

GLADSTONE–FITZROY **PIPELINE PROJECT** Environmental Impact Statement

Project Description



Gladstone Area
Water Board



Contents

2. Description of the Project	62
2.1 Location	62
2.2 Design, Construction and Operation	62
2.2.1 Water Pipeline	63
2.2.2 Fitzroy River Intake and Pump Station	72
2.2.3 Alton Downs Water Treatment Plant and Pump Station	72
2.2.4 Raglan Pump Station and Reservoir	77
2.2.5 Aldoga Storage Reservoir	77
2.2.6 Workforce, Accommodation and Project Facilities	80
2.2.7 Testing and Commissioning	82
2.2.8 Operation, Control and Maintenance	82
2.3 Associated Infrastructure Requirements	83
2.3.1 Transport	83
2.3.2 Electricity and Telecommunications	83
2.3.3 Water Usage	83
2.3.4 Gas Supply	83
2.4 Timing of Construction	84
2.5 References	84

This information has been prepared by, or on behalf of, the Gladstone Area Water Board (GAWB) regarding the Gladstone-Fitzroy Pipeline project. Care has been taken to ensure that the information is accurate and up to date at the time of publishing.





Figures

Figure 2.1	Diagrammatic Representation of the Project Elements	63
Figure 2.2	Typical Right-of-Way Layout	64
Figure 2.3	Typical Standard Trench Support Detail - Cross Section	66
Figure 2.4	Bored Crossing	68
Figure 2.5	Fitzroy River Intake Layout	73
Figure 2.6a	Simulation of the view to the WTP from a viewpoint near the corner of McNamara Road and Klapproth Road	74
Figure 2.6b	Simulation of the view to the WTP from a viewpoint on Ridglands Road	74
Figure 2.7	Water Treatment Plant Layout (Plan)	75
Figure 2.8	Raglan Pump Station and Reservoir layout	78
Figure 2.9	Aldoga Storage Reservoir layout	79

Tables

Table 2.1	Pipeline Location	62
Table 2.2	Pipe Burial Dimensions	66
Table 2.3	Recommended Creek Crossing Methods for Major Creeks	70
Table 2.4	Shows the expected average hours of operation for the WTP	76
Table 2.5	Location and Type of Temporary Site Facilities	81
Table 2.6	Indicative Construction Program	84



2. Description of the Project

2.1 Location

The Gladstone-Fitzroy Pipeline project (the project) will transfer approximately 30,000 ML of water per annum from the Fitzroy River to the Gladstone Area Water Board's (GAWB's) existing water infrastructure at Yarwun. Project elements include:

- An underground pipeline approximately 115 km long and 1 m in diameter from Laurel Bank near Rockhampton to Yarwun just north of Gladstone
- An intake and pump station on the Fitzroy River at Laurel Bank.
- A water treatment plant, reservoir and pump station at Alton Downs.
- A booster pump station and reservoir at Raglan.
- Reservoir at Aldoga.

The pipeline traverses Rockhampton Regional Council area and Gladstone Regional Council area. A description of the land use and infrastructure traversed by the pipeline, including tenure and acquisition processes is provided in Chapter 4, Land Use and Infrastructure. Appendix D provides a complete list of properties contained within the right-of-way (ROW).

The intake point on the Fitzroy River is approximately 15.5 km upstream of Rockhampton Barrage adjacent to an existing intake point for the Stanwell Pipeline owned and operated by SunWater to provide water to the Stanwell Energy Park. A pump station associated with the intake will be located at the same site.

The water treatment plant (WTP) site is approximately 3 km from the intake site at Alton Downs and is located on freehold land. Pump stations and reservoirs associated with the proposed WTP are described in the following sections. Both the intake site and WTP site are within Rockhampton Regional Council area.

The booster pump station site is located on freehold land in the vicinity of Raglan in Gladstone Regional Council area. A description of the Raglan pump station and associated reservoirs is provided in the following sections.

The main storage reservoir is to be located at Aldoga on land owned by the State and administered by the Department of Infrastructure and Planning (DIP) within the Gladstone State Development Area (GSDA) which falls in Gladstone Regional Council area. A description of the Aldoga Reservoir is provided in the sections below.

The pipeline is predominantly located on freehold land that is used for grazing and other agricultural purposes for the first 14 to 15 km, as illustrated in Table 2.1. It will be located within an easement (known as the "Alton Downs Easement") that will traverse land from the intake at Laurel Bank near Rockhampton to a connection point in the vicinity of Capricorn Highway within the Stanwell-Gladstone Infrastructure Corridor (SGIC). For around the next 80 km it will be located within the licence area of the SGIC corridor. It will then enter the GSDA for around 15 km. Within the GSDA, the pipeline follows the Material Transportation Services Corridor, as determined by a corridor study undertaken by DIP. It will terminate near Yarwun, just north of Gladstone.

Table 2.1 Pipeline Location

Distance from Intake Point (km)	Alignment
0-15	Alton Downs Easement
16-95	Licence Area within SGIC
96-approx 115	GSDA Licence Area

2.2 Design, Construction and Operation

The design and construction of each project facility or element will be in accordance with water industry standards and codes of practice with a view to achieving generally a design lifespan of a minimum of 75 years, taking into account the conditions of the sites and the nature of the materials and processes involved.

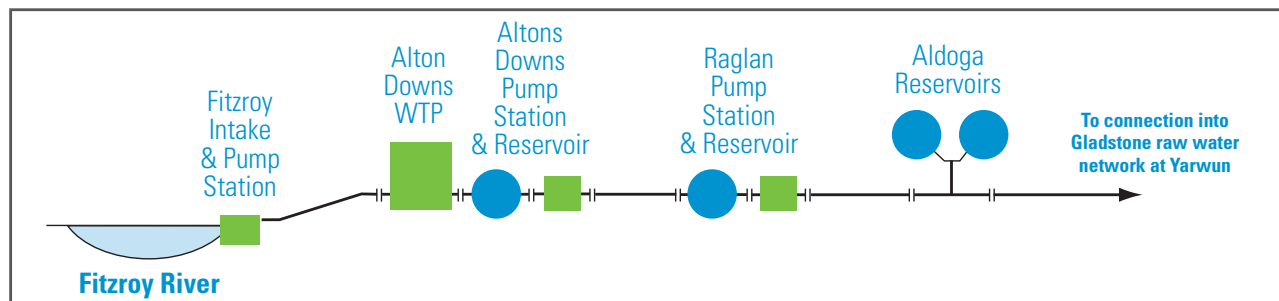
Figure 1.3 shows the pipeline route and Figure 2.1 shows key infrastructure as a diagrammatic representation of the project elements and how they relate to each other.

The following sections describe in detail the construction and operation of the project. A description is provided for the water pipeline, Fitzroy River intake, Alton Downs WTP, pump stations and storage reservoirs.

Preparatory works for the project have included several stages of both design and environmental assessment. Before completion of the impact assessment, a preliminary functional design had been completed and a detailed optioneering design was also complete. This detailed optioneering design confirmed all of the essential elements and locations relevant to the project, and forms the basis of this EIS.

At the time of writing this EIS, the detailed design for costing purposes was going through a design review process. This will be complete by the time the EIS is displayed. If there are any material refinements to the design already articulated in the EIS, these will be incorporated into a Supplementary EIS. The final stage is detailed design for construction, which will be completed only when construction is triggered.

Figure 2.1 Diagrammatic Representation of the Project Elements



2.2.1 Water Pipeline

2.2.1.1 Description

The pipe will be buried for its full length with varying cover depending upon pipe material, ground conditions and loading, as detailed in Section 2.2.1.2, and will be laid with a minimum grade of 1 in 500, meaning that for every 500 m of horizontal distance, the vertical distance will be no less than 1 m.

The annual average flow rate in the pipeline will be up to 30,000 ML per annum. The design flow is to be based on 90 percent utilisation, which is equivalent to 1,057 L/s. The approximate anticipated maximum operating pressure is 2,500 kilopascals (kPa), and will vary along the pipeline route depending on elevation and distance from pump stations.

The pipeline material is proposed to be mild steel cement lined (MSCL). It is also possible that glass reinforced plastic (GRP) could be used for different lengths of the pipeline. Refer to Figure 1.3 for the layout of the pipeline. Where the pipe is made of MSCL it is proposed to have an external diameter of 1,067 mm with rubber ring jointed or welded joints at certain connection points. If the pipe is GRP, the external diameter is proposed to be 1,025 mm and it will be joined with rubber ring and flanged joints at fittings.

The orientation and location of the pipeline within any State-controlled road reserve or rail corridor will be discussed with the Department of Main Roads (DMR), Queensland Rail or Queensland Transport as required. The construction methodology at road and rail crossings has been determined to minimise disturbance as described further in Section 2.2.1.2. The required cover over the pipe will comply with pipeline material specifications for expected loading on the pipe.

Cathodic Protection

MSCL pipes will have cement lining, sintakote (polyethylene) coating and will require cathodic protection. Cathodic protection is the method of protecting metal pipes from corrosion in the presence of water and oxygen, acid sulfate soils (ASS) or stray currents. The pipeline is protected by connecting each pipe length with cables at 'electrode connections' on the pipe,

connecting this to a low voltage power supply and sending a current down the pipeline which gives the metal characteristics which do not corrode. Cathodic protection is only required on ferrous pipes such as MSCL pipe. The location and frequency of cathodic protection points is not known and will be determined during detailed design for construction. No cathodic protection is required for GRP pipe.

