

Drilling – Fluid storage freeboard

- Ponds have freeboard capacity for potential rainfall
- In line with Code of Practice, freeboard must allow for a once in a thousand-year rainfall event
- White line markers indicate maximum fill level with freeboard above the line



Drilling – Fluid and cuttings disposal

- Drill fluids will be disposed of by evaporation
- If the residues meet requirements, it will be disposed of by on-site burial
- If residues do not meet requirements, it will be disposed of by removal from site to a licensed facility



Drilling - Carpentaria 1 V



- Drilled 23/09/2020 to 23/10/2020
- Vertical well drilled to 1890m
- No environmental incidents
- May be re-entered and drilled as a Horizontal well in the future



Drilling - Carpentaria 2

- Drilled 07/11/2021 to 16/12/2021
- Vertical well drilled to 1800m
- Vertical plugged back to 1050m
- Horizontal well drilled to 3150m
- 1300m of horizontal well in the target formation
- No environmental incidents



August 2023

Drilling - Carpentaria 3

- Drilled from the existing Carpentaria 2 pad
- Drilled 13/10/2022 to 21/11/2022
- Horizontal well drilled to 4460m
- ~2500m of horizontal well in the target formation
- No environmental incidents



Drilling - Carpentaria 4

- Drilled 15/12/2022 to 05/01/2023
- Vertical well drilled to 2000m
- No environmental incidents
- Plan to plug back and drill a horizontal well from this wellbore



August 2023

Drilling– EP187



2020

- Carpentaria 1 Vertical (V)

2021

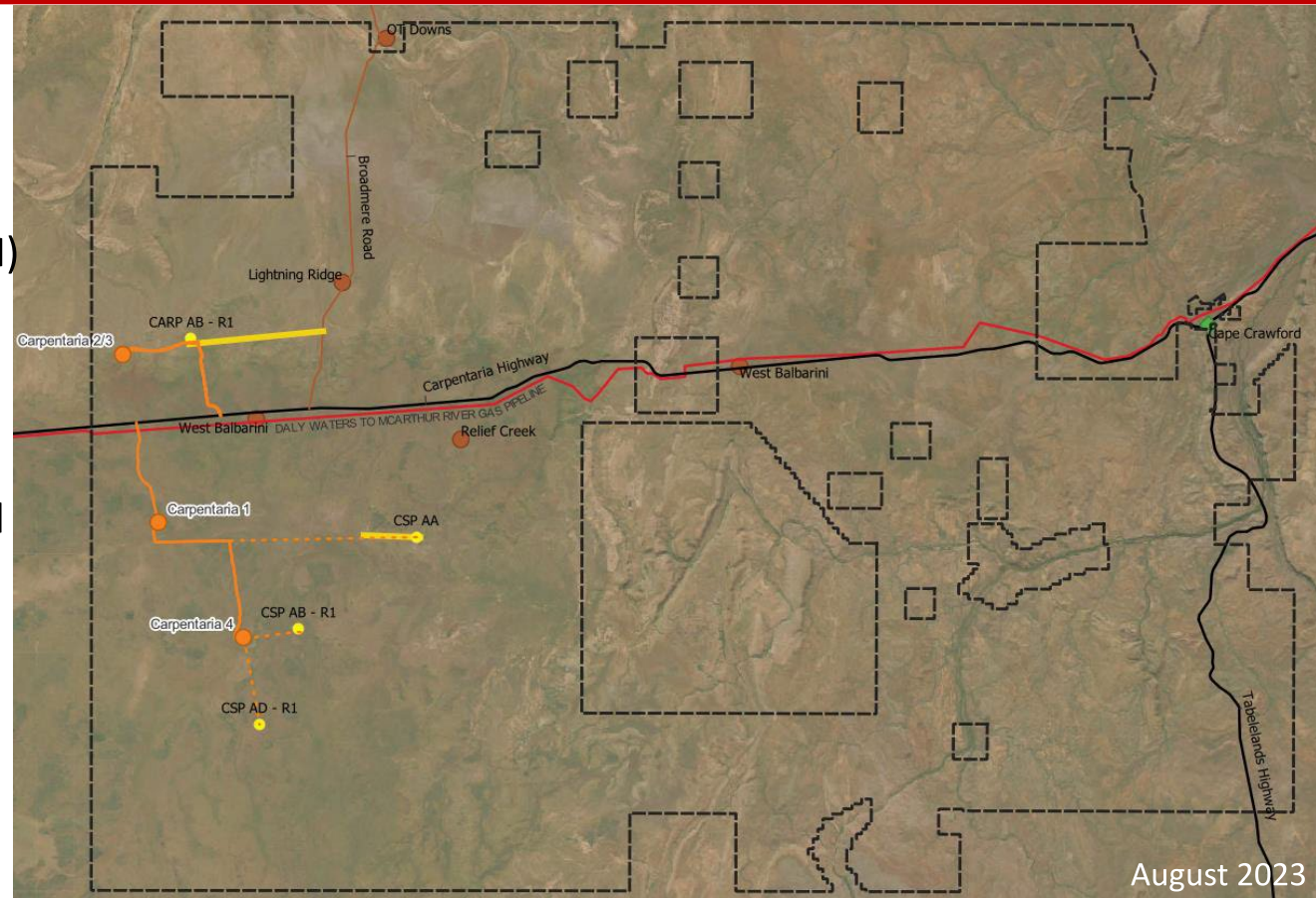
- Carpentaria 2 V
- Carpentaria 2 Horizontal (H)

