughout the construction and operational phases.

5.1.2.1 Training

Appropriate induction procedures should be developed to train staff, contractors and visitors in the identification and management of pest species.

- Induction procedures should incorporate current information, including:
 - Identification of declared and other pest and infestation areas.
 - Potential risk associated with the movement of vehicles and machinery and importation of plants and fill.
 - Corrective and management actions
 - Legislative requirements (e.g. monitoring, control and reporting)
- Relevant staff and contractors should attain established proficiencies in the identification of pests and infestation sites, in the assessment of risk of pest incursion and in the inspection of vehicles and equipment.
- Relevant resources should support induction training and be readily available throughout the duration of the project.

5.1.2.2 Management Plan

Mitigation measures proposed to manage and control pest fauna and flora during construction and operational phases are detailed in Table 6.

Table 6 Mitigations strategies to control and manage pest flora and fauna

Aspect	Mitigation measure
Planning	<ul style="list-style-type: none"> • Minimise vegetation and soil disturbance and the area to be cleared, wherever practicable, to reduce opportunistic infestation and the disturbance/transfer of pest material. • Vehicles should keep to designated access tracks wherever possible, and particularly avoid driving over declared weeds to avoid translocating seeds. • Consider potential for soil disturbance when determining pest flora control methods. Chemical control or slashing may be preferable to heavy mechanical control in situations where erosion and sedimentation area an issue (i.e. during the wet season, in areas adjacent to waterways). • Vehicles are prohibited from entering the wetland area and associated 50 m buffer identified in Figure 3. • Undertake regular property monitoring for the establishment of new weeds.
Vehicle and machinery washdown	<ul style="list-style-type: none"> • Contracts with suppliers of equipment and services will include vehicle washdown conditions prior to presenting to site. • Vehicles will be washed down prior to entering the property. • All inspections of vehicles, machinery, personnel and materials should be undertaken by a suitably trained and proficient personnel.
Treatment and control	<ul style="list-style-type: none"> • Weed control to be undertaken by a suitably qualified contractor to the extent of the property boundaries. • Ensure all procedures for the treatment and control of pests are current, in accordance with best practice and compliant with relevant legislative guidelines. • Treatment and control activities should only be undertaken by suitably trained and certified personnel or contractors. • Chemicals used in the control of pest species should be used in accordance with any label requirements and safety data sheets. • Declared weed species should be treated/removed from construction areas, prior to the commencement of clearing activities. This is to limit the spread of weeds which may be mulched along with cleared vegetation. All weed species have the potential to reshoot within mulched material. Priority species to remove/treat before clearance due to the likelihood of spread, include the declared species rubber vine, bellyache bush, parkinsonia, rat’s tail grass, prickly acacia, chinese apple and other important invasive species including mimosa bush and leucaena. • DAF have published fact sheets for each of the species present and detailed information in relation control methods, to the situation or site setting to which the herbicide applies, the rate of application and the method of application (Appendix A). • Treatment options should be undertaken using an integrated approach. Methods may involve a combination of physical, chemical and/or biological methods, depending on the species and extent of infestations. Some species may require subsequent treatments due to viability of seed banks for longer periods. • Prior to any use of mechanical clearing, proposed treatment sites should be examined, and desirable trees and regrowth clearly marked with pink flagging tape to help reduce clearing of native vegetation. • Appropriate minor use permits from the Commonwealth Australian Pesticides and Veterinary Medicines Authority may apply. • Non-residual agents (such as Roundup Bioactive) should be used in the treatment of weeds wherever practicable to ensure mulch

Aspect	Mitigation measure
	<p>stockpiled from cleared vegetation is free of chemical reagents, prior to use.</p> <ul style="list-style-type: none"> • Stockpiled weeds awaiting removal should be covered or enclosed on covered receptacles to prevent foraging by fauna or wind dispersal of seed. • Appropriate waste control measures should be established to minimise the transfer or plant waste and external seed sources and new, external food sources for pest fauna. • All putrescible waste should be limited to a maximum one week in the project area

5.1.3 Records

Under the ACDC Act 1966, ground herbicide distribution contractors must record:

- The name of the licensed operator carrying out or supervising the ground distribution
- The name and address of the person for whom the ground distribution is being carried out, including postal and physical address of the property
- Particulars to identify the chemical as well as the distinguishing number (registration number assigned to the product by the Australian Pesticides and Veterinary Medicines Authority), if the chemical has a number. Particulars to identify the chemical could include the full registered trade name of the product as found on the label, the name of the manufacturer of the chemical or the name and amount of the active constituent of the chemical (this must be recorded for each herbicide used).
- The diluent used (i.e. water or oil), details of any wetter, spreader, emulsifier or other material added to the spray mixture (i.e. the full registered name on the label of the product used).
- Details identifying the exact location of the land treated, including distance and directions from the nearest town site (e.g. the Real Property Description Number found on the rates notice for the property, together with a farm map detailing paddock names or numbers). Use of global positioning system (GPS) devices may also be helpful in determining and recording the exact location of the land treated.
- The date or dates and start and finish times of the ground distribution carried out.
- Details of weather conditions, such as the wind direction and velocity (strength), at the commencement time and place of the ground distribution.
- Details of any change in wind velocity or direction occurring once the ground distribution commences and up until it concludes, including recording the time when the change occurred.
- The quantity, concentration (rate per hectare) and total volume of herbicide mixture applied.
- The total area covered.
- A description of the type of crop treated or a situation in which the chemical was used (e.g. roadsides, fallow).
- The purpose for which the herbicide was applied.

5.2 Rehabilitation

5.2.1 Rehabilitation extent and treatment

Rehabilitation (i.e. hydromulching) shall be undertaken to all temporary disturbance areas that are not required for operational purposes as a minimum, with the following treatments:

Areas to be rehabilitated during project operations consists of all temporary disturbance areas associated with track renewal and construction along with the construction of the launch facility. The maximum area likely to require is 1.19 ha (Figure 5).

5.2.2 Rehabilitation success factors

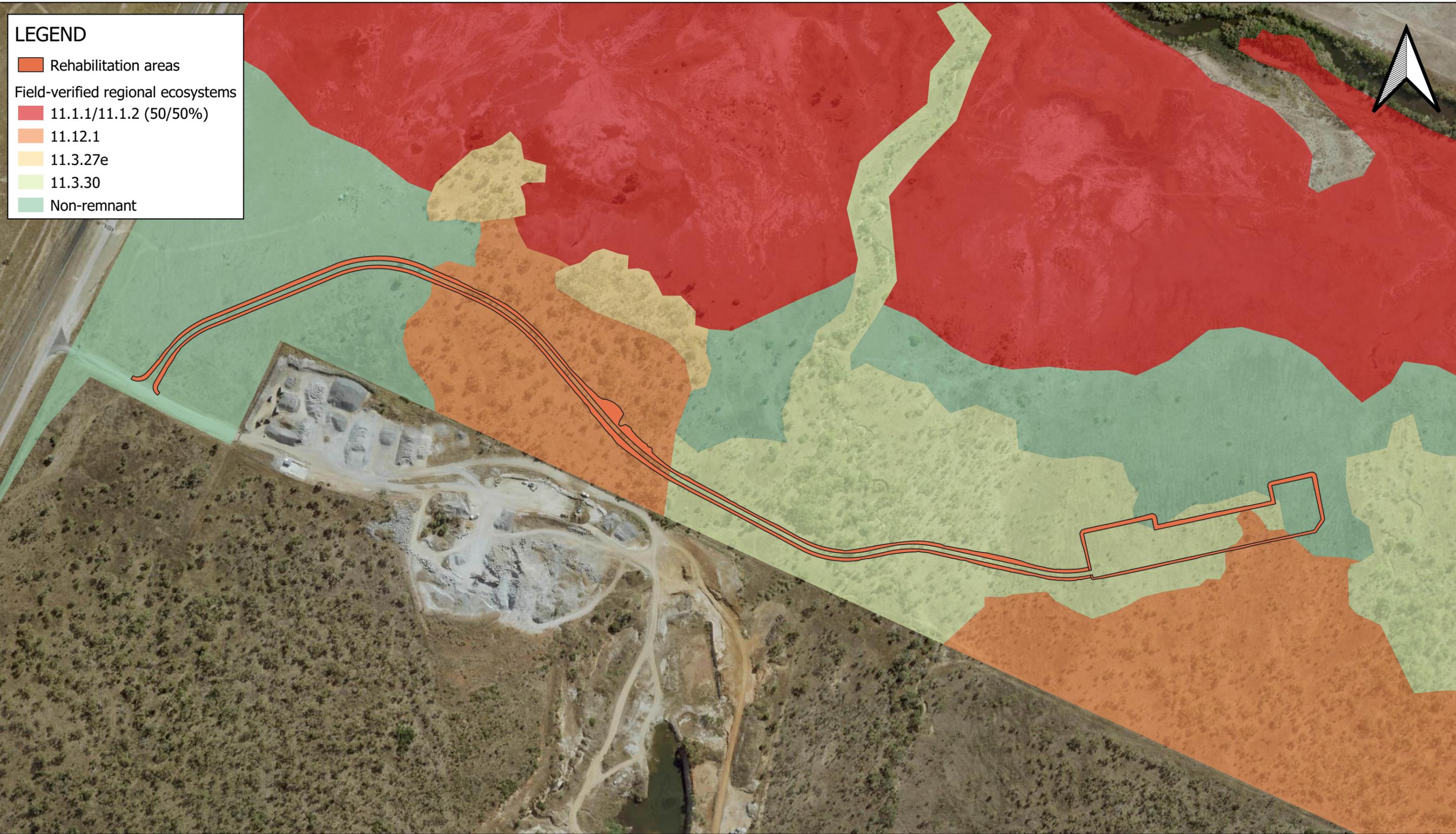
Typical rehabilitation success factors are as follows:

- Soil moisture availability:
 - High variability and low reliability rainfall means rehabilitation timing is critical. Where practicable, rehabilitation is to be scheduled immediately prior to the wet season to ensure soil moisture levels are optimal and to provide a greater chance of subsequent rain events. This will reduce the amount of manual watering required (e.g. water trucks or equivalent methods). Seasonal trends can be reviewed at Queensland Government the Long Paddock SOI Phase Rainfall Probabilities for planning purposes.
- Seed bank and mix and weed management:
 - Topsoil when correctly stripped, stockpiled and managed can provide a significant seed bank and mix of native species when respread across a rehabilitation area and thereby reducing the need for added native grass seed. However, fast germinating weed species may colonise rehabilitation areas if conditions for native species are not met (i.e. soil moisture). Segregation of weed-infested and weed-free topsoil stockpiles and appropriate weed management controls is therefore critical to the success of rehabilitation.
- Soil nutrients:
 - Vegetation and soil nutrient cycles can be disrupted from construction and decommissioning activities resulting in nutrient deficiencies in underlying subsoil and stockpiled topsoil. Topsoil when correctly stripped, stockpiled and managed can retain sufficient nutrients for native species when respread. Placing vegetation (mulched or otherwise) on top of topsoil stockpiles and following rehabilitation can also assist in nutrient retention. This may mitigate the requirement for application of fertilisers to rehabilitation areas.
- Site preparation:
 - Soil compaction from construction activities inhibits rainfall infiltration and increases the risk of erosion to rehabilitation areas. Ripping along contours will promote successful rehabilitation of native species.