Valves

Different types of valves are included in the pipeline design including air release, isolation, check (reflux) and scour valves. These will form part of the maintenance, control and surge protection measures for the pipeline and include:

- **Air valves** will be located at high points along the pipeline profile. Currently, some 240 air valves are included in the design at a spacing averaging approximately 450 to 500 m and are provided to vent air into and out of the pipe. They also allow the expulsion of dissolved air from the water during normal operation. In addition to the general operation requirements, air valves may also be required to perform specific duties identified from the surge analysis. Of the 240 air valves along the pipeline approximately 50 will be anti-vacuum breaker valves.
- **Check valves** will be included where required to prevent backflow for pipes and pumps, protect pumps under emergency conditions and protect components against surge. There will be one check valve installed before the high point of the pipeline between Raglan and Aldoga (approx 15 km from Aldoga). Other check valves are located near reservoirs and at the pump stations. A flow control valve is to be included at the Yarwun connection point.
- **Isolation valves** allow isolation of sections of the pipeline in the case of failure in the adjacent pipeline, pump station, storage reservoir or WTP. This may include pressure bursts, water quality failure, or the need to stop inflow or outflow from a reservoir or the WTP. Isolation valves are typically to be installed every 5 km and are to be installed at the inlet and outlets of all pump stations and storage reservoirs.

- **Scour valves** are used to drain the pipeline and to allow scouring of the main pipe. Scouring of the mainline will be part of the maintenance program, to remove any solid particles that may have settled on the bottom of the pipe during normal operations. Scour valves are to be included at all low points in the pipeline and will function under gravity where possible. There are approximately 200 scour valves in the pipeline design
- **Branch tees** will be provided to allow cross connection to any future duplication. These are not intended to provide water supply from the transmission mains, however, branch tees may also be included in a limited number of locations near populated areas.

Where possible, valves will be located in the vicinity of existing boundary fences to minimise the disruption to properties.

2.2.1.2 Construction

ROW is the total construction width within which vegetation will be cleared to enable construction processes to occur. The ROW width is ideally not less than 30 m however, it can be reduced over short distances (e.g. in environmentally sensitive areas) and may vary depending on project or site specific considerations. A typical ROW layout is shown in Figure 2.2.

The main steps in the construction of the pipeline are outlined in the following sections. A high level construction program is provided in Section 2.4, showing that construction of the pipeline itself (i.e. the steps below for the length of the alignment) is expected to take approximately 24 months. The construction

program may be subject to change as detailed design for construction is finalised with consideration to environmental, climatic and ground conditions as well as engineering requirements. Prevention of weed spread in the area is an issue, and one which will involve implementing a weed management plan for vehicle movements in the project area to prevent cross contamination of land. Chapter 6, Terrestrial Flora, provides further information on the weeds in the study area and a weed management plan is detailed in Chapter 20, Planning Environmental Management Plan, which will be developed further prior to the construction phase.

Survey

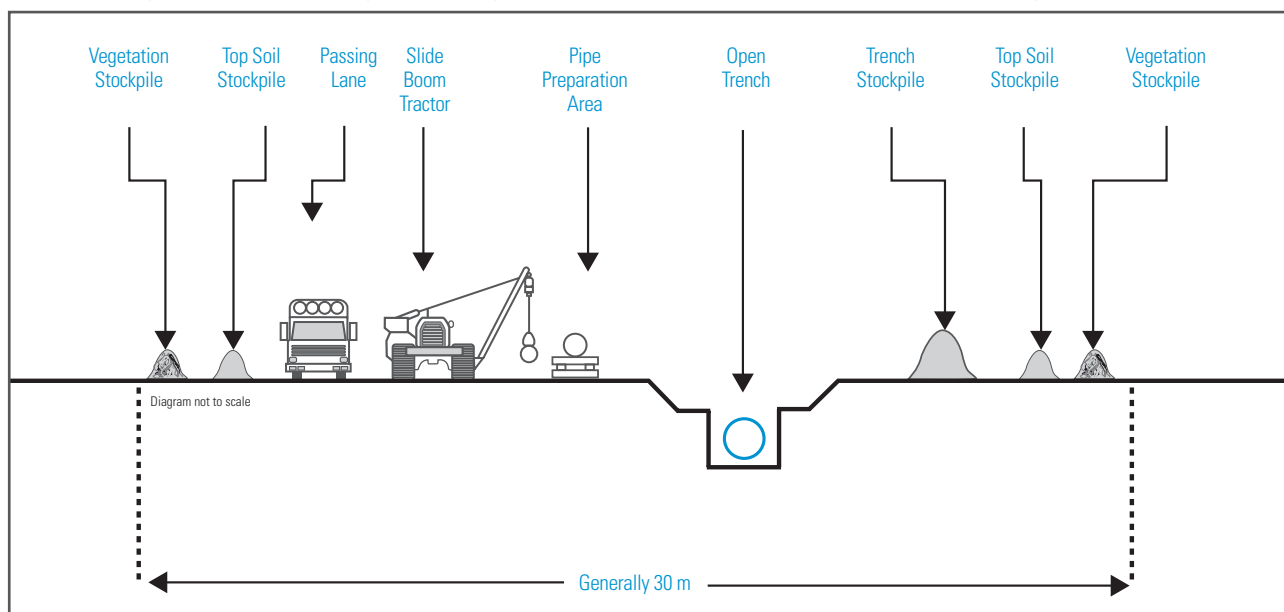
Prior to the commencement of construction, the ROW will be fully surveyed and the pipeline centre line will be pegged. Temporary gates will be installed in any farm fences encountered, in consultation with landowners. On completion of pipeline construction following reinstatement of the ROW, farm fences will be restored and permanent lockable gates may be installed. Any gates installed will provide the State and infrastructure owners with permanent access along the SGIC in accordance with the requirements of the SGIC license.

Clearing

Clearing of the pipeline construction area involves removal of any vegetation, rocks and obstructions from the pipeline ROW. In open, cleared areas clearing of vegetation may not be required. Where practicable, ground disturbance and vegetation clearing will be minimised to maintain soil stability and minimise erosion. This includes retention of a maximum amount of root

Figure 2.2 Typical Right-of-Way Layout

(Adapted from: Australian Pipeline Industry Association Code of Environmental Practice – Onshore Pipelines 2005)



stock and occasional trees which may remain in the pipeline construction area where there are significant natural, heritage or visual amenity values to protect. Vegetation will be mulched, stockpiled and spread with topsoil during the rehabilitation of the ROW. All clearing activities will be scheduled to minimise time between clearing and restoration. Further environmental management measures for vegetation clearing are provided in Chapter 20, Planning Environmental Management Plan.

Grading

Bulldozers and graders will level the ground in certain areas within the ROW to prepare a safe construction platform. In areas requiring grading, the separation of topsoil and subsoil will be managed to protect and preserve topsoil for later restoration of the ROW. Contaminated or ASS will be treated in accordance with an ASS Management Plan. Refer to Chapter 5, Soils and Contamination; and Chapter 20, Planning Environmental Management Plan, for further information on the treatment of ASS or contaminated land.

Pipe Stringing

Pipes will be delivered to site by truck and either directly from the manufacturer or from stockpile locations then laid next to the trench on skids (timber blocks like railway sleepers used to keep the pipe off the ground) or sand bags to protect the pipe from damage. Gaps will be left for vehicle, stock and wildlife crossings in appropriate locations and in consultation with relevant landowners. The pipe will then be positioned using excavators and Rubber Ring Joints connected. Where welding is required precautions shall be taken to minimise fire risk in accordance with relevant local authorities. These precautions include:

- Documented hot work permit system will apply to any welding work in the field
- Welding will be undertaken on graded areas free of grass and brush
- Fire fighting equipment will be available at the welding location at all times
- During windy or high risk times welding will be undertaken within welding enclosures.

Trenching

The pipeline trench will generally be between 2 m deep, and up to 5 m deep depending on pipeline design. The top of the excavation trench will generally be 12 m wide, but could be up to 16 m wide in some locations depending on trench wall soil stability and pipeline design. Specialist heavy earth moving machinery will be used to excavate the pipeline trench.

It is unlikely that blasting will be used for pipeline installation except in the short steep sections between Raglan and Aldoga Reservoir and Aldoga to Yarwun. The handling, storage and use of explosives will be carried out in accordance with Queensland legislation and Australian standards as listed below:

AS 2187.1 -1998 Explosives –Storage, transport and use- Storage

AS 2187.2- 2006 Explosives- Storage and use – Use of explosives

Open trench will be minimised during wet weather to reduce the risk of trench collapse during rainfall events and to reduce the risk of fauna entrapment. Methods such as constructing trench plugs to provide ramps and other means to provide 'ladders' for fauna to exit the trench to avoid fauna entrapment will be adopted where appropriate. Surveillance of the open trench and if required removal of wildlife from the trench by appropriately trained personnel will be carried out during construction. Refer to Chapter 7, Terrestrial Fauna; and Chapter 20 Planning Environmental Management Plan, for details of mitigation measures for fauna.

