

2.5.2.3 Yoweragabbie Scraper Station

The Yoweragabbie scraper station is proposed to be located at approximately KP281 to KP282, which is located approximately 13 km south of Mount Magnet (**Figure 2-6**). The scraper station site will be up to approximately 130 m x 300 m (approximately 1.1 ha) and allow cleaning and inspection of the pipeline. The scraper station will include:

- Two bi-directional pig traps to receive and launch pigs from the Ambania compressor station and Wildara delivery station;
- Two aboveground Monolithic Insulation Joints (MIJs), to enable electrical isolation between segments of the NGI pipeline;
- Actuated MLV, to facilitate partial isolation of the NGI pipeline. The valve will be equipped with an actuating system to enable manual and remote control from the APA Integrated Operations Centre;
- Pipeline blowdown vent, to allow pipeline depressurisation;
- Solar power system to provide power for operation of the facility; and
- Satellite Communications for SCADA system.

The scraper station will be fenced and a firebreak maintained. Site lighting is not considered necessary, however, this will be confirmed during detailed design.

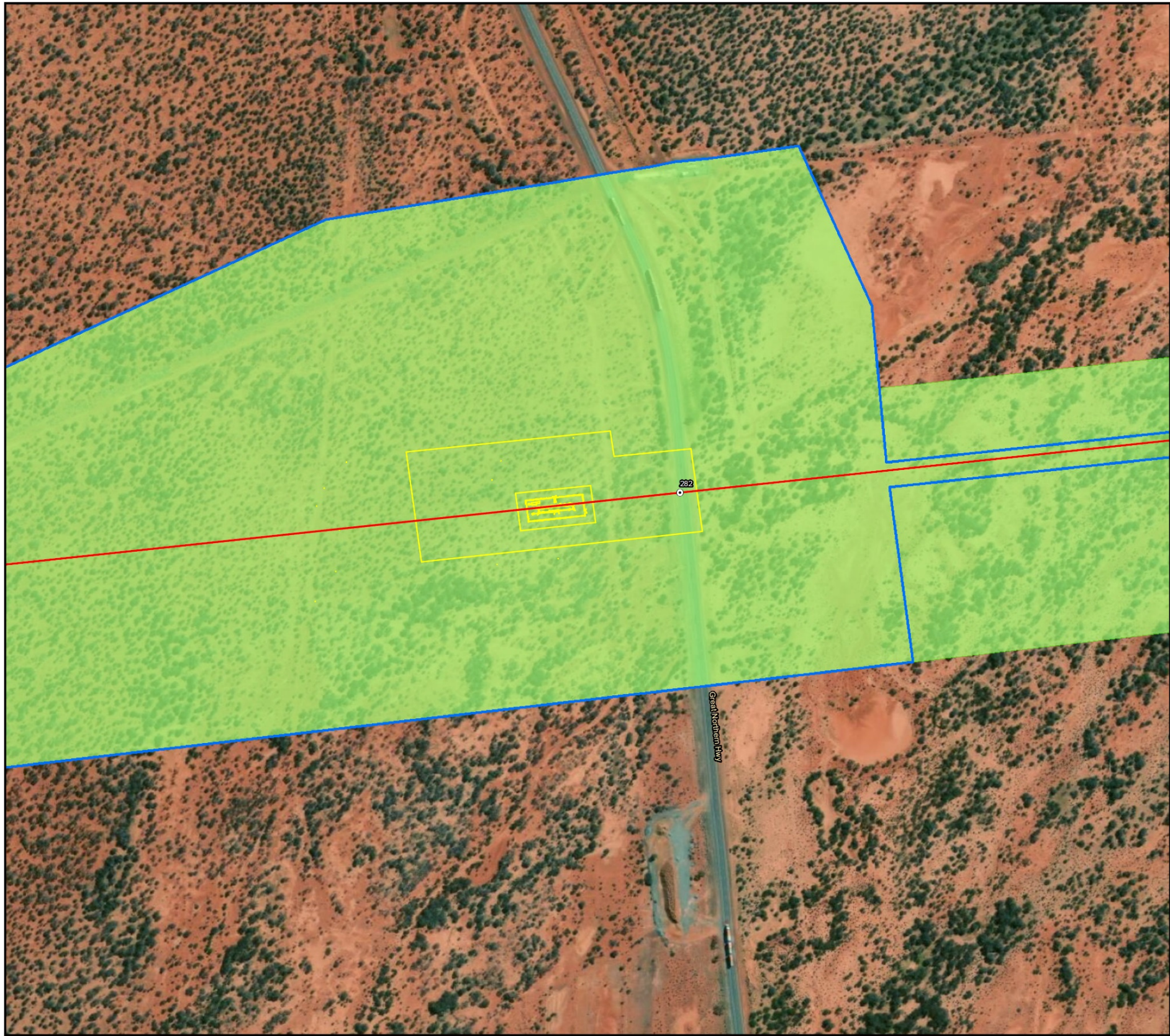
The scraper station location and layout will allow for the potential future installation of an adjoining compressor station. Station piping design will allow for future connection of the compressor station and the control room will have space provision.

2.5.2.4 Mainline Valve Stations

MLVs provide a means of controlling flow of the pipeline product as they allow local and/or remote closure of sections of a pipeline. The valves are open during normal operations but can be closed to isolate a section of pipeline during emergencies. There will be two MLV stations located along the NGI pipeline; these being the (**Figure 2-7**):

- Carlminda MLV, located at approximately KP147 (approximately 12.5 km west-south-west of Yalgoo); and
- Dandaraga MLV, located at approximately KP465 (approximately 5 km south-east of Sandstone).

MLV station above and below ground piping will be designed and constructed as pipeline assemblies in accordance with AS/NZS 2885.1. The MLVs will be designed with full bypass and vent blowdown facility. The MLV stations will have a small aboveground footprint of approximately 0.3 ha each (approximately 50 m x 30 m). A typical comparable MLV station is shown in **Figure 2-8**.



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PROJECT: Northern Goldfields Interconnect

TITLE: Yoweragabbie Scraper Station

SUBTITLE:

DATE: 15/12/2020

DATA SOURCE:
KPs, Proposed Alignment, Yoweragabbie Scraper Station, Development Envelope, Disturbance Footprint: APA Group
Geonoma, Roads, Coastline: LGATE
Aerial Imagery: ESRI

LEGEND:

- ⊙ Kilometre Point (KP)
- Proposed Pipeline Alignment
- ▭ Yoweragabbie Scraper Station (Indicative Layout)
- ▭ Indicative Disturbance Footprint
- ▭ Development Envelope

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0 0.125 0.25 km

Coordinate System: GDA2020

LOCATION DIAGRAM

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Figure 2-6: Yoweragabbie Scraper Station with Indicative Layout



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PROJECT: Northern Goldfields Interconnect

TITLE: Carlinda Main Line Valve

SUBTITLE:

DATE: 15/12/2020

DATA SOURCE:
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Geonoma, Roads, Coastline: LGATE
Aerial Imagery: ESRI

LEGEND:

- Kilometre Point (KP)
- Proposed Pipeline Alignment
- Carlinda Main Line Valve (Indicative Layout)
- Indicative Disturbance Footprint
- Development Envelope