5.2.3 Adaptive management strategies

Adaptive management practices shall be implemented where monitoring indicates rehabilitated areas will not achieve rehabilitation objectives and completion criteria.

It will be the responsibility of the Contractor(s) to implement rehabilitation and adaptive management strategies if required.



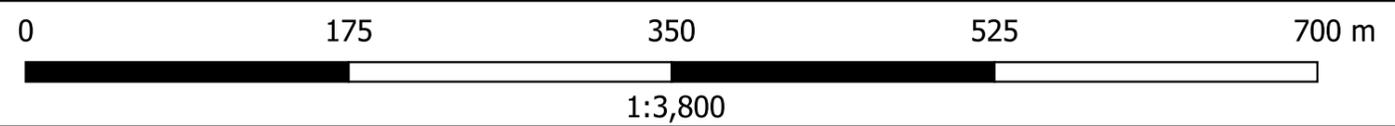
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FIGURE 5: REHABILITATION AREAS

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DOCUMENT: 202108-3_Rehabilitation areas

DATE: 14/09/2022 AUTHOR: A.Fitzaerald



Coordinate system: GDA2020 / MGA zone 55 EPSG:7855

5.2.4 Rehabilitation timing and process

Areas that have been temporarily cleared and are no longer required for construction activities shall be progressively rehabilitated (nominally within six weeks of the cessation of works in an area). Progressive rehabilitation requires rehabilitation of cleared/disturbed areas throughout the work program rather than leaving all rehabilitation to the end of the program. Consideration will also be given to the timing of rehabilitation activities such that it promotes natural regeneration of disturbed areas, maximising potential of existing seedbank and minimising potential for erosion.

5.2.5 Planning ground disturbance/clearing

No work, including ground disturbance and clearing of vegetation, shall be undertaken without works approval (or equivalent Contractor permit to work approval). The works approval shall confirm that the proposed works are undertaken within an approved area and all environmental management requirements are in place, or construction teams are sufficiently resourced to implement the management requirements. Works approvals shall be reviewed by a suitably qualified representative familiar with Project requirements (e.g. Launch Operations Supervisor).

A sufficient area for stockpiling of topsoil/subsoil shall be included in the works approvals. The designation of the area should consider the following:

- The proximity to active drainage lines/waterways and appropriate erosion and sediment control
- Separation of subsoil and topsoil stockpiles
- Location as close as practicable to the final use area while avoiding potential for disturbance from construction activities.

Ground disturbance/clearing areas shall be clearly demarcated on construction drawings and disturbance areas shall be surveyed and marked with flagging prior to commencement of the works. Preferably any excavation equipment involved in the works shall be GPS guided with working areas and any no-go zones pre-uploaded.

Access for vehicles and machinery shall be along designated access tracks, roads and laydown areas. These areas will be defined in the field and on construction drawings to limit impacts on native vegetation, flora and fauna and to reduce subsequent rehabilitation requirements.

In addition, the following should be considered during site establishment/clearing:

- Clearing to be restricted to a maximum 40 m wide construction corridor outside nominated distances from Vegetation Management Act 1999 mapped watercourses which will be limited to 20 m
- Ancillary activities during construction will be located within the 40 m wide construction corridor, existing non-remnant areas (Category X) or existing cleared areas to avoid additional disturbance
- Where reasonable and practicable, cleared vegetation shall be mulched (e.g. via tub grinding) for use on the site as an erosion control aid. This shall not be undertaken where it comprises topsoil and vegetation stockpiles for use in revegetation works.

5.2.6 Topsoil and subsoil management

Topsoil stripping shall occur as close to the ground works commencement date as practicable using a method that minimises compaction and handling and preserves seed bank. Topsoil shall be stripped to a suitable depth based on analysis of the soil profile, however, should be a minimum of 100 mm (where available).

The collection of saturated topsoil following rainfall should be avoided. Where possible, topsoil will be collected at a time of year when the soil seed bank is likely to be at its highest (i.e. post wet season).

Vegetation and topsoil shall be removed in separate stages and stripped vegetation may be temporarily placed on top of topsoil where practicable to reduce wind erosion. To avoid hard setting, water shall not be

used for dust suppression during topsoil stripping or on topsoil stockpiles unless required to mitigate dust impacts to sensitive land uses.

Topsoil shall be reused immediately or stockpiled for rehabilitation. The location of the stockpile shall be planned sufficiently such that the stockpile will not require moving until its required for rehabilitation.

Subsoil should be stockpiled separately for subsequent reuse as backfill material in landscaping or other general fill requirements if appropriate for the use.

Where required, diversion berms shall be constructed from subsoil to direct water away from sensitive infrastructure (or disturbed surfaces for erosion protection) before expected rainfall.

If required, sodic soil will be treated with gypsum at an application rate determined by soil testing. Where treating is not required or warranted, sodic soil may be reburied under a subsoil/topsoil cap of no less than 300 mm.

Topsoil shall be stockpiled to a maximum height of two metres and subsoil or spoil can be stockpiled to a maximum height of four metres. A record (via survey) of topsoil and subsoil stockpiles shall be kept, outlining the date of placement, source location, mapped location of stockpile and estimated volumes. If at risk of disturbance from construction activities, topsoil signs are to be placed on stockpiles and shall include the following details:

- Black lettering on a white background, with a lettering size that can be clearly seen from a vehicle close by
- The words "TOPSOIL STOCKPILE"
- The date of placement
- The source location (e.g. chainage or KP)
- A "KEEP OFF" warning
- Indication if the topsoil is from a weed risk area

Stockpiles shall be stabilised where necessary using viable erosion and sediment control measures, depending on the duration and size of the stockpile to be protected. This may include mulching, minor diversion of upslope surface water or sediment fencing. Stockpiles shall not be in or adjacent to drainage lines or areas where eroded material could be transported into surface water bodies. Topsoil stockpiles shall not be placed where they can slump into sensitive areas. Stockpiles shall be located within the disturbance area where vegetation has been cleared where they will not impede construction activities.

Habitat features such as boulders and hollow logs shall be set aside during clearing works for later placement in rehabilitated areas for rehabilitation stabilisation and fauna habitat.

5.2.7 Soil assessment and amelioration

A soil assessment within the revegetation areas shall be undertaken by the Contractor to provide site specific recommendations for soil amelioration.

The soil sampling and assessment program shall be conducted by a suitably qualified soil scientist. Soil analysis should be undertaken by an Australasian Soil and Plant Analysis Council (ASPAC) certified laboratories.

Sampling and analysis conducted on topsoil and subsoils should conform with the below.

5.2.7.1 Topsoil

Topsoil sampling shall comply with the following requirements:

- Samples shall be representative of the topsoil type (i.e. no mixing different soil types or subsoils).
- Samples shall be collected as per the frequency outlined in Table 7.

- If sampling stockpiles, sub-samples shall be sampled from various locations and 0.5 m apart.
- Composite samples shall include 10 sub-samples.
- Approximately 3 kg of sample shall be collected.

Table 7 Topsoil sampling frequency

Topsoil	Frequency
In situ topsoil	1 per 2,500 m ² With a minimum of one test per topsoil type
Site stockpile	1 per 500 m ³ With a minimum of one test per topsoil type
Manufactured site topsoil	1 per 500 m ³ With a minimum of one test per topsoil type
Imported topsoil	1 per 500 m ³ With a minimum of one test per topsoil type

Laboratory analysis shall be undertaken in accordance with relevant Forms outlined in Transport and Main Roads Specification MRTS16 Landscape and Revegetation Works (MRTS16) and shall include:

- Bulk density
- Organic matter
- Wettability
- pH Electrical conductivity
- Extractable Phosphorus content
- Permeability
- Texture
- Water repellence (hydrophobicity)
- Dispersion
- Exchangeable Calcium, Magnesium
- Calcium/Magnesium ratio
- Exchangeable Sodium percentage
- Exchangeable Potassium, Aluminium
- Effective cation exchange capacity
 - – If EC > 1.2 dS/m – Soluble Chloride*
 - – If EC > 1.2 dS/m – Extractable Sulfur*.

Note: * not included when testing manufactured topsoil

5.2.7.2 Subsoil

Subsoil sampling shall comply with the following requirements:

- Samples shall be representative of the subsoil type (i.e. no mixing different soil types or topsoils)
- One test per subsoil type

- Composite samples shall include 10 sub-samples
- Approximately 1 kg of sample shall be collected

Laboratory analysis shall be undertaken in accordance with relevant Forms outlined in MRTS16 and include:

- Wettability
- pH
- Electrical conductivity
- Texture
- Water repellence (hydrophobicity)
- Exchangeable Calcium
- Exchangeable Magnesium
- Calcium/Magnesium ratio
- Exchangeable Sodium percentage
- Exchangeable Potassium
- Exchangeable Aluminium
- Effective cation exchange capacity.