The depth of trenching will comply with material specifications for MSCL or GRP (whichever is used). Figure 2.3 and Table 2.2 show terminology and dimensions for the proposed MSCL and GRP pipes. These will be used in conjunction with material specifications which provide more detail regarding cover under roads and waterways, and *ASNZS2566.2 Buried flexible pipelines–installation*.

The diagram illustrates a mobile phone booth layout with the following dimensions and labels:

- Exclusion Zones:** Two 1.00m exclusion zones are shown at the top, labeled "1.00m Exclusion Zone".
- Booth Dimensions:**
 - Overall width: 1.00m - 2.00m
 - Overall height: 0.4m - 3.15m
 - Internal width segments: 0.35m (left), 1.00m (center), 0.35m (right)
 - Internal height segments: 0.35m (top), 1.00m (middle), 0.35m (bottom)
- Labels:**
 - "Stepper at 1.5 MAX Intervals" is labeled on the left and right sides.
 - "0.1.5m MAX" is labeled on the right side.
 - "MN" is labeled at the bottom corners.

Description	Dimensions
Min Bedding	150 mm
Min Overlay	150-300 mm
Min Cover (overlay plus trench fill)	750 mm 1100 mm in flood prone areas
Side Clearance	350 mm
Embedment Width	900<OD≤1500, OD+700 mm

Imported material complying with specifications will be placed and compacted to surround the pipe using appropriately sized compaction equipment. Imported material will be sourced from a local quarry where possible and appropriate checks will be made to ensure it is free of weeds, pathogens and fire ants.

Following placement of the bedding the remainder of the trench will be backfilled using material excavated previously. Generally the backfilled surface will be formed a little higher than the previous natural surface to provide for settlement of the backfill. Where practicable, soil will be replaced in the order it was excavated and in accordance with the measures included in Chapter 20, Planning Environmental Management Plan.

Reuse of excavated material from other construction sites and other elements of this project may be considered as a source of fill where excavated material is not considered as suitable for backfill.

Clean up and Rehabilitation

All areas affected by construction including ROW, work areas, access tracks and temporary site office areas will be cleaned up and rehabilitated to pre-construction conditions as far as practicable. Clean up will include removal of waste material and equipment, compaction relief (particularly on heavily trafficked areas) and re-profiling to original or stable contours and re-establishing surface drainage lines. Signs, fences and barriers shall be installed where required to prevent unauthorised access to sensitive areas on the pipeline route, and to prevent damage.

Rehabilitation measures will be conducted according to recommendations in the *Australian Pipeline Industry Association Code of Environmental Practice - Onshore Pipelines 2005* and will consider the application of vegetation regeneration and/or revegetation techniques as appropriate. These will encourage the natural regeneration of disturbed vegetation, which may include topsoil replacement, weed management, re-spreading stockpiled vegetation over disturbed area and seed planting to promote soil stabilisation. Further detail on these measures is included in Chapter 20, Planning Environmental Management Plan. Site clean up and rehabilitation will be conducted in consultation with landowners. The warranty period will be not less than 12 months from construction completion which includes land rehabilitation measures.

Access

Temporary gravel access tracks will be constructed along the pipeline route where required to temporary facilities and work areas. Where possible existing roads and tracks will be used for access, construction areas will be signposted and measures will be taken to prevent access of unauthorised personnel. Refer to Chapter 20, Planning Environmental Management Plan, which outlines some of the traffic management measures to be implemented on the project. This will be further developed in detailed traffic management plans prior to construction.

Temporary equipment wash down facilities will also be placed at points along the project alignment to clean vehicles and construction equipment of seeds, plant material and soil when

transiting between areas. Information on weed management measures is included in Chapter 20, Planning Environmental Management Plan.

Access for construction equipment across minor creeks will be achieved by installing temporary culverts. It is currently not planned to leave a permanent roadway along the pipeline ROW except where access to valves and structures is required for the operation and maintenance of the pipeline. Permanent access for remote valves and structures will be a four-wheel drive access track. Watercourse crossings will generally be left as a gravel causeway without permanent culverts. Temporary creek crossings will be removed on completion of construction and the creek profiles restored. Major creeks will be accessed from each side and no temporary crossings will be installed at these locations.

Crossing Methods

Several construction methods have been considered for the pipeline crossing creeks, roads, rail and other infrastructure. They include open trenching and trenchless methods:

- **Open Trenching** involves excavation of the trench directly through the stream or roadway. Excavators or backhoes are generally used with this technique enabling trench spoil to be stockpiled away from the stream bed or road. The prefabricated pipe is strung out, lowered in and the trench backfilled immediately. This method is often applied to smaller roads or in dry or shallow low flow watercourses or where rapid construction is considered the best means of minimising environmental impacts. In some cases stream flow diversion is required for this method, involving the construction of temporary dams upstream and downstream of the crossing and the temporary diversion of water around the site, thus creating a dry construction area within the dams. Water is pumped around the dammed crossing site or by diverting the water flow through a flume pipe. Pipes under minor creeks will be concrete encased.
- **Thrust boring** is a trenchless method involving launch and reception pits which are excavated on both sides of the crossing (see Figure 2.4). An enveloper pipe with an open face is pressed into the ground with hydraulic jacks from the launch pit to the reception pit and an auger or drill removes the materials inside the pipe. The carrier pipe is then laid inside the enveloper pipe. This method does not disrupt the creek/roadway/railway and is limited to crossings up to 200 m in length. The launch pit would be approximately 6 m by 6 m and the retrieval pit approximately 6 m by 4 m. The launch and retrieval site layouts would be configured to avoid existing infrastructure, trees and other sensitive sites. Both the launch and retrieval sites would be fenced and made secure, with site access control implemented as appropriate.

- **Micro-tunneling** is a trenchless method involving launch and reception pits on either side of the crossing. A tunnelling machine is used to excavate an underground path for the pipeline. This method can be used for crossings generally up to 350 m in length, it requires the pits to be placed well back from the waterway, and has minimal impact on fringing riparian vegetation and river banks. The launch pit would typically be 6 m by 6 m and the retrieval pit approximately 6 m by 4 m, dependent on ground conditions. The launch and retrieval site layouts would be configured to avoid existing infrastructure, trees and other sensitive sites. Both the launch and retrieval sites would be fenced and made secure, with appropriate site access control.

Rail Only Crossings

Rail crossings are to be designed in accordance with *Australian Standard AS 4799-2000 – Installation of underground utility services and pipelines within railway boundaries*, as required by Queensland Rail. There are two rail-only crossings along the alignment:

- Bajool Siding Crossing (a branch of the North Coast Line)
- East End Mine Rail Link Crossing (a branch of the North Coast Line).

Bajool siding crossing is 49 m long and this section of rail line is unused and not maintained. Trenching of the crossing is the preferred option however this is subject to the details being approved by Queensland Rail. Alternatively thrust boring will be utilised. East End Mine Rail Link crossing is approximately 58 m long, with the preferred crossing method being thrust boring as this cost effective and will not cause disruption to rail operation. Rail crossings will comply with Queensland Rail requirements including having pipe launching or receiving pits located greater than 5 m outside the rail corridor and a minimum of 4.5 m cover provided between the rail formation level and the top of the pipe.

Road Crossings

The requirements for road crossings have been determined in consultation with DMR and local councils and will include:

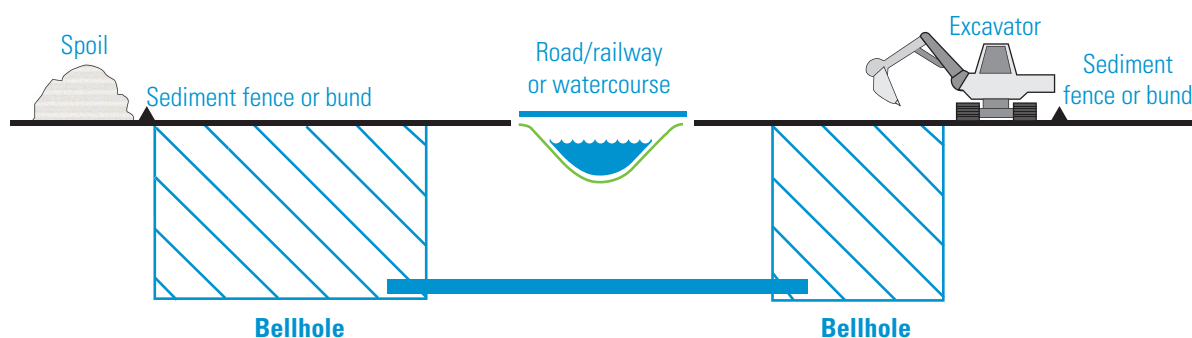
- Arterial roads and highways are to be crossed through trenchless methods where practicable
- Open trenching can be adopted for minor roads with low traffic volumes
- Any pipe launching or receiving pits must lie at a minimum of 5 m from the edge of the bitumen road with the exception of the Bruce Highway for which the pits must lie on land greater than 5 m outside the road corridor
- A minimum of 3 m cover must be provided between the road level and the top of the pipe.