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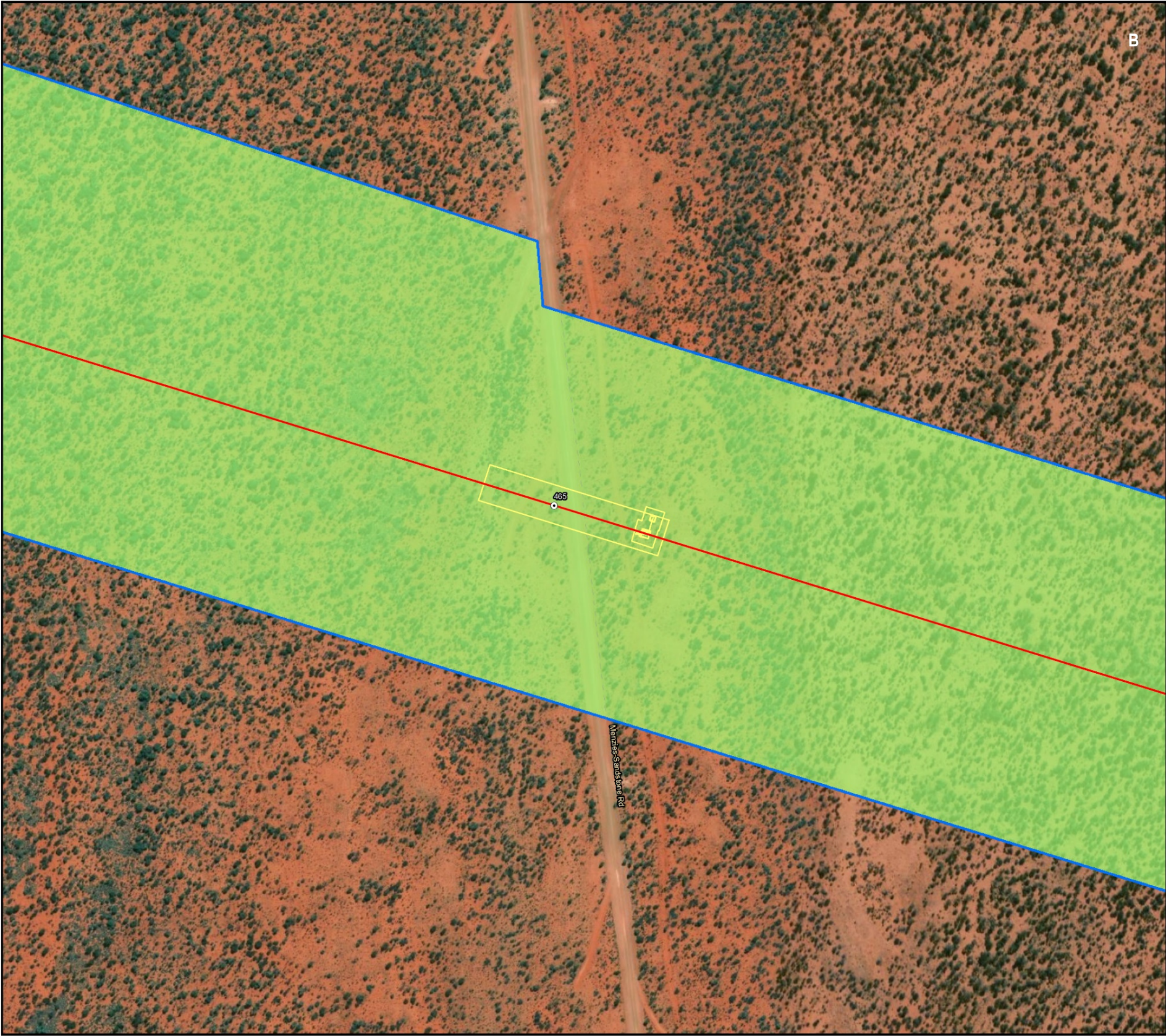
SCALE: 1:1,500 @ A3

0 0.045 0.09 km

Coordinate System: GDA2020

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PROJECT: Northern Goldfields Interconnect

TITLE: Dandaraga Main Line Valve

SUBTITLE:

DATE: 15/12/2020

DATA SOURCE:
KPs, Proposed Alignment, Dandaraga Main Line Valve, Development Envelope, Disturbance Footprint: APA Group
Geonoma, Roads, Coastline: LGATE
Aerial Imagery: ESRI

LEGEND:

- Kilometre Point (KP)
- Proposed Pipeline Alignment
- Dandaraga Main Line Valve (Indicative Layout)
- Indicative Disturbance Footprint
- Development Envelope

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Coordinate System: GDA2020 MGA Zone 50

LOCATION DIAGRAM

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Figure 2-7: Mainline Valve Stations with Indicative Layout
20199-RP-HSE-0001



Figure 2-8: Typical Mainline Valve Station

2.5.2.5 Wildara Delivery Station

The Wildara delivery station will be located near the end of the NGI pipeline (KP579), approximately 40 km south of Leinster (**Figure 2-9**). The station aboveground footprint will be approximately 60 m x 106 m (approximately 0.5 ha). The delivery station compound will extend outside of the existing GGP license area, with a buried pipe connecting the delivery station to the hot tap fitting on the GGP. The delivery station will control the flow of gas from the NGI pipeline to the GGP and include:

- Bi-directional pigging facility installed upstream of the station inlet shutdown valve to receive pigs launched from Yoweragabbie scraper station;
- Gas filtration, which comprises a dust filter to remove particulates from the gas prior to entry into the GGP. The system will have a differential pressure transmitter installed to provide alerts when maintenance is required. A pipe bypass will be installed to enable replacement of the filter elements without interruption to gas supply.
- Custody transfer metering skid – the skid will comprise two flow meters that will measure the total station flow into the GGP. The meters will be sized and calibrated for maximum and minimum process flow. Each meter will have a manual isolation valve.
- Flow/pressure control valves skid – the skid will receive gas directly from the metering skid and consist of a single stage pressure cut using flow control via two pressure control valves in duty/select arrangement. Various valves provide a means to shut off the pipeline in upset or emergency conditions, such as overpressure.
- Isolation and shutdown valves. The isolation valves will allow for the isolation of the NGI pipeline from the aboveground facilities. The shutdown valves will be installed



at the inlet to the delivery station and the outlet to the GGP pipeline, and be equipped with actuating systems to enable manual and remote control from the APA Integrated Operations Centre;

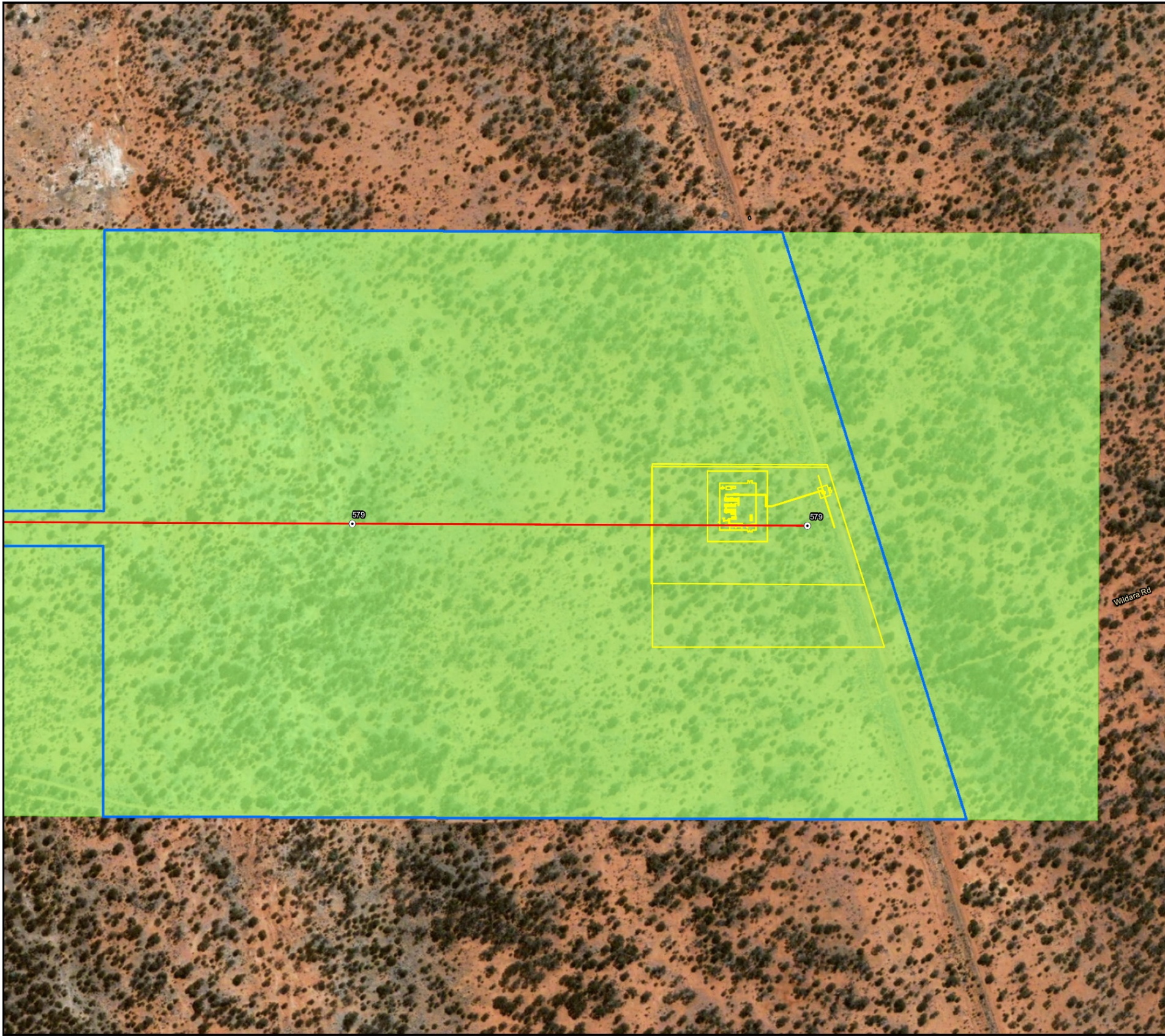
- Pipeline blowdown vent; and
- Solar power system to provide power for operation of the facility.

The delivery station will be fenced, with a firebreak maintained. Site lighting is not considered necessary, however, this will be confirmed during detailed design.

As with the Ambania compressor station, the design of the delivery station will allow future modification for bi-directional flow.