5.2.8 Land stabilisation and erosion management

Prior to commencement of rehabilitation, disturbed areas shall be reshaped to a stable form and align with the surrounding natural landforms. Access tracks may not require rehabilitation under this management plan unless it forms part of the terms of use. Disturbed surface areas will be roughened to reduce the effects of compaction, allowing for natural regeneration processes to occur.

Natural drainage patterns shall be reinstated as close to pre-disturbance as reasonably possible. Where natural drainage patterns cannot be re-established, drainage control measures shall be implemented. Any drainage control measures must take into consideration the potential for erosion from channelled runoff. Erosion and sediment control measures shall be developed in line with the requirements of erosion and sediment control plan.

Slope lengths and angles shall be compatible with the surrounding landscape, suitable for the proposed land use and resistant to erosion. Reconstructed landforms shall be left with a relatively natural profile to allow for topsoil placement and re-spreading.

The watercourses and drainage line embankments should be reprofiled and rock protection placed where required. Binders suitable for cold spray application may also be applied to stabilise mulched and seeded surfaces on banks in areas of high-risk erosion.

5.2.9 Ripping prior to placement of soil

Ripping may be required to reduce compaction and allow infiltration of rainfall into rehabilitated areas. This shall include:

- Removal of any hardstand material (i.e. gravel)
- Deep ripping of compacted areas such as hardstand and laydown areas shall take place after land stabilisation and prior to the placement of topsoil
- Deep ripping shall take place across the natural slope (i.e. parallel to contours) to reduce overland flow velocity and mitigate erosion, at a depth of approximately 0.1 m. Highly compacted areas such as hardstands, laydowns and temporary access tracks may need to be ripped to a greater depth of 0.3 m if possible, with available machinery

5.2.10 Topsoil and vegetation dispersal

Following ripping, topsoil and vegetation shall be redistributed across the area in accordance with the following steps:

- The source stockpile used during rehabilitation shall comprise topsoil taken from the area or from within similar types of soil and vegetation
- Recovery and dispersal of any soil shall not occur if the stockpiles are in a saturated condition.
- Topsoil shall be respread to a depth of approximately 100 mm where volumes permit. Where an excess of topsoil exists, a greater depth of soil may be respread
- Spreading of topsoil should occur from the far edge of the disturbed area (i.e. further from the access point), progressively moving inwards as to reduce the risk of compaction and destruction of seed bank
- Topsoil shall tie in evenly to the natural slope and adjacent vegetation to mitigate erosion risk

5.2.11 Fauna habitat return

Notable fauna habitat features (e.g. boulders, large logs, vegetation with hollows) shall be placed across the rehabilitation area. This shall be planned to minimise compaction and destruction of seed bank from equipment. For example, in large laydown yards, an access track may be left to provide access for placement of fauna habitat and then rehabilitated (i.e. ripped and topsoil placed) as the last item for completion.

Prior to moving any stockpiled rocks or logs for use in rehabilitation they shall be inspected to ensure there are no resident fauna. Any identified fauna shall be removed and relocated by a qualified fauna handler.

5.2.12 Revegetation

Revegetation shall be performed using hydromulching techniques as outlined below.

- Revegetation to be undertaken by a suitably qualified and experienced contractor.
- Mark out the areas to be rehabilitated.
- Weed eradication prior to undertaking revegetation works.
- Calculate material requirements for rehabilitation works well in advance of work commencement (noting there may be a requirement to propagate certain plant species)
- Contact nursery/seed providers to ascertain the availability of seed for use in rehabilitation work
- Nursery/seed providers must provide proof of 'local providence' for all material. A record of providence should be maintained by the contractor undertaking the work. Where possible, local provenance is within 100 km of the site.
- Apply hydromulching material to revegetation areas (100% cover on areas to be revegetated) at the minimum application rate as per the nominated product requirements. Hydromulch shall not be applied under the following weather conditions:
 - Temperature is higher than 35°C
 - Winds exceed 15 km/hr
 - Where, in the opinion of the Superintendent the surface is too wet
 - During rain periods or when rain appears imminent

Specific hydromulch details are provided below:

- Endemic grass species should be used with the goal of surface stabilisation through over-seeding the rehabilitation area with endemic grass species.

- Seeding rate should be sufficient for germination and sustainable cover of approximately 1,000 plants per hectare, per riparian zone.
- A minimum of four different native/endemic grass species should be used from
- Table 8.
- Bonded fibre matrix to be provided as a minimum. 6-month functional longevity, minimum application rate of 5,000 kg/ha (500 g/m²) and minimum wet thickness of 5 mm.
- Apply hydromulching material to rehabilitation areas (100% cover on entire rehabilitation footprint) at the minimum application rate as per the nominated product requirements.

Table 8 Suitable plant species for rehabilitation of disturbed areas

Lifeform	Species	Common name
Forb	<i>Indigofera spp</i>	
Forb	<i>Glycine tabacina</i>	Glycine
Forb	<i>Galactia tenuiflora</i>	Galactia
Forb	<i>Tephrosia juncea</i>	Pink tephrosia
Forb	<i>Grewia retusifolia</i>	Dog's balls
Grass	<i>Sehima nervosum</i>	Queensland Bluegrass
Grass	<i>Heteropogon contortus</i>	Black Speargrass
Grass	<i>Heteropogon triticeus</i>	Giant spear grass
Grass	<i>Bothriochloa bladhii</i>	Forest bluegrass
Grass	<i>Themeda triandra</i>	Kangaroo Grass
Grass	<i>Cynodon dactylon</i>	Green couch

5.2.13 Site maintenance

Maintenance of rehabilitation areas will be required to achieve project objectives. The following maintenance and obligations that will be required are as follows:

- Establishment phase maintenance of rehabilitation areas
- Ongoing maintenance of rehabilitation areas.

5.2.13.1 Establishment phase maintenance

After rehabilitation is established the following minimum maintenance tasks shall be undertaken for the first 12 weeks after completion of rehabilitation:

- Any combination of water truck, hand watering and/or temporary irrigation system shall be utilised to fully establish the plants and grass within the project.
- Inspection for declared weed species should be undertaken every four months by personnel experienced in weed identification and control should be undertaken as necessary using appropriate control techniques.

- Inspection of watercourses to ensure weather has not caused any degradation of the rehabilitation works in these areas and undertake restoration works where required.

5.2.13.2 Ongoing maintenance

Once established, the following site maintenance activities will be undertaken:

- Site inspection for declared weed species should be undertaken every four months by personnel experienced in weed identification and control should be undertaken as necessary using appropriate control techniques.
- Inspection of watercourses to ensure weather has not caused any degradation of the rehabilitation works in these areas and undertake restoration works where required.

6 MONITORING

Monitoring will be undertaken by a separate representative appointed by Gilmour and undertaken every three months until the end of the Defects Liability Period. Pest flora and fauna monitoring will be ongoing and undertaken annually after the end of the Defects Liability Period. Monitoring requirements are detailed in Table 9.

Table 9 Monitoring requirements

Element	Description
Photographic points	Two points for each watercourse or drainage featured restored will be established and marked with star pickets
Soil stability	Assessed visually by observing each monitoring site for signs of erosion.
Groundcover	Groundcover establishment will be assessed by randomly placing five 1x1 m plots at 10 sites within the rehabilitation areas where hydromulching is proposed recording the following: <ul style="list-style-type: none"> • Species present and individual percent cover litter percent cover • Rock percent cover cryptogam percent cover bare earth percent cover.
Flora and fauna pests	Assess visually for: <ul style="list-style-type: none"> • Pest activity (e.g. sighting's, pest damage etc) • Presence and location of declared weeds • Weed infestations in disturbed areas.

7 PERFORMANCE AND COMPLETION CRITERIA AND CORRECTIVE ACTIONS

Monitoring results will be used to determine if the following performance criteria are met, as interim outcomes and targets, prior to completion criteria being achieved. These criteria provide an indication of the success of the management measures being implemented and serve as a trigger values where failure to achieve will result in the implementation of corrective actions. Performance and completion criteria and corrective actions are detailed in Table 10.

Table 10 Performance and completion criteria and corrective actions

Element	Criteria	Compliance	Potential corrective actions
Landform	Final landform is stable and land surface contours within riparian areas are consistent with the adjacent areas	At completion of rehabilitation maintenance period	Installation or repair of erosion and sediment control measures where erosion or stabilisation issues are identified.
Endemic groundcover	Land is vegetated with groundcover (>70% groundcover comprising of preferred endemic species) which is not a declared weeds species and is established and self-sustaining	At completion of rehabilitation maintenance period	Removal of weeds where undesirable species are present
Suitability	Land is fit for purpose (grazing pasture, bank stabilisation) Safe for humans and wildlife	At completion of rehabilitation maintenance period	All of the above
Flora and fauna pests	No declared weeds or new weed infestations No new pest animal activity	At completion of the rehabilitation maintenance period and annually thereafter.	<ul style="list-style-type: none"> Removal of declared weeds and new weed infestations Identify and implement fauna pest management specific actions

8 QUALITY REQUIREMENT

8.1 Post rehabilitation inspections

Following the completion of rehabilitation works and prior to demobilisation from site, rehabilitated areas shall be inspected by a suitable qualified and experienced representative familiar with Project requirements (e.g. environmental manager or equivalent). The purpose of the inspection will be to record and sign off that works have been completed generally in accordance with this DRMP. If rehabilitation works are considered not to meet the requirements outlined in this DRMP, corrective actions shall be agreed and recorded. Corrective actions shall then be implemented by the responsible Contractor with a follow up inspection completed to certify the rectification works were completed to the required standard.

8.2 Hold points

Table 11 identifies the required hold points and required inspections.