There are 5 major road crossings along the alignment:

- Rockhampton Ridglands Road – 17 m length to be crossed by thrust boring
- Capricorn Highway – 42 m length to be crossed by thrust boring
- Mt Larcom Road – 21 m length to be crossed by thrust boring
- Mt Larcom Gladstone Road – 36 m length to be crossed by thrust boring
- Mt Larcom Gladstone Road and calliope River Targinie Road intersection – 142 m length to be crossed by micro-tunnelling.

These methods are considered to be the most appropriate for these crossings due to the length of the crossings and to prevent disruption of traffic. Chapter 13; Transport and Access Arrangements, provides a full assessment of the likely impacts to roads and access.

Figure 2.4 Bored Crossing (Source: Australian Pipeline Industry Association Code of Environmental Practice – Onshore Pipelines 2005)



Combined Road and Rail crossings

There are three combined road and rail crossings along the alignment:

- Bruce Highway and Yeppen Rail (a section of the North Coast Line) – 93 m length to be crossed by thrust boring
- Mt Larcom Road and Aldoga Rail (a section of the North Coast Line) – 85 m length to be crossed by thrust boring
- Mt Larcom Road and Yarwun Rail (a section of the North Coast Line) – 67 m length to be crossed by thrust boring.

Other infrastructure crossings

The pipeline will also cross other infrastructure including:

- Electricity transmission lines
- A gas pipeline
- The Visionstream fibre optic network.

These crossings will be undertaken in consultation with the managing authority of the infrastructure.

Six farm dams have been identified in the construction corridor and it is also likely that farm pondage banks will be impacted during construction, with possible loss of water from these storages. Impacts to farm dams and pondage banks will be mitigated where possible through small realignments of the final ROW to minimise the impact to the dam walls. Where avoidance of dam walls or pondage banks is not possible, they will be reconstructed in consultation with the landowner and the appropriate governing authority and in a location which is outside the ROW and, where possible, also outside the SGIC.

Waterway Crossings

In the selection of waterway crossing methods, the following factors have been considered:

- Whether the waterway is ephemeral or perennial
- Presence of riparian vegetation and its ecological value
- Aquatic ecology values of the waterway and substrate type
- Length of the crossing
- Geotechnical considerations
- Engineering feasibility
- Cost of the crossing.

This information has been obtained through detailed ecological fieldwork undertaken for the EIS and documented in Chapter 6, Terrestrial Flora; Chapter 7, Terrestrial Fauna; and Chapter 8, Aquatic Flora and Fauna. In addition, geotechnical investigations and design work have informed the selection of crossing methods.

Minor ephemeral waterways will generally be crossed by open trenching as this method is cost effective and can be completed quickly, reducing the disturbance time. Mitigation measures that will be implemented at these crossings include:

- Construction will be undertaken during the dry season where possible to reduce the disturbance to aquatic ecology
- Erosion and sediment control and weed management measures will be implemented during construction
- The site will be rehabilitated after construction including stabilisation of stream banks and protection of the stream bed to prevent erosion over the pipe
- Where there is riparian vegetation, clearing will be minimised by reducing the width of the ROW.

Major creek crossings are those where the waterway has flowing or standing water or significant riparian vegetation which could be adversely impacted by open trenching. Major creeks traversed by the alignment are shown in Figure 1.3 and include:

- Lion Creek
- Gavial Creek
- Inkerman Creek
- Twelve Mile Creek
- Marble Creek
- Horrigan Creek
- Raglan Creek
- Larcom Creek

For these crossings an assessment has been undertaken to determine the most appropriate crossing method taking into account the factors listed above.

Table 2.3 outlines the construction methods to be used for the creek crossings in the project area and includes the reason for the method selection and a summary of mitigation measures that will be implemented to reduce environmental impact. More detailed mitigation measures are provided in Chapter 6, Terrestrial Flora; Chapter 7, Terrestrial Fauna; Chapter 8, Aquatic Flora and Fauna; and Chapter 20, Planning Environmental Management Plan.

Table 2.3 Recommended Creek Crossing Methods for Major Creeks

Creek	Characteristics	Ecological Values	Proposed Crossing Method and Reasoning	Key Mitigation Measures
Lion Creek	Ephemeral Drainage	<ul style="list-style-type: none"> Marginal, temporary habitat (during flows) for several fish species of conservation significance (except during floods), none of which are protected under legislation. 	<ul style="list-style-type: none"> Open trenching if the construction is carried out in the dry Swampy area but with no significant vegetation Initial geotech info indicates presence of Basalt Environmental impacts during construction can be managed Cost is significantly less for open trenching than other methods. 	<ul style="list-style-type: none"> Concrete surround protection to the pipe Disturbance to riparian vegetation will be avoided where possible Appropriate management to contain disturbed sediments Monitoring and controlling the encroachment of weeds in areas where vegetation has been removed Where possible, replanting vegetation after construction completion, which would be particularly beneficial to the long-term stability of stream banks.
Gavial Creek	Semi-permanent pools	<ul style="list-style-type: none"> Potential fish refugia during low and zero flow conditions Marginal, temporary habitat (during flows) for several fish species of conservation significance (except during floods), none of which are protected under legislation. 	<ul style="list-style-type: none"> Open trenching Environmental impacts during construction can be managed Cost is significantly less for open trenching than other methods Semi permanent pools which were dry at the time of sampling. 	<ul style="list-style-type: none"> Minimise clearing width through adjacent vegetation Appropriate management to contain disturbed sediments Disturbance to riparian vegetation will be avoided where possible.
Inkerman Creek	Macro-tidal creek	<ul style="list-style-type: none"> Mangrove-lined creek surrounded by extensive saltmarsh flats Weed species present on adjacent land Clay substrate. 	<ul style="list-style-type: none"> Micro-tunnelling due to clay substrate, tidal drainage and presence of mangrove species Trenching will be undertaken through adjacent vegetation, with an alternative route selected to follow an existing track and therefore reduce the impacts to this vegetation. 	<ul style="list-style-type: none"> Commence boring/drilling outside of riparian vegetation zone Minimise clearing width through adjacent vegetation.
Twelve Mile Creek	Permanent pool	<ul style="list-style-type: none"> Riparian vegetation sparse and highly fragmented Bank erosion Macrophytes present. 	<ul style="list-style-type: none"> Open trenching Environmental impacts during construction can be managed Permanent pool but not flowing water No significant riparian vegetation Cost is significantly less for open trenching than other methods. 	<ul style="list-style-type: none"> Only partial obstruction of the waterway will occur at one time Disturbance to stream bed will be minimised Disturbance to riparian vegetation will be avoided where possible.

Creek	Characteristics	Ecological Values	Proposed Crossing Method and Reasoning	Key Mitigation Measures
Marble Creek	Ephemeral Drainage	<ul style="list-style-type: none"> Remnant softwood scrub in riparian zone in good condition with high species diversity. 	<ul style="list-style-type: none"> Open trenching Creek is ephemeral Site inspection at the pipeline crossing point found that no significant vegetation would be affected by trenching, although significant vegetation occurs in adjacent areas. 	<ul style="list-style-type: none"> Site survey by a qualified botanist will occur prior to construction commencement Removal of trees and shrubs will be minimised Trenching will be confined to already-cleared or open areas wherever possible Sediment and erosion control measures will be implemented to prevent impacts downstream (if construction in the wet) Weed management measures will be undertaken If Rare or Threatened sapling species are identified from samples taken on-site, these will be translocated.
Horrihan Creek	Ephemeral Drainage	<ul style="list-style-type: none"> High instream microhabitat diversity No emergent or submergent vegetation Dense eucalypt forest in riparian zone (and mangroves downstream of crossing site) Weeds present on adjacent lands. 	<ul style="list-style-type: none"> Micro-tunnelling due to aquatic ecology values, tidal drainage and presence of mangrove species. 	<ul style="list-style-type: none"> Commence boring/drilling outside of riparian vegetation zone.
Raglan Creek	Macro-tidal creek – drains completely during low tide. No freshwater input due to weir upstream	<ul style="list-style-type: none"> Broad continuous mangrove fringe on banks Stream bed and banks generally in good condition Weed species present in surrounding lands. 	<ul style="list-style-type: none"> Micro-tunnelling due to aquatic ecology values, tidal drainage and presence of mangrove species Some mangroves will still be affected. 	<ul style="list-style-type: none"> Commence boring/drilling outside of riparian vegetation zone Ensure pipe depth is sufficient to prevent erosion.
Larcom Creek	Permanent Pool	<ul style="list-style-type: none"> Semi-continuous riparian vegetation on one bank, sparse on the other Degraded riparian zone, unstable banks Large instream pool with high degree of micro-habitat diversity. 	<ul style="list-style-type: none"> Open Trenching No significant vegetation in the riparian zone Environmental impacts during construction can be managed. 	<ul style="list-style-type: none"> Removal of trees and shrubs will be minimised Trenching will be confined to already-cleared or open areas wherever possible Sediment and erosion control measures will be implemented to prevent impacts downstream (if construction in the wet) Weed management measures will be undertaken.