2.5.2.6 Weebo Inlet Station

The Weebo inlet station is the connection point between the buried NGI pipeline from the Wildara delivery station to the hot tap connection on the GGP. The station aboveground footprint will be approximately 0.1 ha (approximately 30 m x 20 m).



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PROJECT: Northern Goldfields Interconnect

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Geonoma, Roads, Coastline: LGATE
Aerial Imagery: ESRI

LEGEND:

- Kilometre Point (KP)
- Proposed Pipeline Alignment
- Wildara Delivery Station (Indicative Layout)
- Indicative Disturbance Footprint
- Development Envelope

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0 0.1 0.2 km

Coordinate System: GDA2020 MGA Zone 51

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Figure 2-9: Wildara Delivery Station with Indicative Layout
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2.5.3 Temporary Construction Areas and Support Facilities

Temporary work areas and infrastructure will be established to support the pipeline construction works, including: construction camps, bulk fuel storage, workshops, site offices, pipe delivery and laydown areas for pipe, equipment and materials, ablutions, turkeys nest(s) for storage of water for pipeline hydrotesting activities (refer to **Section 2.6.3** for details), and vehicle passing/turn-around bays. These areas will be sited within the development envelope, and consolidated as far as practicable. The Proponent has identified a number of potential locations for these areas within the development envelope, based on site reconnaissance visits, to assist with planning at this early stage. However, the final selection will be subject to the decision of the Construction Contractor.

Up to a total of six construction camps are proposed to be provided to support the construction of the NGI pipeline. The construction camps will collectively accommodate up to approximately 400 personnel. A number of the s will be located within the development envelope. However, a couple may be located in the broader surrounds, such as near Mount Magnet, in existing cleared areas.

The workshops, site offices and equipment laydown areas will be situated in close proximity to the construction camps.

The temporary ablutions (i.e. portaloos), turkeys nest(s), and vehicle passing/turn-around bays will be located within the development envelope and directly adjacent to the CROW.

Sewage from ablutions and associated grey water from the temporary ablutions will be stored in self-contained holding tanks. Contractors will be engaged for servicing and removal of raw sewage and grey water from site at intervals commensurate with storage capacity and waste generation rates. The Contractor will transport and dispose of waste at a licensed facility offsite. It is not anticipated that a sewage system will be required to be installed for the project.

2.6 Construction

The various construction activities are outlined in **Section 2.6.1** to **Section 2.6.5** below.

2.6.1 Clear and Grade

Prior to any ground-disturbing works, the limits of the CROW, turnaround bays and other ancillary work areas will be surveyed and marked out. The boundaries will be marked using stakes with flagging ribbon, which will be retained until reinstatement is complete. Following this, vegetation will be cleared and pushed into separate stockpiles at the side of the CROW and ancillary areas. Topsoil will be stripped to a minimum depth of approximately 100 mm (depending on the soil profile), and pushed into windrows at the side of the cleared areas (adjacent to, but separate from, the stockpiled vegetation) (**Figure 2-10**). Topsoil stockpiles will be no more than 2 m tall. The cleared area will be graded to the required levels.

Operational practices during clear and grade works will include the installation of temporary signs to direct construction works, such as speed limits. Temporary erosion and sedimentation control measures may also be installed, if required.

2.6.1.2 Construction Right of Way

The CROW represents the core work area in which construction activities, including earthworks, trenching, pipelaying, topsoil storage, trench stockpiles and pipeline access, will be undertaken. The ancillary work areas, including temporary portable ablutions and storage areas, will also be located within the CROW. The CROW will be approximately 30 m but may be up to 50 m in some locations to accommodate the ancillary work areas and vehicle turn-arounds. The disturbance footprint of the CROW within the development envelope will be approximately 1,850 ha. A typical cross section of a CROW is illustrated in **Figure 2-10**. Where practicable, the CROW will be narrowed in areas of higher conservation value; specifically in areas characteristic of the Eucalypt Woodlands TEC/PEC. Once completed, approximately 1,727 ha of the total cleared area that comprised remnant native vegetation will be rehabilitated. All clearing within the CROW will be contained within the development envelope (and associated pipeline licence area).

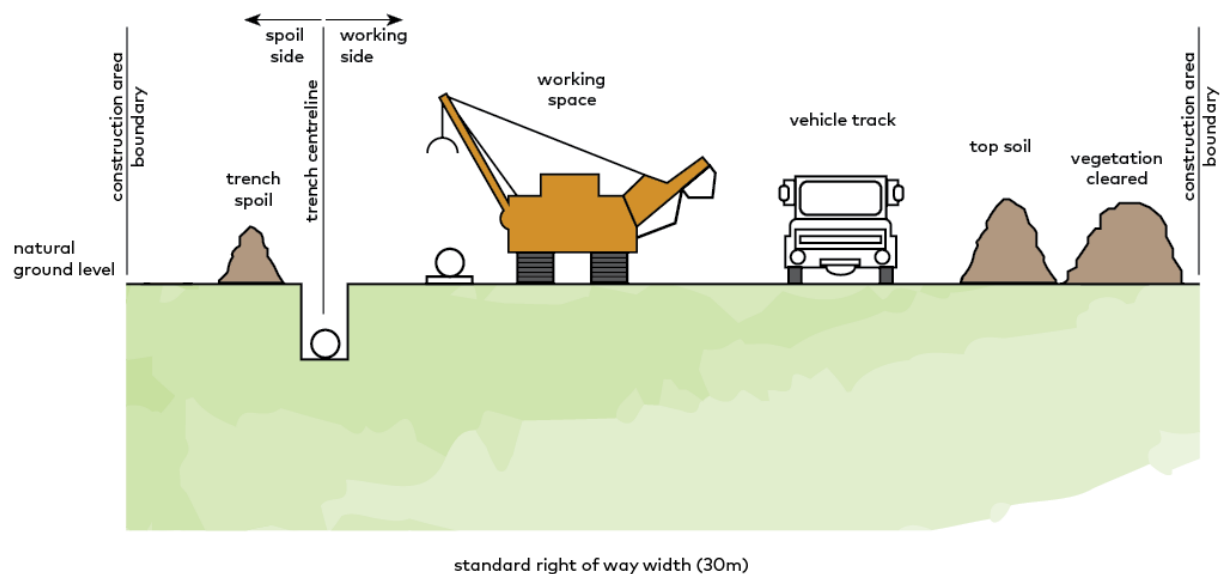


Figure 2-10: Typical Layout of the Construction ROW

2.6.2 Excavation and Trenching

A trench will be excavated for the pipeline using a range of specialist equipment (including excavators, bucket trenchers, and rock-saws, as appropriate to ground conditions) to a depth that allows adequate cover of pipe. Blasting at discrete locations along the NGI alignment will be required, which are designed to be controlled blasts, with minimal localised disturbance under control of a specialist contractor.

The depth of the trench shall be sufficient to ensure minimum cover is achieved after placement of the pipe. Generally, the trench will be approximately 1 m deep to provide cover of at least 750 mm, but depth will vary depending on location, land uses, ground conditions or in accordance with relevant agreements with landholders (**Table 2-4**). The typical maximum depth of the trench will be approximately 2 m.

However, where trenching is required to cross major watercourses or HDD construction methods are employed the depth will be approximately 5 m. Note, intersection with major watercourses is limited within the alignment (e.g. Tenindewa Creek, the upper reaches of the Irwin River and Salt Creek), with the majority of the watercourses being ephemeral creeks and tributaries. The trench is expected to be a minimum of 600 mm wide.

Table 2-4: Depth to Cover Requirements

Location Type	Typical Depth (mm) Normal Excavation
Rural/rural residential	750
Road crossings	1200
Track crossings	1,200
Rail crossings	2,000
Major watercourse crossing (or HDD)	5,000
Minor watercourse crossing (e.g. ephemeral creeks and tributaries)	2,000

Trench spoil will be placed on the trench side of the CROW, separate to the topsoil and vegetation stockpiles formed from clear and grade activities (**Figure 2-10**). The trench stockpiles will be a maximum height of 2 m. The trench will be backfilled (to at least cover the pipe, to provide protection) with the trench spoil, where suitable, as soon as practicable after pipe laying. Topsoil and vegetation will be respread as part of reinstatement activities.

An excavation of approximately 3 m by 3 m will be dug to facilitate the installation of the hot tap into the GGP from the Wildara delivery station.

All excavation for the NGI will be conducted according to APA Pipeline Excavation Procedures. These procedures require all excavations to be clearly marked and properly secured, with walls benched and/or ramped for stability and access, and to allow for fauna egress.

Breaks in the trench (“trench plugs”) will be left at intervals (typically at 1 km) along the trench line, with more breaks at special points such as crossings. The plugs will be ramped at approximately 45 degrees to allow fauna to leave the trench.