Table 11 Monitoring requirements

Activity	Requirement	Notice for inspection	Level of inspection	Released by
Quality control	Submission of all quality control documentation including management plans and inspection and testing plans	10 working days	Hold Point	Superintendent
Revegetation	Submission of revegetation contractor qualifications	10 working days	Hold Point	Superintendent
Survey	Submission of proposed land to be revegetated	10 working days	Hold Point	Superintendent
Weed eradication	Submission of proposed method for weed eradication	10 working days	Hold Point	Superintendent
MSDS to be provided	10 working days	10 working days	Hold Point	Superintendent
Seed Mix	Submission of seed mix for approval	10 working days	Hold Point	Superintendent
On site mark out	On site mark out of areas of re	10 working days	Hold Point	Superintendent

9 COMPLETION REPORT

9.1 Rehabilitation works completion

Contractor is to notify the Superintendent immediately on completion of the works for inspection by a suitably qualified appropriate representative. A rehabilitation completion report with suitable records is also to be provided to the superintendent within five days following the completion of the rehabilitation works.

9.2 Rehabilitation maintenance period completion report

Following completion of the revegetation maintenance period (which shall correspond to the Contract Defects Liability Period), a rehabilitation completion report demonstrating compliance of the revegetation works against the completion criteria in Section 8 shall be developed by a suitably qualified ecologist engaged by the Contractor and submitted to the Superintendent.

The completion report will be submitted by Gilmour to relevant OCG under conditions of approval.

10 REFERENCES

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Appendix A

DAF weed fact sheets

Bellyache bush

Jatropha gossypifolia



Bellyache bush is often confused with castor oil plant (*Ricinus communis*). Both plants are frequently found in the same area.

Bellyache bush has been recognised in Australia as a Weed of National Significance.

It is generally acknowledged that the shallow root system and canopy cover of bellyache bush precludes growth of other plants, often outcompeting native vegetation and reducing pasture growth. Dense infestations may occur on river flats and other areas of good loamy soil. Bellyache bush has taken over extensive sections of river frontage in several locations, reducing biodiversity and increasing mustering costs.



The fruits of bellyache bush are poisonous to humans and animals. The toxic substance is a toxalbumin which, when eaten, leads to symptoms of gastroenteritis and the eventual death of some animals. There have been many stock deaths reported due to bellyache bush poisoning, mainly in times of severe drought.

Legal requirements

Bellyache bush is a category 3 restricted invasive plant under the *Biosecurity Act 2014*. It must not be given away, sold, or released into the environment. The Act requires everyone to take all reasonable and practical steps to minimise the risks associated with invasive plants under their control. This is called a general biosecurity obligation (GBO). This fact sheet gives examples of how you can meet your GBO.

At a local level, each local government must have a biosecurity plan that covers invasive plants in its area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws. Contact your local government for more information.

Description

Bellyache bush is a squat, thick-stemmed shrub 2.5–4 m tall developing from a short, single-stemmed plant with three or four young leaves sprouting from the top. Young leaves are deeply divided into three rounded lobes, and are purple coloured and sticky. Older leaves are bright green, about 10 cm in diameter, and may have up to five lobes, the edges covered in coarse, dark brown hairs.

The flowers are small, red with yellow centres, and found in small clusters throughout the upper part of the plant. Seed pods are smooth and oval, about the size of a cherry and 12 mm across; they contain three to four seeds about 8 mm long.

Castor oil plant is similar but usually taller than bellyache bush. The leaves are larger and clearly different, with more lobes (seven to nine) which are much more pointed. Flowers and fruit are on an obvious spike near the top of the plant. Fruit are covered with soft spines and are 2.5 cm across, much larger than those on bellyache bush.

Life cycle

Bellyache bush flowers throughout the year when moisture is adequate. The seeds germinate during October to December.

Methods of spread

Spread by fruit eating birds, water, livestock and by people on machinery and for use as an ornamental plant.

Habitat and distribution

A native of tropical America, bellyache bush was sometimes grown as a garden plant. It has escaped and become naturalised in various areas of north Queensland. A number of infestations occur throughout the remainder of Queensland. It is usually common along riverbanks and roadsides.

Control

Managing bellyache bush

The GBO requires a person to take reasonable and practical steps to minimise the risks posed by bellyache bush. This fact sheet provides information and some options for controlling bellyache bush.

Mechanical control

As bellyache bush is shallow rooted, grubbing the plant by hand is effective. Repeated slashing of infested areas will help reduce density.

Grazing management

A healthy pasture consisting of large numbers of perennial grasses can effectively inhibit or increase time for an infestation to develop. Pasture management to maintain ground cover post treatment significantly reduces seedlings survival through competition.

Fire

High mortality rates using fire have been observed in the field, but only when there is a sufficient fuel load to carry a fire through a bellyache bush infestation.

Herbicide control

The herbicides currently registered for bellyache bush are listed in Table 1. Testing has shown several others to be effective against bellyache bush; they have been submitted for registration.

Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit biosecurity.qld.gov.au.



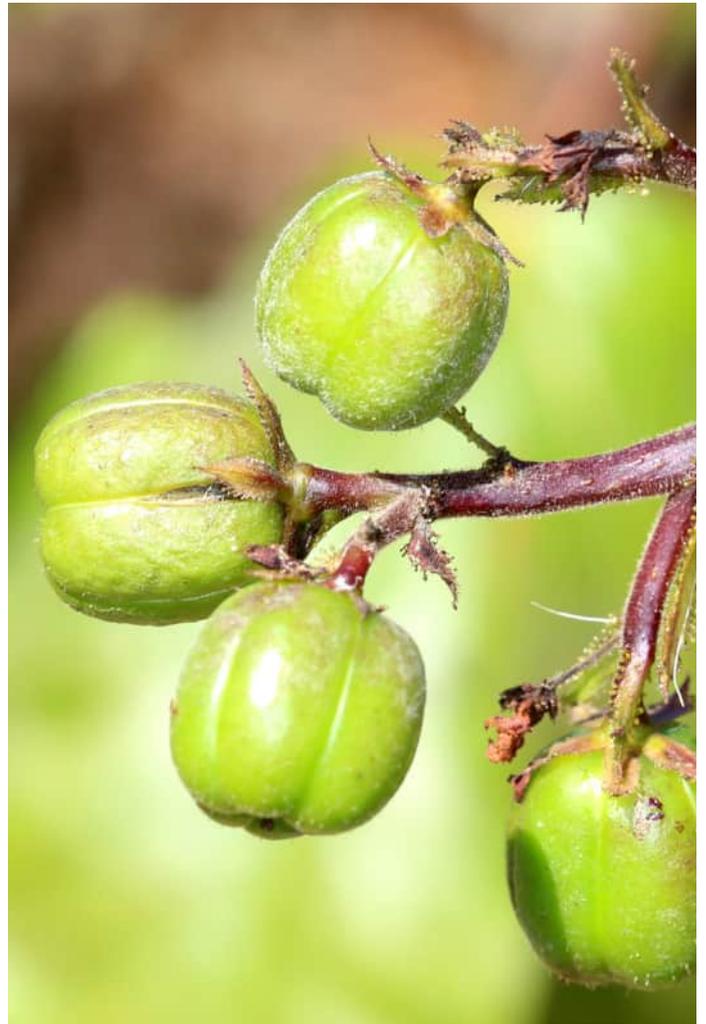
Table 1. Herbicides for the control of bellyache bush

Situation	Herbicide active ingredient	Rate	Comments
Agricultural non-crop areas, and rights-of-way, commercial and industrial areas, forests and pastures ¹	¹ Fluroxypyr as mhe 200 g/L (e.g. FMC Fluroxypyr 200 Herbicide)	0.5 L/100 L	Thoroughly wet plants and apply when actively growing.
	¹ Fluroxypyr as mhe 400 g/L (e.g. Comet 400)	0.25 L/100 L	
Agricultural non-crop areas, commercial and industrial areas, forests (including softwood plantations), pastures and rights-of-way	¹ Fluroxypyr as mhe 333 g/L (eg. Starane Advanced)	0.33 L/100 L	Thoroughly wet plants and apply when actively growing.
Forestry (softwood plantations), roadsides, industrial areas and rights-of-way ¹		0.6–1.8 L/ha	Boom application Pre-plant spray operations in forestry or general broadleaf weed growth.
Forestry (softwood plantations)		0.6–1.8 L/ha	Boom application Post-plant spray operations. Ground based directional spraying to the inter-row zone only in forestry.
Native pastures, rights-of-way, commercial and Industrial areas	Metsulfuron-methyl 600 g/kg (e.g. Associate)	10 g/100 L + penetrant	Thoroughly wet plants and apply when actively growing.
	Triclopyr as Butotyl 75 g/L + Metsulfuron-methyl 28 g/L (e.g. Zelam Brush Weed)	0.25 L/100 L	Spray just before flowering when plant is in full leaf and actively growing.
Native pastures, rights-of-way, commercial and industrial areas	Metsulfuron-methyl 600 g/kg (e.g. Associate)	1 g/1 L + Pulse 2 mL/L PERMIT 13707 (expires 30/09/2022)	Apply 4 mL/m height as foliar application using a gas or splatter gun. Treat actively growing plants with fully expanded leaves after storms. This will allow the mass germination to occur and be treated in the same pass. Seedlings underneath plants will be treated indirectly. Apply mixture to foliage in arc across plant such that all leading branches have had at least some of their leaves contact with herbicide.

Notes

¹ Products containing fluroxypyr have a 7-day withholding period in agricultural situations before grazing or cutting for stockfeed.

Read the label carefully before use. Always use the herbicide in accordance with the directions on the label.



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Restricted invasive plant

Chinee apple

Indian jujube

Ziziphus mauritiana



Dense infestations of chinee apple (or Indian jujube) create impenetrable thickets that seriously hamper stock management and reduce pasture production and accessibility. Mature trees produce large quantities of fruit that are readily eaten by stock, feral pigs, wallabies and birds, which assists the spread of the seed. Damage to top parts of the plant usually ensures vigorous regrowth from lignotubers or cut roots.