2.2.2 Fitzroy River Intake and Pump Station

2.2.2.1 Description

The location of the intake structure is in the Fitzroy River 15.5 km upstream of the Fitzroy River Barrage and is shown on Figure 1.3. The site is within the existing SunWater property at Laurel Bank and upstream of the existing SunWater pump station. The site will be accessed via the existing exit off Laurel Bank Road and Ski Gardens Road using the existing point of access. The SunWater site will provide sufficient space to lay down equipment and materials.

The site was chosen for minimal environmental and property impact, to minimise bank erodability and to access deeper, cleaner waters where possible.

Other factors considered in the location and design of the pump station include:

- The close location of the existing operating SunWater pump station
- Ability to make new connection into a power source
- Permanent access for the operators.

The intake and pump station will consist of a combined single structure located in the river bank, with a separate plant room adjacent to the existing SunWater pump station and at the same level of 13.9 m AHD. There will be three submersible centrifugal pumps, two operating as duty pumps and one on standby. The delivery pipe will be located within the approach embankment. The layout of the intake structure is shown in Figure 2.5.

2.2.2.2 Construction

The construction of the combined intake and pump station structure will require the installation of a temporary sheet piled coffer dam, extending into the river, to allow the foundation of the structure to be dewatered and excavated to the required design level. A U-shaped coffer dam utilising two parallel sheet pile walls, filled with appropriate material and held by longitudinal walers and tie bars, is proposed. The coffer dam will be keyed into the river bank.

The advantages of this system are:

- It is simple to construct
- The double sheet pile wall will stop any water ingress (at least from the sides, water will still enter from the base)
- The filled wall can be utilised as access for cranes and construction equipment
- It has improved safety.

Excavated material will be disposed of at an approved location off the site. Water ingress into the coffer dam will be discharged directly back to the river. Crane access to the river bank and coffer dam will be required to service the construction works.

The construction of the combined structure will take place within the coffer dam. During construction care will be taken to ensure that no oil or other contaminants can enter the river during dewatering.

The structure will be founded on piles, these piles will be driven in only after the coffer dam is dewatered and dry. Dewatering is expected to be a continuous process for the duration of construction.

A concrete floor will be poured on the base of the excavation once the support piles are installed. The concrete floor will provide a solid dry working floor for the construction of the concrete intake structure and will support the formwork.

The coffer dam will be at risk from flooding, to mitigate this risk construction will take place in the dry season.

On completion the coffer dam will be removed and the river bank restored.

2.2.2.3 Operation, Control and Maintenance

A Supervisory Control and Data Acquisition (SCADA) system will be used to monitor intake pumps and the pipeline to the WTP, and signals will be sent to centralised control rooms at the existing Gladstone WTP.

The Alton Downs WTP and pumping stations will generally be designed for unattended, fully automatic operation with manual override of critical functions. Local automatic control is the normal mode of operation. Local manual control is generally used for testing, maintenance and during failure of the automatic control system.

2.2.3 Alton Downs Water Treatment Plant and Pump Station

2.2.3.1 Description

The WTP is situated at Alton Downs approximately 3 km along the pipeline from Fitzroy River as shown on Figure 1.3. Figure 2.6a and 2.6b show a simulation of the WTP from two viewpoints on adjacent roads.

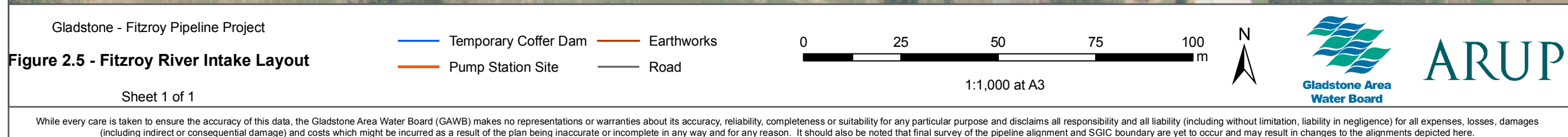


Figure 2.6a Simulation of the view to the WTP from a viewpoint near the corner of McNamara Road and Klaproth Road



Figure 2.6b Simulation of the view to the WTP from a viewpoint on Ridgeland Road



The WTP will be comprised of several systems. The overall objectives will be to provide water of a similar quality to that already provided to existing GAWB customers from Awoonga Dam and improve the operating efficiency of the pipeline. The total area of the Alton Downs WTP site is approximately 11.5 ha. The designed plan is shown in Figure 2.7. The buildings present on the site will include a control building, clarifier, residue dewatering (centrifuge) building, chemical dosing facility and pump stations (main and service). This site will be landscaped post construction to improve visual amenity of the WTP site.

Water will be pumped from the Fitzroy River, through fine screens and passed into the coagulation/flocculation chamber where chemicals (including aluminium chlorohydrate, polymer, polyDADMac, polyelectrolyte and/or sodium hydroxide) may be dosed. The sedimentation (clarification) phase follows, where solid matter is removed from water as residue. Treated water from the sedimentation process is discharged to the treated water reservoir and then disinfected with sodium hypochlorite (and potentially ammonium sulfate).

Residue from the sedimentation process will be transferred to a thickener where either natural or mechanical thickening may be used and polymer may be added. Residue will then be transferred to a centrifuge for dewatering to 30 percent solids, then will be taken to hoppers (silos) for storage, ready for transport off site. The entire residue handling area, including the emergency residue stockpile area, will be bunded and runoff directed to a sediment basin to prevent the residue produced from entering the external environment returning to the Fitzroy River. Water recovered from clarification (supernatant) and centrifuge (centrate) processes is returned to the head of works for treatment.

Treated water from the plant will then be pumped along the pipeline. The pump station at the WTP will be a steel portal frame building with tilt-up concrete panel walls and steel roof. The building will be fully enclosed and ventilated, and attention has been paid to the acoustics of the building to comply with permissible noise levels. Housed inside the building are:

- Electronic equipment for control and monitoring
- Electrical starters and switch gear
- Three pumps, two operating as duty pumps, and one on standby.

The quantity of residue produced by the plant is expected to be approximately 120 tonnes per day of wet residue at a consistency of 30 percent dry solids and 70 percent water. The constituents of the residue and disposal options are described in Chapter 11, Waste. The appropriate residue disposal strategy will be determined in consultation with the relevant council authority and approving bodies. The disposal options under consideration include:

- Local Government approved landfill
- Supply to a local contractor.

The preferred disposal option will be selected prior to construction.

Residue will be transported from the site in trucks. The transport routes and traffic volumes associated with residue transport is described in Chapter 13, Transport and Access Arrangements.

Figure 2.7 Water Treatment Plant Layout (Plan)

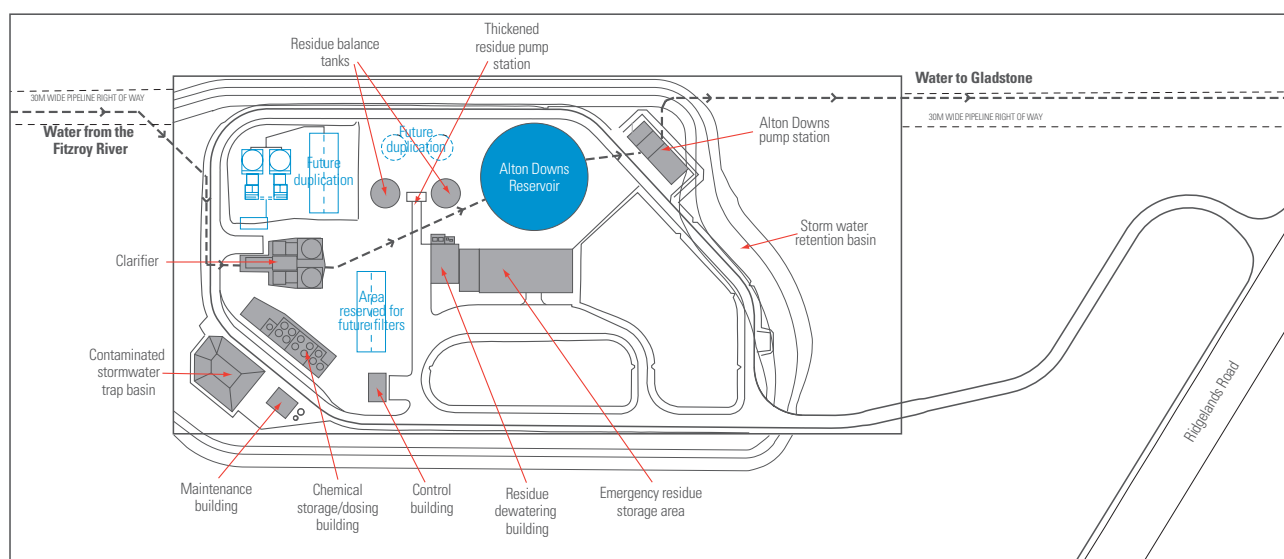


Table 2.4 Shows the expected average hours of operation for the WTP

Process	Hours per day	Days per week	River Water Quality
Water Production	24 hours	7 days	Normal
Residue Dewatering	8 hours	5 days	Normal
Residue Dewatering	Up to 24 hours	7 days	Very Poor

The chemical sodium hypochlorite, which is classed as dangerous in the *Dangerous Goods Safety Management Act 2001* will be used in the WTP for disinfection. Other chemicals used at the WTP will include sodium hydroxide and ammonium sulfate. Chemical storage and dosing facilities will employ handling designs and procedures in accordance with the *Dangerous Goods Safety Management Act 2001* (Qld) and *Dangerous Goods Safety Management Regulation 2001* (Qld) to prevent impact of any chemical on the environment or on the safety of personnel.