2.6.2.1 Pipeline Crossings

Standard designs will be developed for all crossings of roads/rail/tracks, third party infrastructure and permanent water courses. The crossing designs will be in accordance with the AS/NZ 2885.1 *Australian Pipeline Standard – Design and Construction*. Load calculations for roads/rail/tracks will be in accordance with API RP 1102 Steel Pipelines Crossings Railroads and Highways. All crossing of third party



infrastructure will be agreed with the responsible authorities and owners prior to commencement of crossing activities. Road and rail crossings will utilise heavy wall pipe and track crossings will use standard wall pipe to ensure the pipe has adequate strength to resist external loads. Where vehicle crossings (non-road legal) are required APA will design and locate crossing points where appropriate.

The NGI pipeline route crosses a number of minor ephemeral creeks and tributaries. Where the pipeline route crosses water courses (including ephemeral streams) the pipeline will generally be installed straight and horizontal for the full width between tops of banks. The minimum cover depth of the pipeline will be not less than 2 m (**Table 2-4**), however it may be greater if scour is estimated to encroach on the minimum depth.

While the basis of the construction works is that the pipeline will be open trench, HDD is being investigated, or is proposed, at discrete locations along the alignment. These locations include pipeline crossings of infrastructure (e.g. roads), watercourses and where there are known environmental/heritage sensitivities that can be avoided and/or minimised by use of underboring subject to favourable geotechnical conditions. The feasibility of undertaking HDD will be informed by a geotechnical survey, which commenced on 16 December 2020 and will carry through to Q1 2021.

HDD will involve excavating entry and exit pits (typically up to 3 m by 3 m by 3 m) at either side of the feature to be crossed, drilling a borehole under the crossing from entry to exit, then pulling a prefabricated section of pipe back through the borehole from exit to entry. The HDD works will be carried out by specialist contractors using HDD specific equipment and in accordance with project specific HDD procedures. Bentonite (a non-hazardous clay) is typically used as a drilling fluid, and is recirculated through transportable tanks, return mudlines and/or captured in the entry and exit pits. Drilling fluids will be controlled and monitored during drilling to assure there is no material loss onto or into the ground. HDD excavations are generally only open for the duration of HDD works and backfilled as soon as practicable after HDD is complete. Excavations will be ramped and fenced and inspected for fauna.

2.6.2.2 Blasting

Where the trench cannot be excavated with conventional rock-breaking equipment, localised, blasting will be required. Any blasting will be carefully controlled and carried out by a specialist Contractor. Blasts will be highly contained, using methods that have been safely used next to operating high-pressure gas pipelines. Blast size and duration will also be limited to the minimum required for the excavation of the pipeline trench. Consequently, little or no impact on surrounding areas is expected from blasting.

All blasts will be carried out in compliance with the relevant provisions of the Environmental Protection (Noise) Regulations 1997, although the majority of the pipeline route is distant from any premises that would be sensitive to noise. Blasting works will be limited to daylight hours.

2.6.2.3 Dewatering

Based on regional groundwater levels, the requirement for dewatering is unlikely to be required for the majority of the Proposal. More detailed site-specific information is proposed to be collected during the geotechnical survey planned, which



commenced on 16 December 2020 and will carry through to Q1 2021. In the unlikely event that dewatering is required, it will be managed according to a specific trench dewatering plan or procedure that is prepared by the construction contractor. Dewatering management will be consistent with standard industry practice and informed by the former Department of Water (now DWER) *Water Quality Protection Note 13: Dewatering of soils at construction sites* (DoW, 2012).

If dewatering is required, small bunds or windrows will be pushed up on either side of the trench to keep surface water out, and then small “flexidrive” pumps placed in the trench to remove water. Where re-use of trench dewater for dust suppression is not necessary or practicable, trench dewater will be discharged to ground outside the CROW, however inside the development footprint, subject to a site assessment that will consider aspects such as dewater volumes, rates, and quality, and the surrounding area, including any sensitive sites or surface water bodies.

Sprinklers or diffusers will be used to dissipate any dewater discharge, and prevent erosion; near water bodies, additional sediment controls such as sediment fences may also be put in place. Discharge (including water quality, discharge rates, and signs of erosion or inundation) will be closely monitored to ensure that impacts are prevented.

If a site assessment determines that trench dewater is unsuitable for discharge, the water will be contained and taken to a turkeys nest for evaporation or reuse, or taken offsite for disposal.

2.6.3 Pipe Assembly and Burial

Pipe will be delivered to the CROW and laid out end-to-end alongside the trench. The pipes will be approximately 18 m long and will be placed on raised timber skids or sandbags to protect the pipe coating from damage and allow it to be welded in continuous lengths. Bending may be required to enable the pipe to conform to topographic conditions. Pipe may either be ‘cold bent’ in the field using hydraulic bending equipment, manufactured by applying heat in a factory to produce the desired bend angle or by roping.

Pipe segments are welded into continuous lengths before being laid in the trench. Welded joints will be non-destructively tested to ensure compliance with AS2885.2 Pipelines-Gas and Liquid Petroleum-Welding, garnet blasted to remove surface scale and rust and then coated with a high build epoxy (HBE) to provide a continuous external coating to prevent corrosion.

Once welded, the pipe strings will be placed into the trench. Bedding and padding sand will be placed around the pipe to provide protection from sharp objects damaging the pipe coating. This will consist of fine material sourced from the trench stockpiles, wherever possible. If additional fill is required, it will be obtained from approved local sources.

After the pipe is lowered in, stockpiled trench spoil will be returned to the trench and compacted as soon as practicable. If trench spoil is deemed unsuitable for backfilling, (e.g. due to high rock content), clean fill will be imported to make up any shortfall. Where possible, fill material will be locally sourced.

Topsoil removed during clear and grade will then be re-spread over the CROW, including the backfilled trench, and contours reinstated.



2.6.3.1 Pipeline Hydrotesting

The NGI pipeline will be hydrostatically tested (“hydrotested”) in sections, to verify its integrity, in accordance with AS/NZ 2885.5 *Pipelines - Gas and liquid petroleum Field pressure testing*. Prior to hydrotesting, the interior of the pipeline will be pre-cleaned with pigs (cylindrical devices placed in the line) to remove weld debris, dust and surface scale. The pipeline will then be filled with water and pressurised for an extended period above the design pressure to complete strength and leak detection tests.

Approximately 3,540 kL of water will be required per 50 km section of pipeline (approximately 41,064 kL for the 580 km pipeline) for hydrotesting. Water used will likely be sourced from existing bores, subject to agreement from local stakeholders. The water will be tested prior to being allowed to be used for hydrotesting.

The quality of the hydrotest water is largely dependent on the quality of the source water. Hydrotest water may be required to undergo treatment prior to use. If required, the hydrotest water would be treated with chemicals (e.g. biocides and oxygen scavenger) to prevent corrosion in the pipeline. Water treatment will be completed in accordance with dosing rates recommended by chemical manufacturers.

Following completion of each hydrostatic test section, the hydrotest water will generally be discharged from the pipeline to a turkeys nest for storage or alternatively discharged into the next section of pipeline to be hydrostatically tested. Any discharge of hydrotest water will comply with relevant regulations and guidelines. Disposal methods for hydrotest water will be similar to that of dewatering discharges and may include:

- Re-use for dust suppression; or
- A lined turkey's nest may be used to store and evaporate any hydrotest water not deemed suitable for discharge.

2.6.3.2 Hot Tapping

Following excavation and trenching of the NGI pipeline, a hot tap connection will be made into the GGP at KP 1062 of the GGP. Hot tapping is the process of drilling a hole into the operating pipe. A valve is installed on the pipe and a hot tap machine, mounted on the valve used to drill a hole. Once complete the valve is closed to the hot tap machine, the pipe is sealed and the gas inside the hot tap machine can be vented prior to removal of the hot tap machine.

2.6.4 Permanent Aboveground Facility Civil Works

A number permanent aboveground facilities will remain for the life of the NGI pipeline, as described in **Section 2.5.2**. The specific nature of the works will vary between the facilities, however, at these sites, civil works may include:

- Pad construction, including building up and compacting the pad with suitable fill (clean and obtained from local sources), minor excavations, installation of control hut, skids, piling works and placement of concrete slabs;
- Grading to provide good drainage (nominal 1% fall) and raising of the site above natural surface;

- Installation of underground conduits and earth cable;
- Placing of aggregate over the ground, to prevent vegetation regrowth, and erection of site security fencing; and
- Clearing and maintenance of a fire break surrounding the site.

Additional mechanical and electrical works will include:

- Assembling equipment and lifting into position as per design;
- Installing free-standing equipment and structural steel work, interconnected piping and cable trays and gas utility lines; and
- Installing electrical power distribution and control components, power and control cables between the equipment and a remote terminal unit or control hut.

2.6.5 Pre-Commissioning

Testing of equipment will be undertaken onsite prior to commissioning. Testing of the pipeline and related infrastructure that will be completed prior to commissioning will include:

- Non-destructive testing (NDT), a process that is used to detect and assess any flaws in structural components/systems without causing damage to the feature;
- Functional testing of all manual valves, to ensure they are functioning correctly;
- Earthing compliance checks, to validate they are installed and functioning as required;
- Hazardous area checks/inspections;
- Continuity and point-to-point testing of circuits, to ensure the electrical circuit is operational; and
- Caliper pigging, to measure the internal pipeline geometry.