Legal requirements

Chinee apple is a category 3 restricted invasive plant under the *Biosecurity Act 2014*. It must not be given away, sold, or released into the environment. The Act requires everyone to take all reasonable and practical measures to minimise the biosecurity risks associated with invasive plants under their control. This is called a general biosecurity obligation (GBO). This fact sheet gives examples of how you can meet your GBO.



Queensland
Government

At a local level, each local government must have a biosecurity plan that covers invasive plants in its area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws. Contact your local government for more information.

Description

Chinee apple is a large shrub or small spreading tree up to 8 m high and 10 m in canopy diameter. The plants are densely branched, from ground level in some cases. Stands of chinee apple grow as open forests or form thorny thickets along waterways. Branches are zig-zag in shape and have a leaf and a thorn at each angle.

Leaves are rounded, glossy green on top and almost white underneath, and grow on alternate sides of the branches. Flowers are small and inconspicuous, greenish-white and emit an unpleasant smell. The edible fruits are similar in size and structure to a cherry, but pale yellow or orange when ripe.

Life cycle

Flowering occurs mostly from January-June with fruit developing from February onwards. The seeds germinate during the summer wet season but the tree can also regrow from damaged roots.

Methods of spread

Mostly spread by animals and birds eating the seeds in the fruit.

Habitat and distribution

Chinee apple is native to southern Asia and eastern Africa. It was first recorded in the Torres Straits in 1863 and in Townsville in 1916.

The species is widespread in north Queensland, mainly in the areas surrounding towns associated with mining early this century. The largest areas of dense chinee apple are around Charters Towers, Mingela, Ravenswood, Townsville and Hughenden, but the plant also occurs around many other towns in north and central Queensland.

Chinee apple is generally restricted to the seasonally dry tropics with an annual rainfall ranging from 200 to more than 1000 mm. During the dry season, the plant drops most of its leaves in response to water stress but rapidly produces new leaves with the opening rains of the wet season. Although the species does have a tendency to spread along watercourses in the drier regions, it is also capable of growing into dense stands on dry, exposed hillsides.

Chinee apple occurs in a wide range of soil types in association with different vegetation groups. It has successfully established on coarse-textured, gravelly mullock heaps; deep coarse-textured sands; deep alluvial soils; shallow-surfaced solodic soils; and cracking clay soils. The pattern of spread away from the towns has shown no marked preference for any soil type or vegetation association.

The major factor that appears to affect the growth of chinee apple is the density of the associated vegetation. Chinee apple does not establish successfully under the canopy of other trees and the species is normally restricted to areas that have sparse tree cover or where the other tree vegetation has been removed.

The old mining centres provided ideal conditions for establishment of chinee apple with the removal of all trees for pit timber and fuel.

Control

Managing chinee apple

The GBO requires a person to take reasonable and practical measures to minimise the risks posed by chinee apple. This fact sheet provides information and some options for controlling chinee apple.

Effective control of chinee apple can be achieved through a combination of mechanical and herbicide treatments, or by herbicide treatment alone. All areas treated must be periodically checked and any regrowth treated or the initial treatment efforts will be wasted. Follow-up is essential to ensure a successful control program.

Mechanical control

Dense infestations can be initially cleared by stick raking, ripping or using a cutter bar (if the terrain and soil type permit). Remaining broken and exposed stems should be treated by basal bark spraying as soon as possible following clearing.

In order to ensure a successful control program, regrowth must be sprayed.

Cultivation and planting crops or improved pasture will assist in the prevention of re-infestation. Herbicide treatment of regrowth should still be carried out and maintained so the initial program is not wasted.

Fire will cause some damage to the plant but regrowth is normally rapid and few plants are killed. Seedlings may be more susceptible to fire but mortality declines rapidly once they reach more than 30 cm in height.

Herbicide control

The methods of chemically treating chinee apple are described below. The herbicides registered for these methods are listed in Table 1.

Basal bark spray

For stems up to 15 cm in diameter, carefully spray completely around the base of the plant to a height of 40 cm above ground level. It is important to thoroughly spray into the crevices of multi-stemmed plants.

Larger trees may be controlled by spraying to a greater height, up to 100 cm above ground level. The best time for treatment is during autumn when plants are actively growing and soil moisture is good.

Cut stump treatment

At any time of year, cut the stems off horizontally as close to the ground as possible and immediately (within 15 seconds) swab or spray the cut surfaces and associated stem with the herbicide mixture.

Soil application

Apply granules over an area extending from the main stem to 30 cm outside the canopy drip line to cover the main part of the root system. Treated plants will not be affected

until sufficient rainfall moves the herbicide into the root zone. Do not use residual herbicides within a distance of twice the height of desirable trees.

Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit biosecurity.qld.gov.au.

Table 1. Herbicides for the control of chinee apple

Situation	Herbicide	Rate	Comments
Agricultural non-crop areas, commercial and industrial areas, fence lines, forests, pastures and rights-of-way	Triclopyr 240 g/L and Picloram 120 g/L (e.g. Access [®])	1 L/60 L diesel	Thoroughly spray all crevices. Basal bark spray plants up to 15 cm basal diameter. Cut stump plants greater than 15 cm basal diameter. For cut stump, spray immediately after cutting (consult label).
	Fluroxypyr 200 g/L (e.g. Acclaim [®] , Flagship [®] 200)	3 L/100 L diesel	Basal bark plants with up to 15 cm basal diameter. Treat circumference of stem to a height of 45 cm from the ground. For cut stump, treat plant up to 15 cm diameter and spray immediately after cutting (consult label).
	Fluroxypyr 333 g/L (e.g. Starane [®] Advanced, Fluroken 333 [®])	1.8 L/100 L diesel	
	Fluroxypyr 400 g/L (e.g. Comet [®] 400, Decoy 400 [®])	1.5 L/100 L diesel	
	Triclopyr 600 g/L (e.g. Invader [®] 600 [®] , Garlon* 600, Redeem [®] 600)	1 L/60 L diesel	Basal bark plants up to 5 cm basal diameter. Cut stump plants up to and in excess of basal bark diameter. Spray immediately after cutting (consult label).
Agricultural non-crop areas, commercial and industrial areas, fence lines, forests, pastures and rights-of-way	Triclopyr 300 g/L and Picloram 100 g/L (e.g. Conqueror [®] , Fightback [®])	350 mL/100 L water	Spray plants and seedling regrowth up to 2 m tall. Spray when plants are actively growing and cover foliage thoroughly to the point of run-off (consult label).
	Triclopyr 300 g/L, Picloram 100 g/L and Aminopyralid 8 g/L (e.g. Grazon [®] Extra)	350 mL/100 L water	Add a wetting agent e.g. BS-1000 or similar at 100 mL/100L water for best results (consult label).
Grazing pastures, forests	Picloram 20 g/kg (e.g. Tordon [™] granules)	35–45 g/m ²	Treat before growth begins or during vigorous growth when rainfall is expected (consult label).

Read the label carefully before use. Always use the herbicide in accordance with the directions on the label.



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Leucaena

Leucaena leucocephala



Established stands of leucaena form dense thickets, hindering the movement of wildlife and excluding all other plants. These thickets can also decrease visibility along roadsides. Leucaena has been planted for fodder in many tropical areas of the world, including Queensland where an introduced stomach bug prevents ruminant problems, but horses lose hair if too much is eaten. Leucaena is also used for shade, firewood and as a soil stabiliser. Unless it is heavily grazed or otherwise controlled, it is able to rapidly spread to adjacent areas.

Native to Central and South America, leucaena is also listed as a weed in New Guinea, Hawaii, western Polynesia and the United States. Leucaena has naturalised

throughout many areas of the Australian mainland and on a number of off-shore islands. Leucaena has been seen to invade many disturbed sites and creek lines and may have suppressed the regeneration of native species.

Legal requirements

Leucaena is not a prohibited or restricted invasive plant under the *Biosecurity Act 2014*. However, by law, everyone has a general biosecurity obligation (GBO) to take reasonable and practical steps to minimise the risks associated with invasive plants under their control.



Local governments must have a biosecurity plan that covers invasive plants in their area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws. Contact your local government for more information.

Description

Leucaena is a shrub growing up to about 6 m high. Leaves are about 25 cm long and bipinnate, with dull, greyish-green leaflets. Flower heads are spherical and creamy yellow in colour on short stalks about 5 cm long. Flattened pods up to 15 cm long occur in dense clusters, each pod containing around 20 flat glossy-brown seeds that scatter when ripe.

Control

Small individual plants may be manually removed, taking care to remove the roots. Controlled grazing before it grows out of cattles' reach controls it. On larger specimens or infestations, this option will probably not be feasible.

Herbicide control

There are no herbicide products specifically registered for the control of leucaena in Queensland. However, a permit held by the Department of Agriculture and Fisheries allows people generally to use some herbicide products to control leucaena as an environmental weed in various situations.

See Table 1 for the treatment options in situations allowed by the permit.

Prior to using the herbicides listed under this permit (PER11463) you must read or have read to you and understand the conditions of the permit. To obtain a copy of this permit visit apvma.gov.au.

Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit biosecurity.qld.gov.au.

Table 1. Herbicides for the control of leucaena

Situation	Herbicide	Rate	Registration details	Comments
Agricultural non-crop areas, commercial and industrial areas, fence lines, forestry, pastures and rights-of-way	Triclopyr (240 g/L) + picloram 120 g/L (e.g. Access®)	1 L per 60 L diesel	Registered	Basal bark (for plants with stem diameter <5 cm)
				Registered Cut stump method Plants up to and in excess of basal bark size
Non-crop areas including native vegetation, conservation areas, gullies, reserves and parks	Picloram 47.7 g/L + aminopyralid 4.47 g/L (e.g. Vigilant II)	Apply a layer of product 3–5 mm thick over cut surface		Cut stems no higher than 10 cm above ground level. Stems greater than 20 mm in diameter, apply 5 mm thick. In multi-stem plants treat at least 80% of stems including all main stems.
Non-agricultural areas, domestic and public service areas, commercial and industrial areas, bushland/ native forests, roadsides, rights-of-way, vacant lots, wastelands, dunal and coastal areas	Triclopyr 300 g/L + picloram 100 g/L (e.g. Conqueror) or Triclopyr 300 g/L + picloram 100 g/L + aminopyralis 8 g/L (Grazon Extra)	350 mL/100 L water	APVMA permit PER11463 (Permit expires 30/06/2023)	Foliar spray, seedlings only A permit is required for Shires of Caboolture, Caloundra, Maroochy, Noosa and Pine Rivers because of environmental concerns with picloram

Read the label carefully before use. Always use the herbicide in accordance with the directions on the label.