Engineered solutions will be provided to ensure that noise levels for the operating plant comply with both the stipulated requirements and community expectations. Noise attenuation measures could include acoustic insulation in walls and roof, acoustic louvers to the ventilation air intakes and exhausts, cavity wall construction or acoustic enclosures fitted to centrifuges. Chapter 12, Noise and Vibration, provides more detail on the potential noise generation at the site.

The WTP process is unlikely to produce undesirable odour or gaseous emissions. However, if potential odour sources can be identified in the detailed design for construction phase a treatment strategy will be developed.

During commissioning of the WTP, it is intended that treated or partially treated water will be directed to a stormwater retention basin before returning to the head of works. This is described further in Chapter 11, Waste, and discussions will be held with the EPA and/or the Department of Natural Resources and Water to determine the requirements for this disposal and obtain any approvals. Plant design will prevent overflow from the WTP to the environment.

Site Access

The WTP site is located at Alton Downs, Rockhampton Regional Council area approximately 3 km from the Fitzroy River intake.

Access to the site for construction shall be by a newly formed exit off Ridgeland Road. The site shall be fenced with a security fence complete with an entry check point for construction

traffic. Consideration will be given in the design of the plant for permanent roadways for frequent access of GAWB operational staff including access for operational vehicles, bulk tankers, residue transport vehicles and cranes.

The development of the detailed design for construction will identify and allow for access corridors, temporary offices and lay down areas required for construction equipment and pipe storage. Approvals under the *Infrastructure Planning Act 1997* or relevant development schemes will be sought for use of such areas, as required.

2.2.3.2 Construction

Civil

The construction of the WTP will firstly involve the bulk earthworks and site preparation which will flow on to the construction of the concrete structures and reservoirs. Site preparation works will require the clearing of existing trees and vegetation. The vegetation will be mulched for use in the restoration and landscaping of the site on completion.

The majority of the construction phase land disturbance, noise, dust and other environmental effects will be associated with the earthworks required to prepare the site for construction of the concrete structures and reservoirs. It is anticipated that due to the low strength of the underlying rock, the site will not require the use of blasting for excavation.

Water from the Fitzroy River will be used for dust suppression during construction. Environmental controls such as bunds and silt fences will be installed during construction to minimise erosion and capture mud and silt during rainfall runoff events.

Once the earthworks and site preparation works are complete, construction of concrete structures will commence. This involves importing steel reinforcing, formwork and concrete to the site.

Structural, Mechanical and Piping

Structural steel, pipework, access hatches and other ancillary equipment will be set into the concrete structures, as required. Equipment required for fit-out of treatment processes such as screens, grit handling equipment, clarifier scrapers, filter equipment, chemical storage and dosing equipment, pumps, pipes, belt filter presses and other equipment, will generally be fabricated offsite and imported to the site for installation.

When concrete structures are complete, the remainder of the works will relate to installation of prefabricated equipment which is unlikely to generate significant noise, dust, land disturbance or other environmental effects.

Electrical

Ergon will provide power to operate the plant. The application to Ergon for power connection will request that one 22 kV connection be provided to the boundary of the WTP site.

The types of electrical equipment to be installed at the WTP site will include transformers, generators, variable frequency drives, HV/LV switchgear, HV/LV cabling and Motor Control Centres (MCC). The majority of the electrical works will be completed within the WTP structures, using cranes to locate components into position and hand tools to affix components into place.

Control System

The WTP control system will be highly automated with capability to be operated on an unsupervised basis for extended periods of time. The types of control equipment to be installed at the WTP site will include flow meters, SCADA equipment, telemetry equipment, flow recorders and level, turbidity and other water quality recorders as well as pressure sensors.

2.2.4 Raglan Pump Station and Reservoir

Description

The Raglan Pump Station and Reservoir site shall be located midway along the pipeline on an area of approximately 6 ha, adjacent to the SGIC where pumps will lift the water to deliver it to the Aldoga Reservoir (see Figure 2.8).

The pump station at Raglan will be a steel portal frame building with tilt-up concrete panel walls and steel roof. The building will be fully enclosed and ventilated, and attention has been paid to the acoustics of the building to comply with permissible noise levels. Housed inside the building are:

- Electronic equipment for control and monitoring
- Electrical starters and switch gear
- Three pumps operating 50 percent duty/50 percent duty assist/50 percent common standby.

The reservoir will have a capacity of 15 ML and 46 m diameter and approximately 10 m high. The construction methodology will be similar to that of the Aldoga Reservoir, as described in Section 2.2.5.

Site Access

Access to the Raglan reservoir and pump station is proposed via an existing private track accessed from Raglan station road. Raglan station Road is accessed from the Bruce Highway. Raglan Station Road, except for a short section connecting to the Bruce Highway, is an unsealed dirt road approximately 4 m wide.

Site Preparation

Site preparation works will require the clearing of existing trees and vegetation. The vegetation will be mulched for use in the restoration and landscaping of the site on completion.

Following clearing, the site will be cut and the base of the pump station and reservoir will be levelled.

Weed management measures in this area will require all vehicles and construction equipment entering the site to have a certified inspection prior to entry. These control measures will remain in place for the period prior to the construction of the permanent access road.

The site for the Raglan pump station and reservoir will be fenced with security fencing, with night flood lighting and periodic security patrols during construction.

2.2.5 Aldoga Storage Reservoir

Description

The Aldoga storage reservoir is to be located near Mt Larcom, shown in Figure 1.3 and will be fully enclosed reinforced concrete storage with 100 ML capacity, with land area approximately 10.5 ha (see Figure 2.9). This will provide a security of supply and operational control over the connection into Gladstone raw water network.

Due to the shape and size of the hill top location of the 100 ML Aldoga Reservoir, and following on from the optioneering phase, it is expected that the final detailed design for construction shall be two circular shaped structures, approximately 90 m diameter.

Site Access

Access to the Aldoga Reservoir will be from a newly formed access off Mylrea Road which is accessed from Mt Larcom Road. The reservoir site will be located on the crest of a hill with access to the site to be constructed as part of the works.