2.6.6 Resource Requirements

2.6.6.1 Water Usage

Indicative water requirements for the Proposal construction are summarised in **Table 2-5**. These represent a conservative estimate based on the information available at this time. Water is anticipated to be sourced from local sources and trucked to site. Water licences (5C and 26D) from DWER may be needed for groundwater abstraction and taking of water for construction works for the Proposal. The application for the required water licence(s) will be made by the construction Contractor.

Table 2-5: Construction Water Usage

Construction Activity	Approximate Water Usage (Kilolitres [kL])
Camp (including dust suppression)	135 kL/day/camp
Dust suppression – indicative disturbance footprint	90 kL/day
Construction – general	420 kL/day
Construction – hydrotest	3,540 kL per 50 km (total of 41,064 kL)

2.6.6.2 Fill

Additional fill may be required for backfill, pipe protection and bedding within the trench. All fill will consist of locally derived soils, supplied from a third party supplier, and transported to site. Any additional fill will be stored within the designated CROW.

2.6.6.3 Power Generation, Fuels and Other Hydrocarbons and Chemicals

Electricity will be supplied at construction areas by diesel generators.

The storage of fuels and other hydrocarbons/chemicals required for construction activities will be co-located with the construction workshops and site-offices at designated laydown areas, which are located in close proximity to the construction camp locations. Oil storage areas shall comprise of structural steel and concrete foundations and be covered and bunded.

Diesel storage is expected to include transportable fuel tanks, located at the construction workshop/site office laydown areas and mobile onsite fuel trailers to allow for refuelling along the CROW.

2.7 Commissioning

Commissioning of the NGI pipeline and associated aboveground facilities will involve the progressive introduction of gas, commissioning each item of equipment sequentially until the whole system is capable of operating as a unit.

Venting will be undertaken during commissioning. The volume of gas vented will be recorded as a part of the APA Permit to Work process. Venting is likely to occur over a period of up to total of approximately 2–3 days. The total volume of gas that will be vented from the pipeline and compressor station(s) (and compressor units) is expected to be in the order of approximately 124,008 m³, based on the current engineering design and including allowance for an additional compression at the Yoweragabbie scraper station (see **Section 2.5.2.3**).

2.8 Demobilisation and Reinstatement/Rehabilitation

Upon completion of testing and commissioning, all machinery, equipment and temporary buildings will be disassembled and removed from site. All waste and surplus materials will be removed from site and disposed of at the appropriate class landfill facility. Those areas required for construction purposes only, will be reinstated and/or



rehabilitated. Of the total area cleared for the Proposal, approximately 2,080 ha will be reinstated (91% of the indicative disturbance footprint). The area that will be rehabilitated will form a subset of this area, taking into account pre-existing cleared areas/pasture, and is expected to be in the order of approximately 1,727 ha (or 89%). The overall objective of rehabilitation is for vegetation re-establishment and soil stabilisation. Specific works to be undertaken may include:

- If required, scarification of disturbed areas to a depth of approximately 100 mm to facilitate decompaction of disturbed surfaces to allow seed and water trapping and vegetation re-establishment;
- Replacement of stockpiled topsoils over disturbed areas, distribution to be roughly even to a maximum depth of approximately 100 mm; and
- Redistribution of stockpiled vegetative matter (removed during initial vegetation clearing) over scarified areas.

The above approach is typical of a gas pipeline and has been successful at previous APA pipeline construction sites. The Construction Environment Plan (CEP) will provide further detail on rehabilitation and re-instatement, and a dedicated Rehabilitation Plan developed for the project.

2.9 Operations

The NGI pipeline and aboveground facilities will be operated remotely from the APA Integrated Operations Centre as the normal operating control mode. The facilities will be monitored and controlled remotely via SCADA, which is used nationally by APA across all assets. The pipeline and facilities shall also be provided with full local control for flexibility of operation and maintenance trouble-shooting.

APA will be responsible for the ongoing maintenance of the NGI pipeline and aboveground facilities.

Continuously supplied reticulated water is not required at the stations, except for the Ambania compressor station. The installation and operation of a water supply bore at the Ambania Compressor Station will supply the compressor station with continuous reticulated water, and provide water supply for general maintenance purposes. Water will be piped from the water supply bore at the Ambania Compressor Station to the required locations for maintenance activities when needed.

2.10 Access

Access to the CROW will mostly be from existing roads and tracks, and throughout the CROW itself. Access will include the existing APA MWP System ROW, roads and tracks off the Geraldton–Mount Magnet Road and Mount Magnet–Sandstone Road, and tracks on various pastoral leases (subject to agreement with the pastoralists). Access from existing roads and tracks may be improved to allow for the safe turning of trucks onto the CROW.

The CROW will include turnaround bays for large trucks and passing bays for vehicles and equipment working within the CROW. Turnaround bays will be generally located every approximately 2.5 km along the CROW.



At completion of construction works the CROW will be rehabilitated. The only exception to this will be an operations access track being maintained along the pipeline route, for maintenance inspections during pipeline operations and for pastoralist use. The long-term disturbance footprint of this access track is expected to be located adjacent to the NGI centreline, and will include occasional connections to nearby roads.

As part of the early planning phase of the Proposal, APA have identified provisional access routes to the development envelope. These preliminary access routes have been selected to:

- Take into account any known environmental and heritage values and avoid impacts to them as far as practicable; and
- Provide preference to the use or upgrade (widening) of existing/historically cleared tracks or naturally cleared areas to avoid intersecting native vegetation and fauna habitat as far as practicable. From project planning and reconnaissance activities undertaken to date it is expected that the requirement for the creation of new access tracks will be limited.

APA have provisioned for up to approximately 42 ha within the indicative disturbance footprint for the upgrade or establishment of access tracks to allow access during construction. The final selection of the access tracks will be subject to future refinement and definition by the construction Contractor, with APA oversight. Any clearing native vegetation outside the development envelope for the purposes of access will be managed under a native vegetation clearing permit, in accordance with the Environmental Protection (Clearing of Native Vegetation) Regulations 2004.

2.11 Local and Regional Context

2.11.1 Regional Setting

A biogeographic regionalisation of Australia has been developed in which bioregions (broad-scale regionalisations) are formally recognised and mapped: the Interim Biogeographic Regionalisation for Australia (IBRA), currently version 7 (Department of Environment, 2012). IBRA provides a landscape-based approach to the classification of the land surface of Australia, with bioregions being classified according to common climate, geology, landform, native vegetation and species information. Bioregions each reflect a unifying set of major environmental influences that shape the occurrence of flora and fauna and their interaction with the physical environment across Australia. Subregions are more localised and homogeneous geomorphological units within each bioregion.

The development envelope is located within several bioregions, which are summarised in **Table 2-6** and shown in **Figure 2-11**.

Table 2-6: Summary of IBRA Bioregions Intersecting the Development Envelope

Bioregion	Sub-region	Description
Geraldton Sandplains	Geraldton Hills	Consists mainly of Proteaceous scrub-heaths, often with mallees, on sandy soils on an extensive, undulating lateritic sandplain, with many endemic species of flora. Extensive York gum (<i>Eucalyptus loxophleba</i>) and acacia woodlands occur on outwash plains associated with drainage (McKenzie <i>et al.</i> , 2002).
Avon Wheatbelt	Merredin	Consists of a gently undulating landscape of Proteaceous scrub-heaths, rich in endemics on lateritic uplands, and mixed eucalypt, <i>Allocasuarina huegeliana</i> , and York gum woodlands on alluvial and eluvial sandplains (Beecham, 2001).
Yalgoo	Tallering	Is situated at an interzone between the Southwest and Eremaean botanical provinces. The bioregion is characterised by Gimlet (<i>Eucalyptus salubris</i>), <i>Callitris</i> and mulga woodlands over herb rich understorey on red sandy soils on open plains (McKenzie <i>et al.</i> , 2002).
Murchison	Eastern Murchison	The bioregion covers a large geographical area and, as such, is dissected into eastern and western regions. The eastern region, which is relevance to this Proposal, consists of salt lake systems associated with paleodrainage systems and sandplains with breakaways. Vegetation is dominated by mulga woodlands, generally over grasslands and ephemeral herbs, and alluvial and eluvial soils, with hummock grasslands on sandplains, saltbush shrublands on calcareous soils, and <i>Tecticornia</i> low shrublands on saline soils (McKenzie, 2002).