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Mimosa bush

Acacia farnesiana



Mimosa bush can spread readily and grow quickly. As it often forms thorny thickets, it can be a considerable nuisance during mustering and can also hinder stock access to water.

Mimosa does offer shade in open downs country and can be useful as a supplement to grass during the dry season. It may therefore be a useful plant in some areas if its spread can be controlled to prevent thicket formation. The maintenance of healthy pasture competition is the best mechanism to achieve this.

Legal requirements

Mimosa bush is not a prohibited or restricted invasive plant under the *Biosecurity Act 2014*. However, by law, everyone has a general biosecurity obligation (GBO) to take reasonable and practical steps to minimise the risks associated with invasive plants under their control.

Local governments must have a biosecurity plan that covers invasive plants in their area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws. Contact your local government for more information.



Description

Mimosa bush is a rounded shrub or small tree generally growing 2–3 m high, occasionally to 5 m. It often forms thorny thickets, and is nearly always multi-stemmed. The branches grow in a zigzag shape and are usually a grey-brown colour with prominent white spots.

Leaves are a ferny type, with 1–6 pairs of leaf ‘branches’ each with 5–20 pairs of narrow, rounded leaflets 4–8 mm long. Leaves are sometimes more of a yellowish green than a pure green. Thorns are found in pairs at the base of each leaf and can grow up to 10 cm long.

Golden yellow to orangeish flowers are ball-shaped, about 1 cm across, and grow on stalks, usually two stalks at the base of each leaf. Flowers develop into clusters of cigar-shaped pods, slightly curved and up to 6 cm long. The pods are dark brown or black and woody at maturity, with seeds embedded in the pith. Pods do not split open and tend to stay on the plant for a length of time.

Mimosa bush can be confused with the declared weeds mesquite (*Prosopis* spp.) and prickly acacia (*Vachellia nilotica*), particularly when young (see the ‘identification of prickly bushes’ fact sheet from biosecurity.qld.gov.au).

Distribution

Mimosa bush, a native of central and south America, is naturalised in Australia. Mimosa bush is widespread in Queensland, and found in all but the wettest and driest parts of the State. Seeds sprout readily and plants grow rapidly. Mimosa bush does well in dry localities and on loamy or sandy soils, forming thickets along watercourses. Mimosa bush withstands drought well, is readily eaten by stock, and has good regrowth after grazing.



Mimosa bush is not a long-lived plant. It is readily attacked by many native insects and is prone to dieback on an irregular basis. In some parts of the world mimosa bush is cultivated for perfume production.

Control

Basal bark spray

For stems up to 15 cm diameter, carefully spray completely around base of plant to a height of 30 cm above ground level. Thoroughly spray into all crevices. Larger trees may be controlled by spraying to a greater height, up to 100 cm above ground level.

The best time for treatment is during autumn when plants are actively growing and soil moisture is good.

Cut stump treatment

At any time of year, cut stems off horizontally as close to the ground as possible. Immediately (within 15 seconds) swab cut surface with herbicide mixture.

Bore drains

Channels and drains must be empty of water. Spray a one metre strip into the mud in channel or drain. Wait at least three days for diuron to bond to mud before slowly allowing water in again. Water must not be used in domestic water supply or supplied to desirable shade trees for 7–14 days after re-opening the drain.

Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit biosecurity.qld.gov.au.

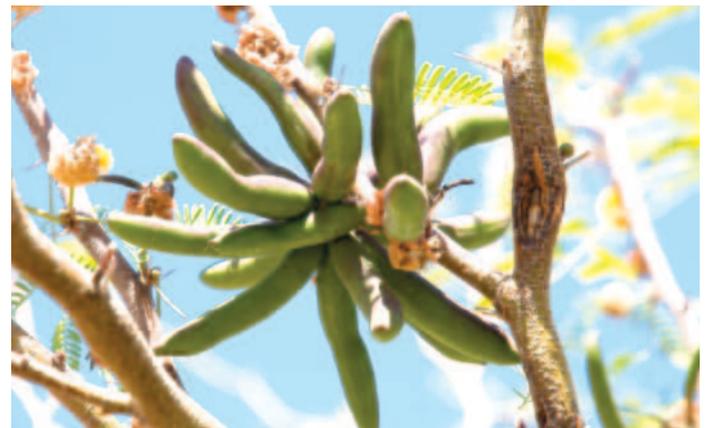


Table 1. Herbicides for the control of mimosa bush

Situation	Herbicide	Rate	Comments
Agricultural non-crop areas, commercial and industrial areas, forestry, pastures and rights-of-way	Fluroxypyr 200 g/L (e.g. Acclaim, Fluroxypyr 200)	Refer to label for the correct rate for your product	Basal bark/cut stump Plants up to 5 cm basal diameter Ensure all stems on multi-stemmed plants are treated
	Fluroxypyr 333 g/L (e.g. Starane Advanced, Fluroken 333)		
	Fluroxypyr 400 g/L (e.g. Comet 400, Fluroxypyr 400)		
Agricultural non-crop areas, commercial and industrial areas, fence lines, forestry, pastures and rights-of-way	Triclopyr 240 g/L + picloram 120 g/L (e.g. Access®)	1 L/60 L diesel	Basal bark Plants up to 5 cm basal diameter Cut stump Plants up to and in excess of basal bark diameter
Pastures, roadsides and rights-of-way	Tebuthiuron 200 g/kg (e.g. Tebular 200GR herbicide®, Graslan herbicide®, etc) (PERMIT PER13891)	2.0 g/m ² or 20 kg/ha	Soil application Application just prior to rainfall gives best results Avoid damage to off target species – refer to herbicide label and permit for product restraints and critical comments
Powerline areas, rights-of-way and grassland pasture	Clopyralid present as the triisopropanol amine 500g/L (e.g. Lontrel herbicide®, Nufarm Archer®, Farnoz Victory herbicide®) (PERMIT 14929)	500 mL of product per 100 L of water (plus non-ionic surfactant at 0.1%)	High volume spray Spray when plants are actively growing and in full leaf Full covering of foliage with spray is essential Withholding period: do not graze treated areas, or cut for stock feed, for seven days after application Consult both permit and label for critical comments
Bore drains	Diuron 500 g/L (e.g. Diuron 500SC) Diuron 900 g/kg (e.g. Diuron 900 WG)	Refer to product label	Do not apply between 1 December and 30 March each year Do not apply more than once per calendar year Do not open drains for 72 hours following treatment Do not apply if heavy rains are predicted within three days of application Application should be limited to 1 m strips along the sides of bore drains Withholding period – do not allow animals to drink water from treated bore drains for three days, before slaughter for human consumption Read the label carefully

Read the label carefully before use. Always use the herbicide in accordance with the directions on the label.



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Restricted invasive plant

Parkinsonia

Jerusalem thorn or jelly bean tree

Parkinsonia aculeata



Parkinsonia is native to tropical America but has spread throughout the world as an ornamental and shade tree. It can form dense impenetrable thorny thickets along river courses, bore drains, floodplains and grasslands. This makes land inaccessible for people and animals, restricts stock access to drinking water, decreases the amount of pasture available and excludes native vegetation.

Because of its invasiveness, parkinsonia has been recognised in Australia as a Weed of National Significance.

Legal requirements

Parkinsonia is a category 3 restricted invasive plant under the *Biosecurity Act 2014*. It must not be given away, sold, or released into the environment. The Act requires everyone to take all reasonable and practical measures to minimise the biosecurity risks associated with invasive plants under their control. This is called a general biosecurity obligation (GBO). This fact sheet gives examples of how you can meet your GBO.



Queensland
Government

At a local level, each local government must have a biosecurity plan that covers invasive plants in its area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws. Contact your local government for more information.

Description

A hairless shrub or small tree that rarely grows any more than 10 m high. Parkinsonia has slender green photosynthetic zigzag branches armed with sharp spines.

Its leaves have a short, spine-tipped stalk, with leaf branches 20–40 cm long, flattened with small, oblong leaflets along each edge.

Flowers are yellow, fragrant, five petals, each on a long, slender drooping stalk. Seeds are oval and hard, about 15 mm long, and borne in pencil-like pods 5–10 cm long, constricted between the seeds.

Life cycle

Parkinsonia is fast growing and may flower in early summer of its second or third year of growth. Once established, flowering can occur opportunistically to exploit variable seasonal conditions. Pods mature in late summer, float on water and hence are readily dispersed by flood waters.

Under favourable warm and wet field conditions, most seeds germinate within two years. However, a small proportion of seed may remain dormant for longer periods if it's under heavy pasture cover, buried deeper in the soil profile, when inundated or when insufficient rain has fallen.

Methods of spread

The pods float easily on water so can be carried long distances in floods. Seeds can spread in mud, sticking to vehicles, machinery and on footwear.

Parkinsonia can be spread by livestock, native and feral animals consuming the seed, though this is more in drought times as the pods have low palatability.

Habitat and distribution

As parkinsonia is adapted to an extremely wide range of soil types, there is little doubt that it will continue to spread through watercourses and adjoining areas throughout the sub-humid and semi-arid environments of Queensland.

The most vulnerable areas are the lower Gulf of Carpentaria region, Lake Eyre catchment especially the Channel country, Central Queensland including coastal areas and highlands, and Cape York.

Control

Managing parkinsonia

The GBO requires a person to take reasonable and practical measures to minimise the biosecurity risks posed by parkinsonia. This fact sheet provides information and some options for controlling parkinsonia.