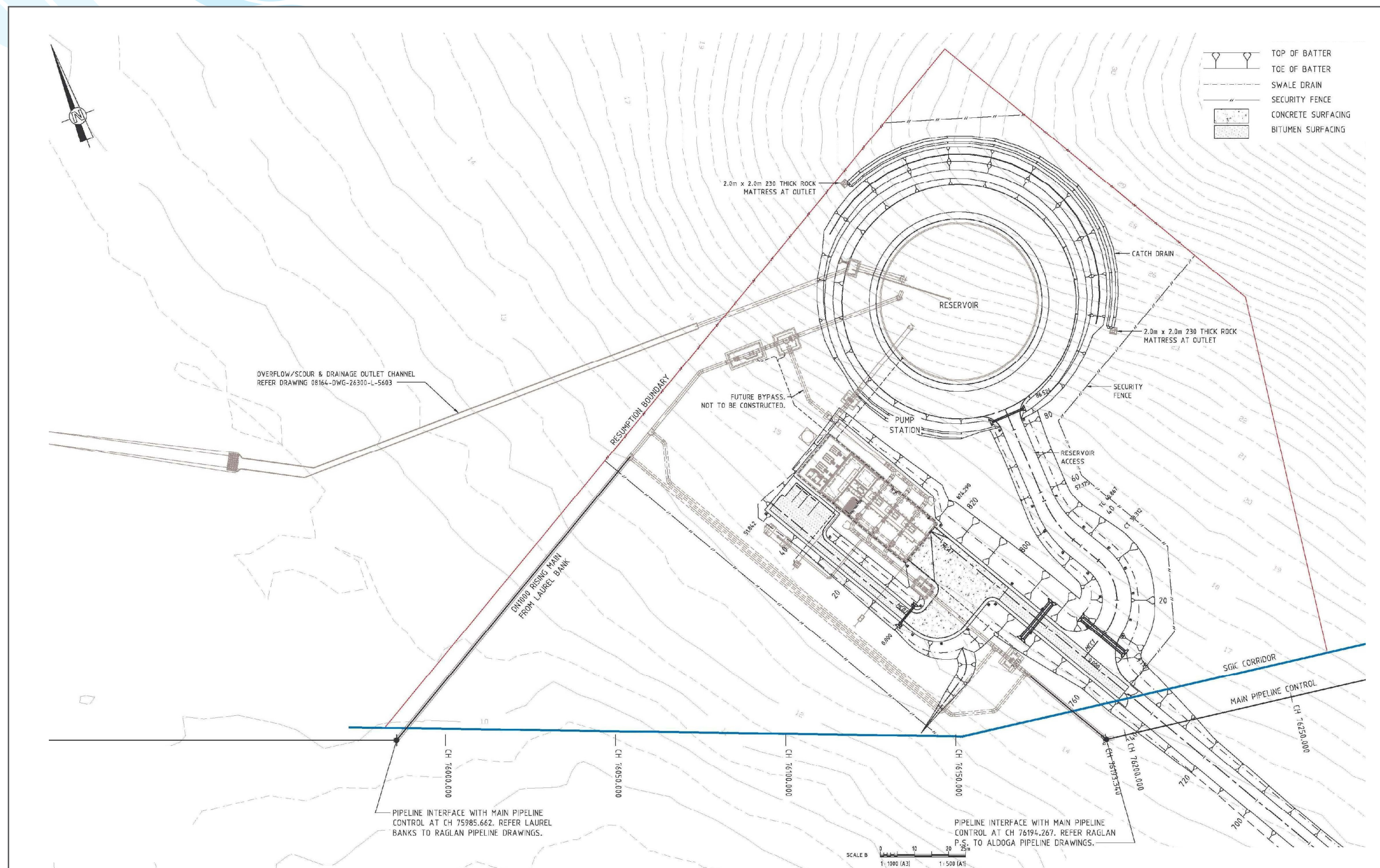
Site and Office Facilities

Temporary site facilities at Aldoga will be established and connected to mains power, supplied from Ergon if possible. Should this not be possible, alternative temporary power supplies will be arranged through other methods. Domestic potable water for personnel washrooms and toilets will be purchased from local council, trucked to site and stored in tanks.

The site facility's temporary sewage waste will utilise a pump out system where waste will be removed and disposed of at an approved local council treatment plant.

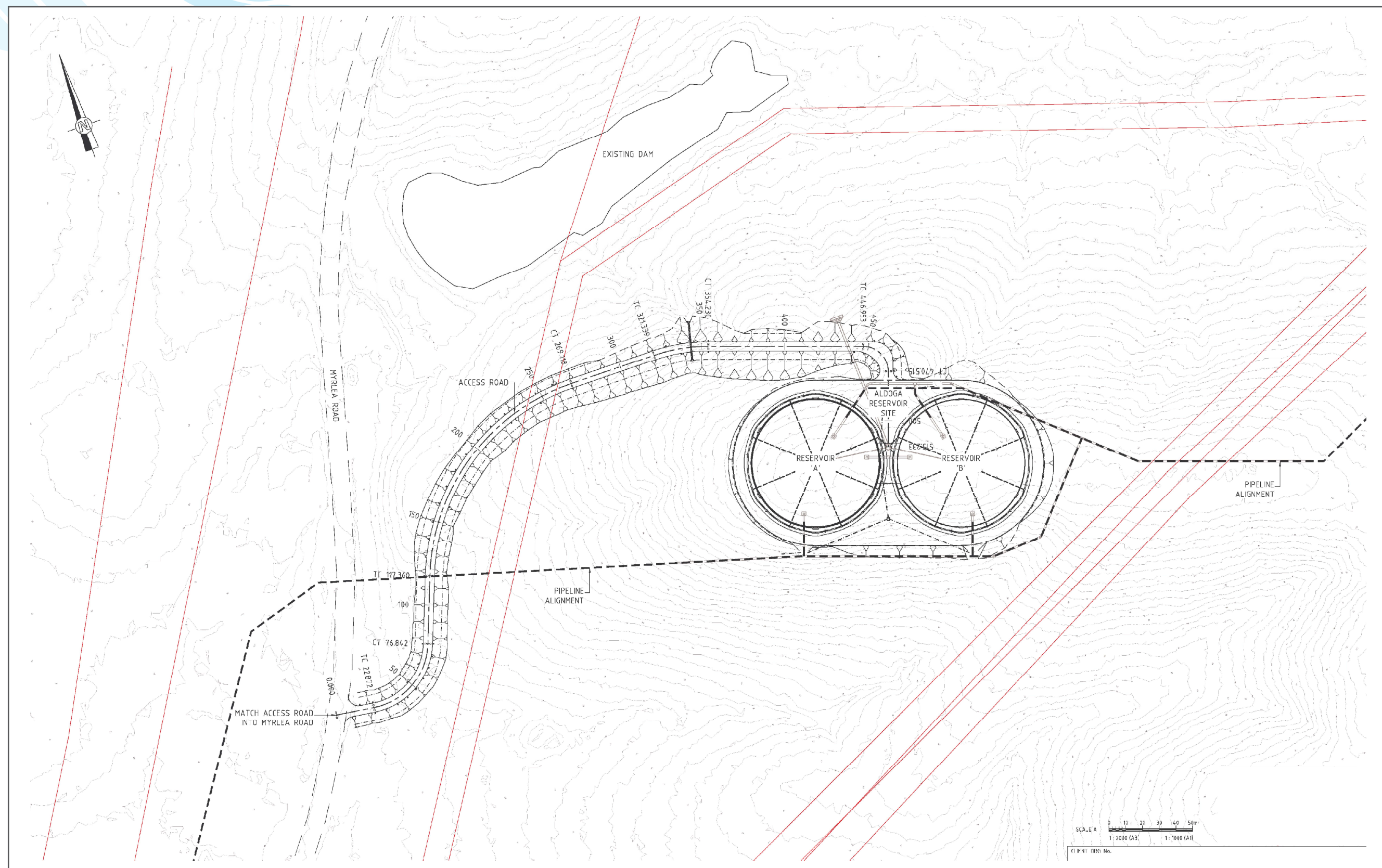
Site Preparation

Site preparation works will require the clearing of existing trees and vegetation. The vegetation may be mulched for use in the restoration and landscaping of the site on completion.



Gladstone - Fitzroy Pipeline Project
Figure 2.8 - Raglan Pump Station and Reservoir Layout
 Sheet 1 of 1

While every care is taken to ensure the accuracy of this data, the Gladstone Area Water Board (GAWB) makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which might be incurred as a result of the plan being inaccurate or incomplete in any way and for any reason. It should also be noted that final survey of the pipeline alignment and SGIC boundary are yet to occur and may result in changes to the alignments depicted here.



Gladstone - Fitzroy Pipeline Project

Figure 2.9 - Aldoga Storage Reservoir Layout

Sheet 1 of 1



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Following clearing, the site will be cut and levelled to the level of the base of the reservoir.

The site consists of rock (tuff) and will require a combination of drilling, blasting and/or mechanical removal by a certified operator under controlled conditions. There is an adjacent Queensland Gas pipeline which will require protection from blast impact.

Water for construction will be sourced from the dam adjacent to the site. A pump and standpipe will be established to enable water fills from this location. Access to the dam for this purpose is already established.

Reservoir Construction

The two circular reservoirs, post tensioned and cast in situ, will be constructed using traditional well used techniques. Construction of the floor will commence first followed by the walls. Walls would be poured in quadrants at 2 m lifts (jump form technique).

The reservoirs shall generally be reinforced concrete structures. Construction of the reservoirs will require the delivery to site of large quantities of reinforcing steel, formwork and concrete.

Underfloor drainage will be placed prior to pouring of the concrete bases.

The reservoir shall be completed and made ready for testing so as to receive test water from the pipeline. Once the reservoir testing is complete the test water shall be retreated if necessary and shall then continue to be used for pipeline testing.

2.2.6 Workforce, Accommodation and Project Facilities

Pre-Construction

It is envisaged that there will be a period of approximately six months prior to construction in which activities will be required to enable construction start. These activities include, but are not limited to:

- Mobilising resources
- Gaining all necessary final approvals
- Securing access agreements
- Procuring long lead items (e.g. pipe)
- Completing detailed design for construction.

Construction

Labour requirements during the project are likely to vary as construction progresses. The peak workforce is likely to exceed 300 including design and construction staff. However this maximum will not occur for the duration of the construction period. The approximate average workforce for the project over the construction period is estimated to be between 190 and 200 people.

It is envisaged that the project works will be divided into two sections to be constructed simultaneously. The northern section will include the intake, WTP and northern section of pipeline up to Raglan. The southern section will include the southern section of the pipeline, Raglan pump station and Aldoga Reservoir.

Existing rental, motel and hotel accommodation in the area will be used for labour accommodation needs where possible and depending upon timing, temporary construction camps may also need to be investigated to accommodate staff. An assessment of the accommodation market in the region and the possible impacts of the project are provided in Chapter 15, Social and Economic Environment.

Temporary site facilities will be located at each of the major project work locations. Transportable buildings will be utilised to establish temporary site offices to house day-to-day workforce activities such as catering, toilets and offices. The location and type of these facilities is described in Table 2.5. Access to these facilities is detailed in Chapter 13, Transport and Access Arrangements.

Table 2.5 Location and Type of Temporary Site Facilities

Location	Description	Access	Facility Type
Fitzroy River Intake	Located within the existing SunWater property	Off Ski Gardens Road	Minor
Water Treatment Plant	Within proposed WTP property	Ridgeland Road	Major
Serpentine Creek	Southern Bank of Serpentine Creek	Off Port Alma Road	Minor
Raglan Creek	Northern Bank of Raglan Creek	Off Bruce Highway	Minor
Raglan Pump Station and Reservoir	Within the proposed Pump Station property	Off Raglan Station Road	Minor
Aldoga Reservoir	Adjacent to Aldoga Access Road	Off Mylrea Road	Minor
Pipe Storage Sites	To be identified at time of construction with agreement of landowners	Various	Minor
Major Road/Rail crossings	Located adjacent to road and rail crossings	Various	Minor

The major site facility will comprise the following elements:

- Office complex (for approximately 50 people)
- Staff amenities
- Training/meeting room
- Materials storage shed
- Container storage units
- Maintenance workshop
- Vehicle wash down facility (for weed management).