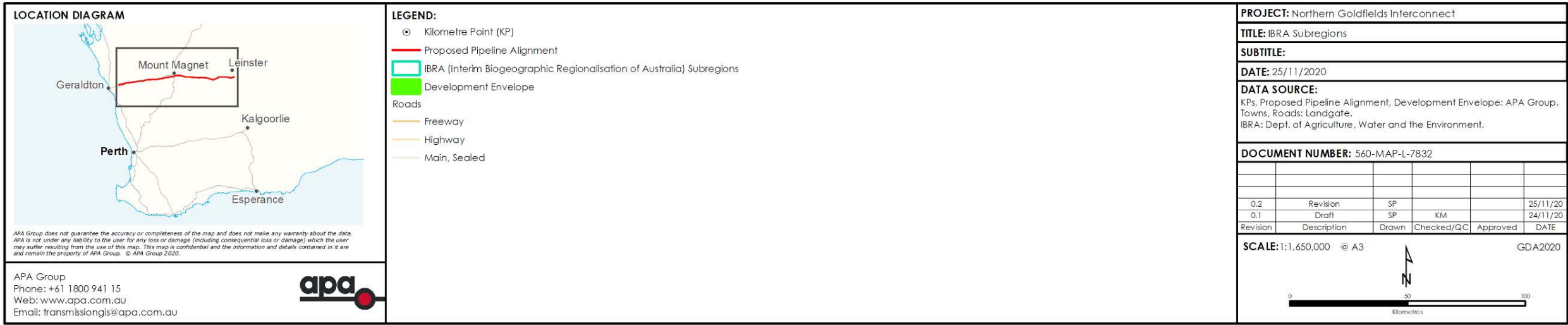


Figure 2-11: IBRA Regions of Relevance to the Proposal
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2.11.2 Land Systems

Land systems are based on landforms and vegetation and have been broadly mapped according to similarities in landform, soil, vegetation, geology and geomorphology (Pringle *et al.*, 1994). The development envelope traverses 31 land systems, as described in **Table 2-7** (Department of Primary Industries and Regional Development (DPIRD), 2018). The Monk, Tindalarra, Woodline, Mileura and Joseph land systems are the most common within the Proposal.

Table 2-7: Land Systems Intersecting the Development Envelope

Land System	Landform and Vegetation
Bandy	Gritty-surfaced plains and low outcrops of granite with scattered acacia shrublands.
Brooking	Prominent ridges of banded iron formation supporting mulga shrublands; occasional halophytic communities.
Challenge	Gently undulating gritty-surfaced plains, occasional granite hills, tors and low breakaways, with acacia shrubs.
Cunyu	Calcrete platforms and intervening alluvial floors and minor areas of alluvial plains, including channels with acacia shrublands and minor halophytic shrublands.
Desdemona	Extensive plains with deep sandy or loamy soils supporting mulga and wanderie grasses.
Ero	Tributary floodplains with shallow, erodible duplex soils on red-brown hardpan, supporting acacia shrublands with halophytic and non-halophytic undershrubs.
Gabanintha	Ridges, hills and footslopes of metamorphosed rocks (greenstones), supporting sparse acacia shrublands
Gransal	Stony plains and low rises based on granite supporting mainly halophytic shrublands.
Gumbreak	Low granite breakaways with extensive saline alluvial plains, supporting halophytic shrublands.
Hamilton	Hardpan plains, stony plains and incised drainage lines supporting mulga shrublands.
Joseph	Undulating yellow sandplain supporting dense mixed shrublands with patchy mallees.
Jundee	Hardpan plains with ironstone gravel mantles and occasional sandy banks supporting mulga shrublands.

Land System	Landform and Vegetation
Kalli	Elevated, gently undulating red sandplains edged by stripped surfaces on laterite and granite; acacia shrublands and understorey of wanderie grasses (and spinifex locally); replaced by areas of Bullimore land system.
Marmion	Gently undulating sandplains with mixed shrublands and hummock grasslands.
Mileura	Saline and non-saline calcreted river plains, with clayey flood plains interrupted by raised calcrete platforms supporting diverse and very variable tall shrublands, mixed halophytic shrublands and shrubby grasslands.
Monk	Hardpan plains with occasional sandy banks supporting mulga tall shrublands and wanderie grasses.
Nerramyne	Undulating plains of sandy-surfaced laterite and weathered granite, breakaways and rises supporting acacia
Nallex	Gently undulating stony plains supporting acacia tall shrublands and halophytic low shrublands.
Nubev	Gently undulating stony plains, minor limonitic low rises and drainages supporting mulga, halophytic shrublands.
Pindar	Loamy plains surrounded by sandplain supporting York gum woodlands and acacia shrublands.
Racecourse	Partly calcreted alluvial plains with dense acacia shrublands and bluebush and saltbush low shrublands
Sherwood	Breakaways, kaolinised footslopes, gently sloping plains supporting mulga shrublands, halophytic shrublands.
Steer	Gravelly alluvial plains with halophytic shrublands.
Tango	Saline hardpan plains with ironstone gravel mantles supporting mulga tall shrublands with understorey shrubs.
Tindalarra	Near level hardpan wash plains, narrow drainage lines and moderately saline drainage floors; supporting tall mixed acacia shrublands with wanderie grasses, also minor saltbush/bluebush low shrublands.
Tyrrell	Extensive sandplain with mallees, wattles, heath and spinifex.
Windarra	Gently undulating stony plains and low rises on granite, supporting acacia-eremophila shrublands.
Wilson	Large creeks with extensive distributary fans, supporting mulga and halophytic shrublands.

Land System	Landform and Vegetation
Woodline	Almost flat sandy-surfaced hardpan wash plains supporting tall shrublands and woodlands dominated by mulga.
Yalluwin	Hardpan plains and drainage tracts, supporting mulga, curara and other acacia shrublands.
Yanganoo	Almost flat hardpan wash plains, supporting mulga shrublands and wanderrie grasses on banks.

2.11.3 Geology and Soils

2.11.3.1 Geology

The majority of the Mid West Region, in which the Proposal is predominantly located, occurs within the Murchison Province (Johnson and Commander, 2006). The basement rocks of the Murchison Province comprise the Narryer Gneiss Complex of the Western Gneiss Terrane (in the north and northwest) and granite-greenstone rocks are overlain by Proterozoic sediments of the Nabberu Basin (in the northeast). Overlying the basement rocks, particularly along the palaeodrainages, are alluvial, colluvial and calcrete deposits of Cainozoic age.

The upper layers of unconsolidated alluvium and calcrete are variable in thickness but typically extend up to 20 m thick, reflecting a slope-wash and valley calcrete environment (Johnson and Commander, 2006). The thickness of the alluvium layer is influenced by its location within the drainage system and ranges between approximately 5 m to 20 m. The calcrete layer typically occurs along the margins of salt lakes and locally in parts of the main sub-catchments in the palaeodrainages. The thickness of the calcrete is generally < 10 m (Johnson and Commander, 2006), except in the Depot Springs Palaeodrainage in the Northern Goldfields in which calcrete extended up to 40 m in thickness (Johnson et al., 1999). The sedimentary sequence of the alluvium and calcrete layers is similar to that in the Northern Goldfields region. While there is limited data on the Tertiary sediments within the palaeodrainage systems, the basal sands typically range in thickness from 10 m to 40 m (Johnson and Commander, 2006).

Table 2-8 summarises the general stratigraphy of the rock units. The table also presents the hydrogeological significance of each geological layer.

Table 2-8: Broad Stratigraphy and Associated Hydrogeology of the Murchison Province

Age	Name	Lithology	Hydrogeology
Quaternary	Alluvium	Fine to coarse-grained sand with lenses of clay and gravel	Major surficial aquifer in stream channels and palaeodrainages; fresh to saline groundwater
Late Tertiary	Calcrete	Sheet calcrete	Major surficial aquifer in palaeodrainages; fresh to saline groundwater

Age	Name	Lithology	Hydrogeology
Early Tertiary	Palaeochannel deposits	Grey plastic clay overlying fine to coarse, carbonaceous, basal sands	Major confined sedimentary aquifer in palaeodrainages; saline to hypersaline
Cretaceous	Parmelia Formation	Interbedded sandstone, siltstone and shale	Significant confined sedimentary aquifer in Perth Basin; fresh to marginal groundwater
Jurassic	Yarragadee Formation	Interbedded sandstone, siltstone and shale	Significant confined sedimentary aquifer in Perth Basin; fresh to marginal groundwater
Triassic	Lesueur Sandstone	Sandstone	Significant confined sedimentary aquifer in Perth Basin; fresh groundwater
Silurian	Tumblagooda Sandstone	Sandstone with local interbeds of siltstone	Significant confined sedimentary aquifer in Perth and Carnarvon Basins; brackish groundwater; fresh to marginal in recharge zone
Proterozoic	Northampton Block	Granite, gneiss and dolerite	Minor local fractured-rock aquifer in linear belt separating the Perth and Carnarvon Basins; fresh to saline groundwater
Archaean	Granitoids	Granitoid rocks intruded by quartz veins and dolerite dykes	Minor local fractured-rock aquifer in plutons; fresh to saline groundwater
	Greenstones	Mafic to ultramafic volcanics, felsic volcanics, and metasedimentary rocks including chert and banded ironstone formation (BIF)	Minor local fractured-rock aquifer in linear, faultbounded belts; fresh to saline groundwater
	Migmatites and gneiss	Foliated and deformed granitic gneiss rocks	Very minor fractured-rock aquifer in linear belts; part of Narryer Gneiss Complex; brackish to saline groundwater

Source: Adapted from Johnson and Commander (2006).