Mechanical control

Initial clearing by stick raking, blade ploughing or ripping is effective, however:

- it is restricted to reasonably level areas away from watercourses
- clearing will hasten seed germination, necessitating follow-up control either mechanically or chemically
- before clearing, legislative obligations and restrictions must be considered.

Establishing improved pasture will aid in managing parkinsonia by competition.

Fire

Fire may be a useful tool for the management of parkinsonia infestations. Kill rates may vary from 30% to 90% with best results obtained from slow moving fires.

Fire will destroy seedlings if sufficient fuel load is present, but mature plants will usually survive.

Biological control

Four species of insects have been introduced into Australia as biological control agents against parkinsonia.

Parkinsonia seed beetles (*Penthobruchus germani* and *Mimosetetes ulkei*)

Both *Penthobruchus germani* and *Mimosetetes ulkei* are seed beetles that attack only parkinsonia and whose larvae destroy mature parkinsonia seeds.

Penthobruchus germani is a small (5–6 mm long) brown beetle from Argentina. It was first released in 1995 and has established much more readily than *Mimosetetes*. It has established readily at all release sites and spreads rapidly.

Penthobruchus can exert heavy pressure on parkinsonia seeds in some areas. In the field its presence is indicated by white eggs against a darker background of the pods. Round holes in the pods indicate that beetles have emerged.

Mimosetetes ulkei is a small (about 5 mm long) two-tone grey beetle from the USA. While it is established at several sites, it does not establish as readily as *Penthobruchus*. It has potential to contribute to the destruction of parkinsonia seeds. In the field, round emergence holes are the only external indication of its presence.

Parkinsonia leaf bug (*Rhinacloa callicrates*)

Rhinacloa callicrates is a small green bug (about 3 mm long) imported from the USA. It feeds on leaves and shoots of parkinsonia resulting in tiny round white spots where it destroys photosynthetic tissue. It is well established throughout Queensland.

Leaf-feeding looper (*Eueupithecia cisplatensis*)

Eueupithecia cisplatensis (UU) is a leaf-feeding looper caterpillar from Argentina who was imported by CSIRO. DAF releases commenced in 2013 and it is now widely established throughout Queensland. The caterpillar stage eats and damages the leaves, affecting flower and seeding production.

Dieback research

Naturally occurring fungal pathogens have been identified as causing dieback within many infestations of parkinsonia across Northern Australia. Studies by the University of Queensland and BioHerbicides Australia have resulted in the registration of an effective bioherbicide.

Herbicide control

Herbicides for the control of parkinsonia are listed in Table 1.

Aerial application

Aerial application is undertaken by purpose-built applicators by helicopter. This is useful for dense, strategic infestations although it may be expensive on a broad scale.

Foliar (overall) spray

This is an effective control method for seedlings up to 2 m tall. Spray leaf and stems to point of runoff. A wetting agent must be used.

Basal bark spray

For stems up to 15 cm diameter, carefully spray around the base of the plant to a height of 30 cm above ground level. Larger trees may be controlled by spraying to a greater height, up to 100 cm above ground level. Plants should be actively growing and preferably flowering. Field experience has shown that good soil moisture is essential for effective control.

Because parkinsonia infested areas are often subject to flooding, care is needed to ensure mud and flood debris does not prevent spray penetration to the bark. The trunk may need to be cleared before spraying. Addition of petrol or A-1 jet fuel will aid penetration.

Cut stump treatment

Cut stump treatment may be performed at any time of the year. Cut stems off horizontally as close to the ground as possible. Immediately (within 15 seconds) swab or spray the cut surface and associated stem with herbicide mixture.

Soil application

Use one dose of herbicide per metre of tree height. Place doses close to tree trunk, either with spot gun on clear bare ground, or underground with ground injector. Rain or sufficient soil moisture is required before herbicide is taken up by the plant. Do not use near watercourses or within a distance equal to at least twice the height of desirable trees.

Stem injected encapsulated bioherbicide

Treatment occurs through drilling 8 mm holes into the plant, inserting a bioherbicide capsule and re-sealing the hole (1 or 2 holes and capsules per plant). The bioherbicide causes infection, leading to severe stem damage and eventual plant death.

Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit biosecurity.qld.gov.au.



Table 1. Herbicides for the control of parkinsonia

Situation	Herbicide	Rate	Optimum stage and time	Comments
Agricultural non-crop areas on floodplains	Triclopyr 300 g/L + picloram 100 g/L (e.g. Conqueror) or Triclopyr 300 g/L + Picloram 100 g/L + Aminopyralid 8 g/L (e.g. Grazon Extra)	3 L/ha	Seedlings 1–2 m high, or 12–24 months old	Aerial application (helicopter only) Use specified wetting agent (consult label)
Grazing land	Tebuthiuron 200 g/kg registered for aerial application (e.g. Clearview)	10–15 kg/ha	Any time, but needs moisture to activate herbicide	Aerial application Use the high rate on dense infestations or heavy clay soils (consult label)
Agricultural non-crop areas, commercial and industrial areas, forests, pastures and rights-of-way	Triclopyr 300 g/L + Picloram 100 g/L (e.g. Conqueror) or Triclopyr 300 g/L + Picloram 100 g/L + Aminopyralid 8 g/L (e.g. Grazon Extra)	350 mL/100 L water	Seedlings less than 2 m tall and actively growing	High volume foliar spray Wet plant thoroughly Use wetting agent (consult label)
Agricultural non-crop areas, commercial and industrial areas, fence lines, forestry, pastures and rights-of-way	Triclopyr 240 g/L + Picloram 120 g/L (e.g. Access)	1 L/60 L diesel	See details above Stems up to 5 cm diameter	Basal bark spray Do not treat wet stems Parkinsonia can be treated using the alternative ThinLine method (consult label)
			See details above Plants up to and in excess of basal bark size	Cut stump Cut close to ground level and treat immediately
Around agricultural buildings and in pasture situations	Hexazinone 250 g/L (e.g. Velpar L, Bobcat SL Herbicide)	4 mL per spot 1 spot for each shrub/tree	Any time, but needs moisture to activate herbicide	Soil application (hand application via spotgun) Shrubs/trees up to 5 m high Avoid damage to off target species (consult label)
Grazing land	Tebuthiuron 200 g/kg (e.g. Clearview 200 GR, Scrubmaster)	1 to 1.5 g/m ²	Any time, but needs moisture to activate herbicide	Avoid damage to off target species (consult label)
Grazing lands and non-crop areas	Di-Bak Parkinsonia Bioherbicide Lasiodiplodia pseudotheobromae NT039, Macrophomina phaseolina NT094, Neoscytalidium novaehollandiae QLD003	One or two capsules per shrub	Any time	Consult label for directions for use and critical comments

Read the label carefully before use. Always use the herbicide in accordance with the directions on the label.



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Prickly acacia

Vachellia nilotica subsp. *indica* (Benth) Kyal and Boatwr



Prickly acacia was introduced into Queensland for shade and fodder. Prickly acacia infestations favour bore drains and water courses where trees spread out onto adjacent grassland. Trees along bore drains use valuable water, make maintenance of bore drains more costly, and provide seed to further increase the spread of prickly acacia. As a tree increases in size it outcompetes pasture for water.

Thorny thickets interfere with mustering, movement of stock and access to water.

Prickly acacia is a threat to biodiversity through the transformation of natural grasslands into thorny scrub and woodlands. Prickly acacia also causes soil degradation by facilitating erosion.

Prickly acacia has been recognised in Australia as a Weed of National Significance.



Legal requirements

Prickly acacia is a category 3 restricted invasive plant under the *Biosecurity Act 2014*. It must not be given away, sold, or released into the environment. The Act requires everyone to take all reasonable and practical measures to minimise the biosecurity risks associated with invasive plants under their control. This is called a general biosecurity obligation (GBO). This fact sheet gives examples of how you can meet your GBO.

At a local level, each local government must have a biosecurity plan that covers invasive plants in its area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws. Contact your local government for more information.

Description

Prickly acacia is a thorny shrub or small tree that typically grows 4–5 m high and up to 10 m. The umbrella-like canopy shape and distinctive pods are characteristic features.

The young shrubs form dense thorny thickets, while mature trees are usually single stemmed, with spreading branches that have lost most of their thorns.

Bark on saplings are orange and/or green tinged. Older trees have dark, rough bark.

Leaves are finely divided and fern-like, with four to ten pairs of leaf branches and ten to twenty pairs of small, narrow, green leaves on each branch. Pairs of stout thorns, usually 1–5 cm long, grow at the base of the leaves.

Flowers are golden-yellow, ball-shaped, about 1 cm across, grow on stems from leaf joints with two to six flowers per group. Pods are 10–15 cm or longer, flat, with narrow constrictions between the seeds, grey when ripe.

Life cycle

Flowering generally occurs late February and continues through to June. Pods ripen and fall from late October through to January. Seeds germinate after significant rainfall in late spring and summer. Seedling growth can be rapid and trees flower and set seed with two to three years after germination under ideal conditions.

Methods of spread

Stock, particularly cattle, are the main agents for dispersing seed. Seed may be viable as early as July, even in maturing green pods. The seed takes six to eight days travel through the gut so stock moved by road transportation can disperse seed over large distances. Water can also disperse pods during floods.

Habitat and distribution

There are widespread infestations of prickly acacia in areas of north-west and central-west Queensland. The variety of *Vachellia nilotica* has been cultivated in many parts of tropical Queensland for its shade and the fodder value of leaves and pods, and is now naturalised in many areas.

Several million hectares of the Mitchell grass plains are infested with prickly acacia. Major areas of infestation occur from Barcaldine north to Hughenden and west to Longreach, Winton and Julia Creek.

Prickly acacia is also found in the lower Gulf of Carpentaria region between Burketown and Normanton, at coastal locations including Bowen, Ayr and Rockhampton, in the Central Highlands and isolated occurrences elsewhere.

Prickly acacia has the potential to grow in most areas of Queensland, and about one-third of the state is well-adapted for prickly acacia growth.