The minor site facilities will comprise the following elements:

- One office unit
- One toilet
- One lunch unit
- Two container storage units.

Transportable buildings will be utilised to establish temporary site offices where required to house day-to-day workforce activities such as catering, toilets and offices. Each project facility location will be connected to mains power supplied from Ergon where possible. Remote sites without access to power supply will be powered by generators. Domestic potable water for personnel washrooms and toilets will be purchased from local council, trucked to site and stored in tanks.

Domestic waste will be treated by an approved septic or anaerobic waste treatment system where possible. Minor sites which will only operate on a short-term basis will be pump out systems where waste will be removed and disposed of at an approved local council treatment plant.

All activities undertaken at temporary site facilities will be subject to the requirements of the Construction Environmental Management Plan (CEMP). A CEMP is an EMP for the construction phase of a project, which is explained in Chapter 20, Planning Environmental Management Plan. The siting of facilities will ensure an appropriate set back from creeks and other sensitive environmental areas.

Equipment wash down facilities will be placed at strategic points to clean vehicles and construction equipment of weed seeds and contaminated soil when transiting between sites.

Temporary storage areas, typically one hectare in area will be required at intervals along the pipeline route to unload and store the large quantities of pipe and construction materials and equipment. Gravel hardstand areas and roadways will be laid within the stockpile sites to allow the movement of heavy equipment and to allow loading of trucks and trailers. Each storage area will be fenced for security, with minimal night lighting and regular night time security patrols.

Storage sites will be chosen to allow all weather truck access and provide minimal disruption to vegetation, landowners and the travelling public. The intent will be to utilise a minimal number of pipe storage sites and to reload and haul pipe by truck and trailer to the work locations as required by the construction program.

Operation

GAWB currently employs operations staff for its network and it is anticipated that GAWB will maintain this skills base and where necessary, employ new staff or contractors to operate the pipeline and its related infrastructure upon commissioning. Permanent facilities will be provided at some infrastructure locations such as the WTP, pump stations and storage reservoirs which are appropriate to the level of manning prescribed.

2.2.7 Testing and Commissioning

The commissioning process will be done in two stages for each part of pipeline and its associated infrastructure. These will be pressure testing and leak testing, and also wet commissioning. It is expected that between 100 and 600 ML of water will be discharged at numerous points along the pipeline and at the locations of the associated infrastructure during commissioning. These will be to either land or waterways depending on the location of the discharge. See Chapter 11, Waste, for further detail.

For all waste waters that are discharged during commissioning, measures will be taken to:

- Minimise the waste volumes of water generated
- Minimise the treated water to be discharged to the environment
- Ensure that the water to be discharged meets the requirements of the EPA (expressed in the documented EPA Guidelines), Department of Primary Industries and Fisheries, the Water Quality Objectives for the receiving waters, ANZECC Guidelines or the requirements of stakeholders
- Ensure that treated water meets the requirements of the Operations Manual (GAWB requirements) as soon as possible
- Ensure erosion protection measures are in place.

Full details of the commissioning and testing process are provided in Chapter 11, Waste.


2.2.8 Operation, Control and Maintenance

Data acquisition, system control and monitoring of pipeline and infrastructure operations will be provided for the project by a SCADA system that will generally be controlled from the centralised control room at GAWB's existing WTP in Gladstone, with the facility to also manage the system using the terminal provided in the distributed system at the new Alton Downs WTP. A control philosophy will be more fully developed during detailed design for construction, which will address the level of automation required, methods of reporting plant operational condition and actions in the event of plant failures.

The surge analysis shall identify the worst case rapid shut down scenario/s for each section of pipeline by modelling different scenarios. These scenarios may include pumping failure (e.g. caused by a power outage), pump start-up/shut down, rapid valve closure, pipeline burst or check valve slam (similar to rapid valve closure). During detailed design for construction, an optimised pipeline design shall be developed by considering the use of different surge mitigation options and surge protection measures such as using pipes of different pressure ratings, size and position of devices such as surge vessels, double acting air release valves, check valves and the use of specialised devices such as slow opening/closing valves, surge anticipation valves, pressure sustaining valves.

Pigging is the method of maintenance which cleans the inside of pipes by propelling a tool (a "pig") along the pipeline by water pressure. The design of the valve pits makes provision for insertion of a pigging launcher or receiver for future maintenance of the pipeline. During operation pigging will only be required between the intake pumps and the WTP.

Any inspection and surveillance activities and frequency will be developed in the detailed design for construction phase. This will include focus on impacts on waterways and natural vegetation as a result of operation and maintenance activities; safety procedures (including provision of shut-down and/or draining in event of an emergency); and provision for public safety in such circumstances. Common activities undertaken by operation staff include pipeline corridor patrols, maintenance of the pipeline and associated facilities and pigging (where applicable). Checking of revegetation and erosion control measures to ensure they are effective and maintenance or correction measures as required will also be undertaken during operation.



The minimum cover over the pipeline, depending upon material specification will be adopted which will allow the landowners to resume use of the land as much as possible. Land uses that would result in damage to the pipe such as ploughing, installing irrigation or the building of new infrastructure may not be permitted subject to the terms of the pipeline easement agreement between the landowner and DIP. See Chapter 4, Land Use and Infrastructure for more detail. Please refer to Section 2.2.1.2 – Pipe Laying and Backfilling for burial depths and recommendations. Warning signs and fences will be installed around major above ground facilities, including valves. Landholders may resume normal land use operations near the buried pipeline but this may include restrictions to ripping, excavation or the installation of new irrigation infrastructure in the vicinity of the pipeline ROW. Other protection measures may include marker tape or concrete slabs buried above the pipeline at crossings to prevent third party interference, supervision of activities within the vicinity of the pipeline or deeper burial of the pipe if required.

2.3 Associated Infrastructure Requirements

2.3.1 Transport

Temporary access routes will be provided where construction teams cannot use existing transport infrastructure, or where this will cause disruption to local traffic. Permanent access routes will be required to pump stations, WTP and storage reservoir as described previously. Likely routes, traffic volumes and modes are detailed in Chapter 13, Transport and Access Arrangements. The details of access routes will be devised by the Contractor prior to construction for incorporation in the traffic management plan.

2.3.2 Electricity and Telecommunications

Ergon have been engaged to supply power to the pumping stations, WTP and storage (where required). Substations may be required in some locations and investigation is being conducted to determine any additional requirements of Ergon relating to the capacity of their existing system.

Communications will be set up for operation of the pipeline. Possible options include the laying of fibre optic cable, leasing from local operators, or the purchase of radio and/or microwave frequencies.

2.3.3 Water Usage

Water will be required during testing and commissioning and for dust suppression and other activities during construction. The likely quantities of water required during testing and commissioning are provided in Chapter 11, Waste, and will be further detailed prior to construction.

Along the pipeline route the contractor will negotiate with council and landowners to access raw water from:

- Existing council water sources
- Private farm dams
- Any other water filled pits at quarries and extraction sites (either Queensland Rail or DMR).

At Aldoga there is a dam adjacent to the reservoir site, which would be used to extract water for construction purposes.

Construction water for the stretch of pipeline between Aldoga and the existing network connection near Gladstone is likely to be sourced from the existing GAWB network servicing at Fishermans Landing.

At the WTP, a potable water supply will be set up for site activities as the site currently has no potable water supply. Potable water will also be required for domestic use at site offices and will be kept separate from construction activities.

2.3.4 Gas Supply

No gas supply will be required for this project.

2.4 Timing of Construction

The overall construction period is aimed to be completed within 24 months, including testing and commissioning. Mobilisation may occur for up to six months before the start of full construction. Construction in each individual area will be preceded by a mobilisation period of one to two months. Table 2.6 provides a high-level construction program indicating the approximate time periods for the construction of the different project elements. Wet weather has the potential to slow pipeline construction and will also potentially increase certain environmental impacts (as described in Chapter 8, Aquatic Flora and Fauna).

Table 2.6 Indicative Construction Program

Construction Area	Approximate Construction Duration (Months)
Alton Downs WTP & Pump Station	21
Fitzroy Intake Pump Station	8
Raglan Pump Station & Reservoir	14
Pipeline	
Laurel Bank to Raglan (75 km)	11
Raglan to Aldoga (31 km)	10
Aldoga to Yarwun (7 km)	4
Crossings	13
Commissioning	3

2.5 References

Australian Pipeline Industry Association Code of Environmental Practice, 2005, Onshore Pipelines

Australian Standard AS 4799-2000 – Installation of underground utility services and pipelines within railway boundaries

Clough Diversified United Joint Venture, 2008, Drawing No. 08164-DWG-24000-C-0222 (Rev G)



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