2.11.3.2 Soils

The soils of the development envelope have been mapped and described in the Digital Atlas of Australian Soils (National Resource Information Centre, 1991). The development envelope traverses 13 soil systems, with brief descriptions provided in **Table 2-9**.

Table 2-9: Soil Systems Intersecting the Development Envelope

Soil System	Description
AB5	Sandy outwash plains from granitic areas with some gentle undulations and Wanderie banks. Dominant soils are shallow red earthy sands, shallow red earths, and red earthy loams. Some soils may contain ironstone gravels.
AB6	Sandy outwash plains from granites, gneisses, and allied rocks with numerous small waterways. Dominant soils are shallow red earthy sands with small areas of shallow red earths and red earthy loams. Some ironstone gravels may be present.
AB8	Sandy plains often with low dunes. Dominant soils are red earthy sands.
AC9	Gently undulating plateau underlain by sedimentary rocks with some dune tracts in places and some breakaways at margins. Areas of block laterite may occur. Dominant soils are yellow earthy sands.
BE3	Broken slopes and ridges characterised by breakaways, generally on gneissic granites and allied rocks; ironstone gravel pavement variably present. Dominant soils seem to be shallow earthy loams with some shallow soils, both underlain by a red-brown hardpan. Associated are a variety of soils on outwash areas below the breakaways, often only 15 – 35 cm deep. Some soils on calcrete (kunkar) platforms between shallow drainage-ways on the outwash areas below the breakaways, with some block laterite.
F8	Gently undulating to low hilly areas with gneissic rock outcrops and some low dunes. Dominant soils seem to be shallow loams. Associated are shallow soils with a red-brown hardpan at shallow depths.
F9	Gently undulating to low hilly areas with gneissic rock outcrops. Dominant soils seem to be shallow loams.
Ms12	Undulating plateau area with some low dunes, ironstone gravel pavement. Dominant soils are acidic yellow earths often containing much ironstone gravel and underlain by a red-brown hardpan. Associated usually on low dunes are yellow earthy sands sometimes underlain by a red-brown hardpan.
My46	Plains with occasional dunes and narrow saline flats and creeks. Dominant soils are neutral red earths with some alkaline red earths. Associated are some red earthy sands mainly on and adjacent to dune formations.

Soil System	Description
My48	Gently undulating to low hilly areas with gneissic rock outcrops dominated by soils of neutral red earths on the flatter portions underlain by a red-brown hardpan. Associated on the slopes are shallow soils.
My49	Plains and their flanking slopes dominated by soils of neutral and alkaline red earths with low rises, all underlain at shallow depths by a red-brown hardpan. Associated are saline flats with calcrete (kunkar) platforms having, and flanking slopes of the soils of the F8 system.
My50	Broad plains with a scatter of surface gravels. Dominant soils are shallow neutral red earths and shallow earthy loams in intimate micro-association. The system is underlain by a red-brown hardpan.
SV4	Saline valleys and salt lakes-salt-lake channels, mostly devoid of true soils, and their fringing areas. Common soils are gypseous and saline loams on riverine wash and usually underlain by clayey or sandy strata by about 30 cm. Associated are small areas of the soils of the adjacent areas, in particular soils often underlain by calcrete (kunkar). Also, dunes and lunettes of sandy soils.

2.11.4 Hydrology and Hydrogeology

The Mid West Region, in which the majority of the Proposal is located, is predominantly externally draining to the west into the Murchison, Greenough, and Irwin River catchments, which flow into the Indian Ocean (Johnson and Commander, 2006). All drainages are ephemeral with the exception of the Murchison River, which is intermittent (i.e. typically flows after heavy rainfall). The drainage in the remainder of the region, mainly in the east and south-east, is characterised by internal drainage into inland salt lakes (Johnson and Commander, 2006).

The Proposal does not intersect any freshwater lakes. However, a number of ephemeral creeks and tributaries are intersected, with flows highly dependent on rainfall. Low-lying salt lakes systems (and the associated fringing shrublands) occur in broader surrounds and intermittently intersect the Proposal. The Proposal crosses three key watercourses; Tenindewa Creek (approximately KP18.5), the upper reaches of the Irwin River (approximately KP59) and Salt Creek (approximately KP141.5).

Groundwater in the Mid West Region occurs within the different geological layers, as shown by **Table 2-8**. Some historical groundwater level data from bores near the Proposal are available from the Bureau of Meteorology (BoM) Australian “Groundwater Explorer” database (BoM, 2020). This data indicates that groundwater levels are typically 15 m – 25 m below ground level (bgl), but have been recorded as shallow as 4 m bgl.

Groundwater was not intersected during the MWP location (i.e. potholing) survey, which involved investigations up to depths of approximately 1.5 m–2 m in close proximity to KP1 to KP343 of the proposed NGI pipeline.

The Proposal does not fall within any Public Drinking Water Supply Areas.



2.11.5 Conservation Areas

There are no conservation areas or DBCA managed reserves within the development envelope (**Figure 2-12**). One DBCA land of interest, the Ex Barnong Station, is located directly adjacent to a portion of the development envelope between approximately KP113.5 to KP123.5 (10 km), which is approximately 26 km west-south-west of Yalgoo (at the closest point) (**Figure 2-12**). The Ex Barnong Station is a former pastoral station that DBCA are proposing to list as a National Park (Douglass *et al.*, 2019). The Ex Barnong Station has been excised from the GNEGIC, in which the development envelope is located within in this area. As part of the route alignment and refinement process, APA has avoided the requirement to create any additional access into/through the Ex Barnong Station, which will likely represent a future conservation estate, by staying within the GNEGIC corridor.

There are no known environmentally sensitive areas in the development envelope. The closest environmentally sensitive area is a salt lake system located approximately 5.3 km to the south of the development envelope and approximately 2 km south-east of the Wagga Wagga Salt Lake, which is located approximately 48 km east of Yalgoo.

Wagga Wagga Salt Lake is a nationally important wetland and is located approximately 4 km south of the development envelope at the closest point. The wetland has inflow from numerous minor drainages, with the main drainage coming from the north, and is characterised by a bare lakebed (DAWE, 2020a). Surrounding areas are covered by an open shrubland of mixed wattles, dominated by mulga. The land type within the surrounding area is sandplain with outcrops of greenstone (DAWE, 2020b). Given the nature of the Proposal and the separation distance, no impact to the Wagga Wagga Salt Lake is expected.