Control

Managing prickly acacia

The GBO requires a person to take reasonable and practical measures to minimise the risks posed by prickly acacia. This fact sheet provides information and some options for controlling prickly acacia.

The following strategies are recommended for landholders to limit the spread of prickly acacia.

Map prickly acacia areas on your property before commencing control:

- a coordinated management strategy can then be devised.
1. **Try to eliminate all prickly acacia along bore drains, creeks and dams:**
 - these trees will produce seeds in most years
 - one medium-sized tree can produce 175 000 viable seeds per year
 - seeds can remain viable in the soil for at least seven years.
 2. **Consider replacing open bore drains with piped water:**
 - trees along bore drains are the main seed producers
 - additional advantages of controlled waters are that supplements can be administered to animals via water.
 3. **Clean up either least infested paddocks or seeding trees first:**
 - preventing the problem is easier than curing it
 - good management involves keeping some paddocks clean.
 4. **Do not let cattle or sheep graze where mature pods are available (pods ripen from October onwards):**
 - insects can destroy much of the seed on the ground
 - cattle relish pods and spread the seed throughout paddocks and properties.
 - sheep and goats also spread prickly acacia by regurgitating seed.
 5. **Incorporate strategic fencing to contain prickly acacia:**
 - seeds are primarily spread by stock.
 6. **Run sheep instead of cattle in prickly acacia-infested paddocks, wherever possible:**
 - sheep graze seedlings more heavily than cattle.

7. **Quarantine cattle and sheep when moving them from infested paddocks to clean areas:**
 - prickly acacia seed can take six to eight days to pass through an animal
 - seed also travels in mud packs on animals' feet.
8. **Do not let trees become thick:**
 - trees reduce grass production
 - as many as six plants per m² may be lying dormant in the soil underneath prickly acacia stand.
9. **Do not overgraze:**
 - conserve perennial grasses
 - a good stand of grass should reduce establishment of prickly acacia seedlings by competing for soil moisture and nutrients.
10. **Supplement animals with nitrogen at critical stages (e.g. lambing, weaning or in drought)**
 - dry Mitchell grass pastures usually have inadequate levels of protein for optimum production, especially in the case of pregnant and lactating animals. When prickly acacia is removed, consider providing supplements of non-protein nitrogen such as urea.

Mechanical control

Grubbing

Grubbing is ideal for large areas of scattered to medium density infestations. Wheeled tractors are usually used with a scoop or grubbing attachment. This method requires a tractor of around 80 hp. Trees greater than 15 cm in diameter can be difficult to grub out. Grubbing is best undertaken from May to September or before pod drop.

Pushing

Pushing with dozers or loaders is useful for large areas of medium density infestation. Timing of this method should be restricted to May-September to lessen the establishment of seedling regrowth or during drought conditions. Massive seedling emergence may occur in areas around permanent waters and drainage lines.

Stickraking

This technique utilises a stickrake with cutter bars attached to the bottom of the tines. Timing should be restricted to May-September or during drought conditions. Costs vary depending on the density of plants, terrain, operator skills and machinery used. This method gives immediate results and clean country.

Double chain pulling

This method is adopted by those with high density prickly acacia. It is effective against established stands but not plants below 40 mm in basal diameter.

Timing is important and the technique is best applied in the second year of drought, or before the first pod drop coming out of drought. Chaining along drainage lines and waterways is not recommended due to the high seed loads and the high probability of re-establishment.

Biological control

Six insects have been introduced into Australia as biological control agents against prickly acacia with two of these establishing and providing some benefit. The beetle *Bruchidius sahlbergi* established successfully and is now widespread. Seed predation is generally low but may reach up to 80% where mature pods are available. The leaf-feeding caterpillar *Chiasmia assimilis* has not established in western Queensland but is exerting pressure on prickly acacia in coastal locations. Recent surveys in India, Ethiopia and Senegal have identified potential new agents which will be subject to host-testing studies prior to release.

Native insect attack and dieback

Prickly acacia is attacked by native insects associated with Australian native acacias and other native plants. Generally, leaf-feeding, sap-sucking, root, pod and seed feeding insects attack actively growing prickly acacia. Bark and wood-feeding insects (including borers and twig-girdlers) prefer stressed and dying plants. Native insects can weaken prickly acacia and can contribute to the death of plants when other stresses are involved.

Since the 1970s, dieback of large areas of prickly acacia has occurred throughout western Queensland infestations. The causal factors remain unclear but may involve: water stress during dry seasons and drought, high salt concentrations in soils, root predation by cicada nymphs, and attack by insects and fungal diseases on stressed plants. The University of Queensland is currently undertaking dieback trials using fungal pathogens.

Herbicide control

Basal bark spray

For stems up to 10 cm diameter, carefully spray around the base of the plant to a height of about 30 cm above ground level. Thoroughly spray into all crevices. Large trees may be controlled by spraying to a height of up to 100 cm above ground level. The best time for treatment is autumn.

Cut stump treatment

At any time of the year, cut stems off horizontally as close to the ground as possible and immediately swab or spray the cut surface and stem with the herbicide mixture.

Soil-applied treatments

Soil-applied herbicides are taken up by the roots of plants after rainfall. The major benefit of this method is the speed and ease of application and suppression of new seedlings in treated area. Prickly acacia is a deep rooted plant with the canopy acting as a funnel for rainfall. It is best to apply these herbicides as close to the trunk as possible, preferably when rainfall is likely to occur within a few months. October to January is the best application period.

Foliar (overall) spraying

Foliar spraying of seedlings and young plants to 2 m high may be undertaken with Starane Advanced[®] mixed with water and a wetting agent. This method is a useful and relatively cheap follow-up control option.

Spray misting

Spray misting using horticultural mist blowers for the foliar application of fluroxypyr based herbicides (e.g. Starane Advanced™) to control prickly acacia is approved under Minor Use Permit PER82366 accessible from apvma.gov.au. Spray misting provides a cost effective initial control treatment for high to very high density prickly acacia infestations. It is particularly useful for rapid treatment of dense linear stands of prickly acacia.

Stem injected encapsulated herbicide

Treatment occurs through drilling holes 10 cm apart into the stem circumference, inserting Di-Bak G Herbicide capsules and plugging the holes.

Bore drains (Desert Channels)

A bore drain is generally a man-made open earth channel that carries water from a bore to a particular point such as a stock trough or turkey's nest dam. Heaviest infestations

of prickly acacia plants normally occur along bore drains tending to produce a large number of pods annually. When treating a bore drain the water needs to be temporarily diverted away from the channels or dam for 24 hours prior to herbicide application. Diuron is then sprayed along a 1 m strip of mud along the sides of the bore drains. The artesian water source is to be returned slowly to the drain 72 hours after initial diuron application. Water flowing past treated drains must also bypass house rainwater tanks and desirable trees for seven days after reopening the drain. To allow maximum uptake of the diuron by prickly acacia roots the drains should not be delved for a minimum of two weeks after treatment.

Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit biosecurity.qld.gov.au.



Table 1. Herbicides for the control of prickly acacia

Situation	Herbicide	Rate	Comments
Agricultural non-crop areas, commercial and industrial areas, forests, pastures and rights-of-way	Fluroxypyr 200 g/L (e.g. FMC Starane 200) Fluroxypyr 333 g/L (e.g. Starane Advanced®) Fluroxypyr 400 g/L (e.g. Comet® 400)	Consult label	Basal bark/cut stump Basal bark only when plant is actively growing and up to 10 cm basal diameter; or cut stump at any time of year and all plant sizes (swab or spray stump within 15 seconds of cutting)
	Triclopyr 600 g/L (e.g. Garlon 600®)	500 mL/60L diesel	
	Triclopyr 240 g/L + Picloram 120 g/L (e.g. Access®)	1 L/60 L diesel	Any time of year Basal bark plants up to 10 cm basal diameter; or cut stump and all plant sizes (swab or spray stump within 15 seconds of cutting)
Around agricultural buildings and in pasture situations	Hexazinone 250 g/L (e.g. Velpar L®, Bobcat SL®)	4 mL/spot, 1 spot for each metre of height	Soil applied (hand application) Apply October-March for best results For seedlings/bushes/trees up to 5 m tall Avoid damage to off target species (consult label)
Grazing land	Tebuthiuron (e.g. Clearview 200GR® Tebulan 200GR®)	1.5 g/m ²	Avoid damage to off target species (consult label)
Agricultural non-crop areas, commercial and industrial areas, forests, pastures and rights-of-way	Fluroxypyr 200 g/L (e.g. FMC Starane 200) Fluroxypyr 333 g/L (e.g. Starane Advanced®) Fluroxypyr 400 g/L (e.g. Comet® 400)	Consult label	Foliar (overall) spraying For seedlings and young plants up to 2 m high Add uptake spraying oil
Grazing land	Tebuthiuron 200 g/kg registered for aerial application (e.g. Clearview)	10–15 kg/ha	Aerial application Use the high rate on dense growth or heavy clay soils (consult label)
	Diuron 500 g/L (e.g. Diuron 500SC®) Diuron 900 g/kg (e.g. Diuron 900WG)	64 L/ha 36.5 kg/ha Consult label	Bore drains (Desert Channels) DO NOT apply between December and March DO NOT apply more than once per calendar year DO NOT open drains for 72 hours following treatment DO NOT apply if heavy rains are predicted within three days of application Application should be limited to 1 m strips along the sides of bore drains Withholding period – do not allow animals to drink water from treated bore drains for three days, before slaughter for human consumption
Forests, pastures, commercial and industrial areas, rights-of-way, around agricultural buildings and public service areas	700g/kg Glyphosate – each capsule contains 271 mg Glyphosate (eg. Di-Bak G Herbicide)	1 capsule every 10 cm of stem circumference Minimum two capsules per tree	Use when active plant growth is present Apply at waist height Refer to critical comments (consult label)

Landholders and contractors should check if the property is situated in a hazardous area. This prevents the use of some herbicides, as defined in the *Agricultural Chemicals Distribution Control Act 1966*.

Read the label carefully before use. Always use the herbicide in accordance with the directions on the label.