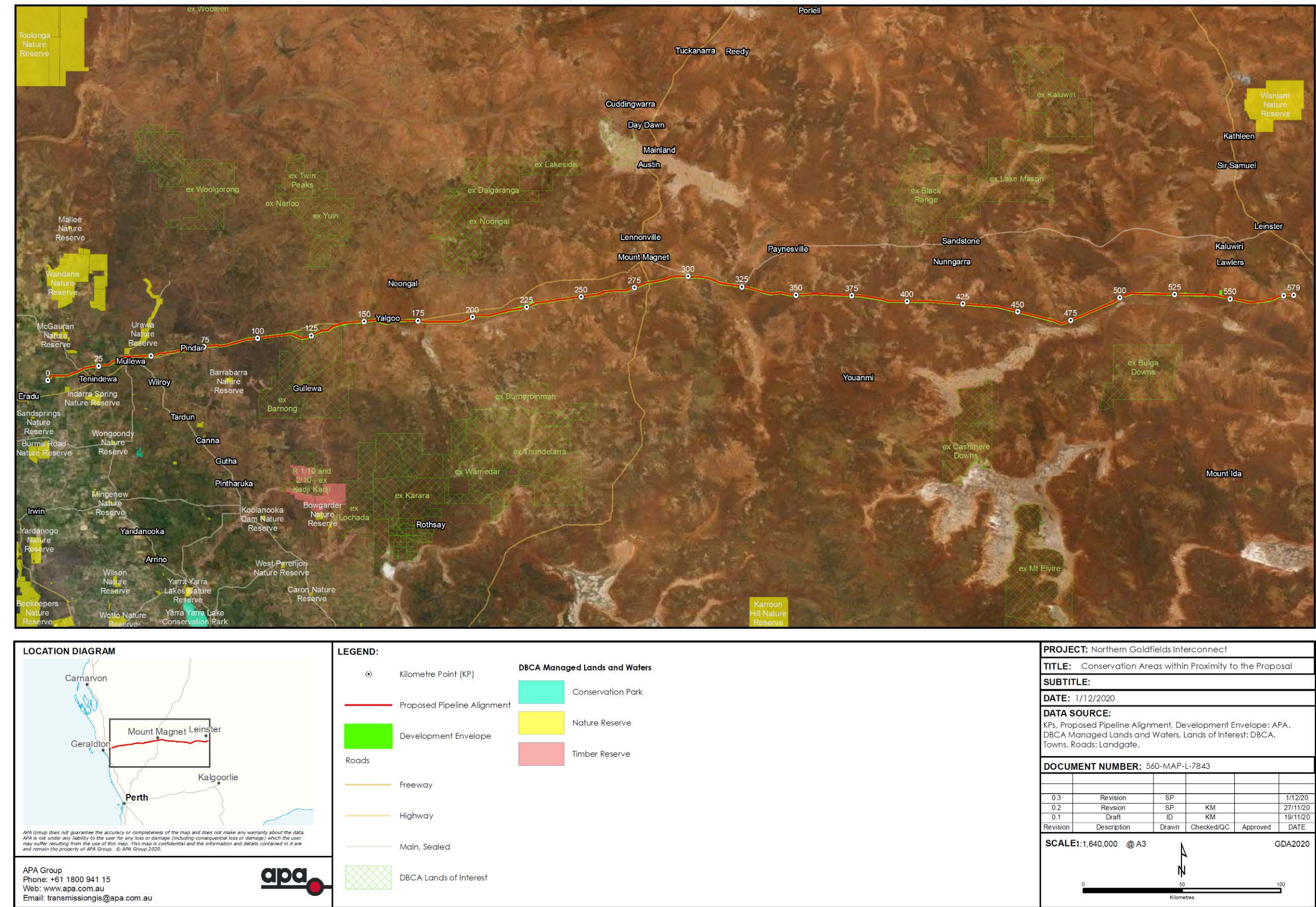


Figure 2-12: Conservation Areas within Proximity to the Development Envelope

2.11.6 Land Use

The dominant land uses for the region traversed by the development envelope includes cultivation (wheat farming), grazing (native pastures), unallocated Crown Reserves and mining (**Figure 1-2**).

The development envelope traverses through a sparsely populated area and does not directly intersect any towns or densely populated residential areas. The closest towns are (from west to east) Mullewa, Pindar and Yalgoo, which are located less than 2 km from the development envelope. Mount Magnet is the next closest town, at approximately 13 km north of the development envelope. There are a number of individual residences within the surrounds of the development envelope. The closest of these is approximately 120 m within the agricultural section of the Mid West region with the next closest residence being approximately 350 m away. The nearest pastoral homesteads in the eastern Mid West and Goldfields regions are approximately 350 m (Yoweragabbie Station) and 700 m (Murrum Station) from the proposed alignment. The Proponent has commenced a comprehensive stakeholder engagement program with all landholders whose properties are intersected by the development envelope (refer to **Section 3** for further detail).

The development envelope traverses agricultural land, which includes a mix of cropping (western portion) and pastoral land uses (eastern portion). The development envelope also maximises the use of existing infrastructure corridors, such as the DBNGP easement and GNEGIC, where possible, in order to reduce the extent of disturbance required for the Proposal and in keeping with the proposed use of the land.

2.11.7 Native Title

There are two Native Title Determined Claims overlapping the Proposal; the Yamatji Nation and the Badimia People. The Determined Claim for the Badimia People identifies that Native Title does not exist in the entire determination area. The Determined Claim identifies that Native Title exists in parts of the Determination Area only for the Yamatji Nation. It was intended that the Determination of Native Title would consolidate the following Native Title claims within the Yamatji Nation Claim; the Southern Yamatji Claim, Hutt River Claim, Mullewa Wadjari and Widi Mob Claim. Settlement was reached for these parties on 7 February 2020 as part of the Yamatji Nation Southern Regional Agreement (i.e. Indigenous Land Use Agreement).

No areas of Determined Native Title (that are non-exclusive or exclusive) intersect the Proposal. One Native Title area associated with the Yamatji Nation Claim is directly adjacent to the Proposal and is associated with the Ex Barnong Area. More broadly, this area of Native Title has also been excised from the GNEGIC.

Four Registered Native Title Claims intersect the Proposal, these include:

- Southern Yamatji; WC2017/002 – accepted for registration (new decision in progress under s190A of the *Aboriginal Heritage Act 1972*) and intersects the start of the NGI pipeline route and the Ambania compressor station;
- Mullewa Wadjari Community; WC1996/093 – accepted for registration and intersects part of the NGI pipeline route west of Mount Magnet;



- Widi Mob; WC1997/072 – accepted for registration (new decision in progress under s190A) and intersects part of the NGI pipeline route west of Mount Magnet; and
- Wajarri Yamatji (WAD28/2019) – accepted for registration, however Native Title and all other interest were taken (as per Taking Order J481854) as part of the Reservation of the GNEGIC.

The Southern Yamatji, Mullewa Wadjari Community and Widi Mob Claims form part of the Settlement with the State of WA in the Yamatji Nation Southern Regional Agreement. These Native Title Claim groups authorised an Indigenous Land Use Agreement on 9 December 2019.

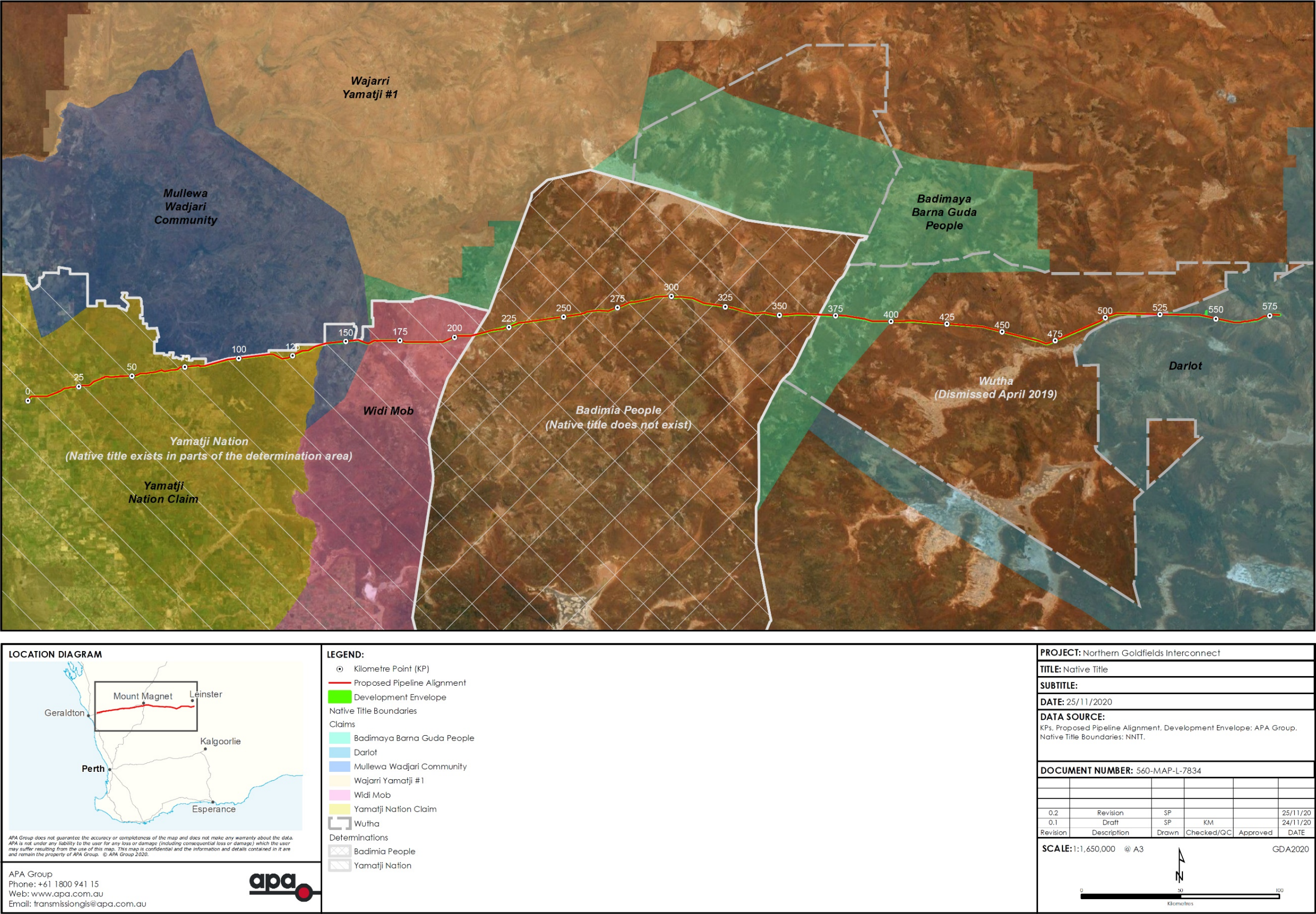


Figure 2-13: Native Title of Relevance to the Proposal