2022

- Carpentaria 3 H on the Carpentaria 2 wellpad
- Carpentaria 4 V

Future works under approved EMPs

- Carpentaria 1 & 4 H
- Carpentaria 5,6 & 7 V&H



Hydraulic fracturing – EP187

2021

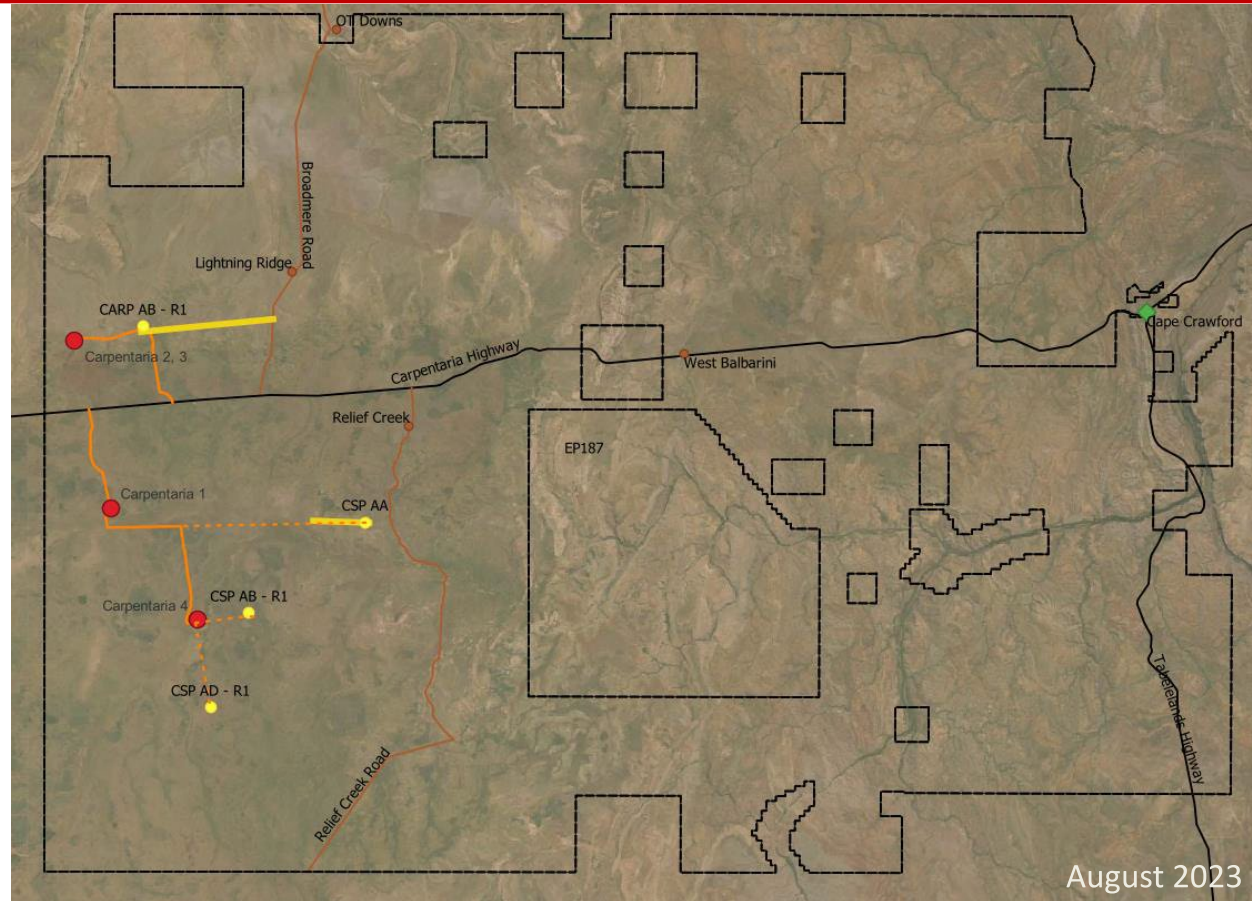
- Carpentaria 1 Vertical

2022

- Carpentaria 2 Horizontal
- Carpentaria 3 Horizontal

Future works

- Carpentaria 1, 4, 5, 6, & 7 Horizontal wells



- Rehabilitation of works goes over the life of the project
- Wellpad ponds are backfilled when no longer needed
- Wellpads are made smaller during production
- Rehabilitated areas are recontoured to natural shapes and revegetated to close to pre disturbance vegetation cover



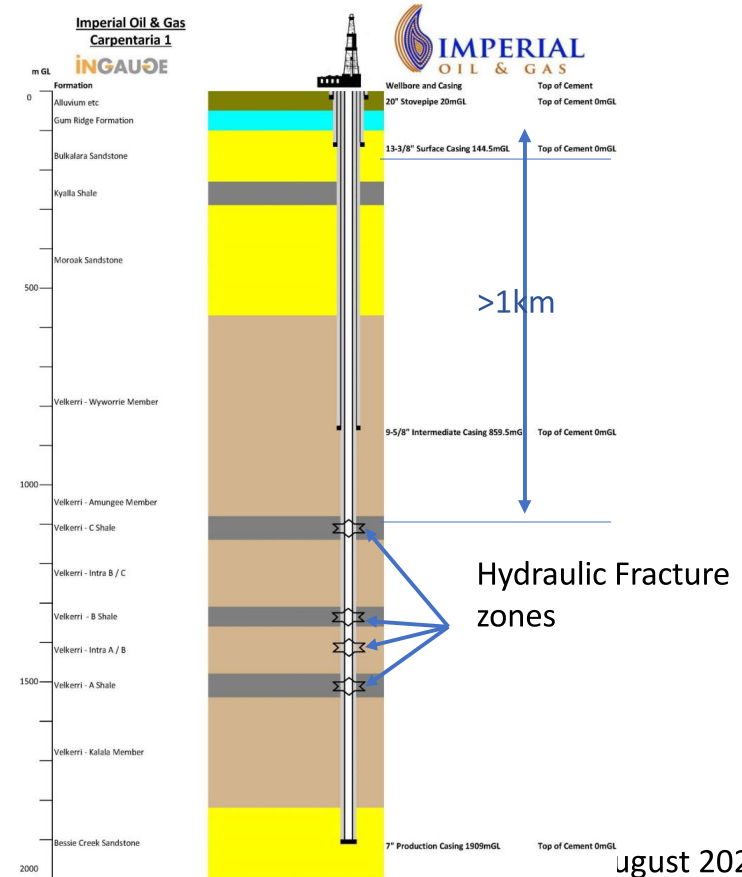
★ BAS Point ▨ Interim Reclamation ▩ Reference Area ▤ Exclusion Area

August 2023

Additional Information Hydraulic Fracturing

2021 Hydraulic Fracture – Carpentaria 1

- Perforated and Fracture stimulated into 4 zones in the Velkerri Formation
- The closest formation over 1km deeper than the bottom of the closest aquifer
- The aquifer monitoring showed no impact on the aquifer from HF
- The well integrity monitoring showed no well integrity issues during HF
- The seismicity sensor showed no seismic events caused by HF



August 2023

Hydraulic Fracture – Carpentaria 2

- HF 21 stages in 1km of horizontal wellbore
- No safety or environmental issues
- The closest formation is over 1km deeper than the bottom of the closest aquifer
- Aquifer monitoring showed no impact on the aquifer from HF
- The well integrity monitoring showed no well integrity issues during HF
- The seismicity sensor showed no seismic events caused by the HF



Hydraulic Fracture – Carpentaria 3

- HF 40 stages in ~2.5km of horizontal wellbore
- No safety or environmental issues
- The closest formation is over 1km deeper than the bottom of the closest aquifer
- Aquifer monitoring showed no impact on the aquifer from HF
- The well integrity monitoring showed no well integrity issues during HF
- The seismicity sensor showed no seismic events caused by HF



August 2023

2021 Hydraulic Fracture – Carpentaria 1

- The aquifer monitoring showed no impact on the aquifer from HF
- The well integrity monitoring showed no well integrity issues during HF
- The seismicity sensor showed no seismic events caused by HF



August 2023

Additional Information Production testing

Production Testing – EP187

2021

- Carpentaria 1 Vertical

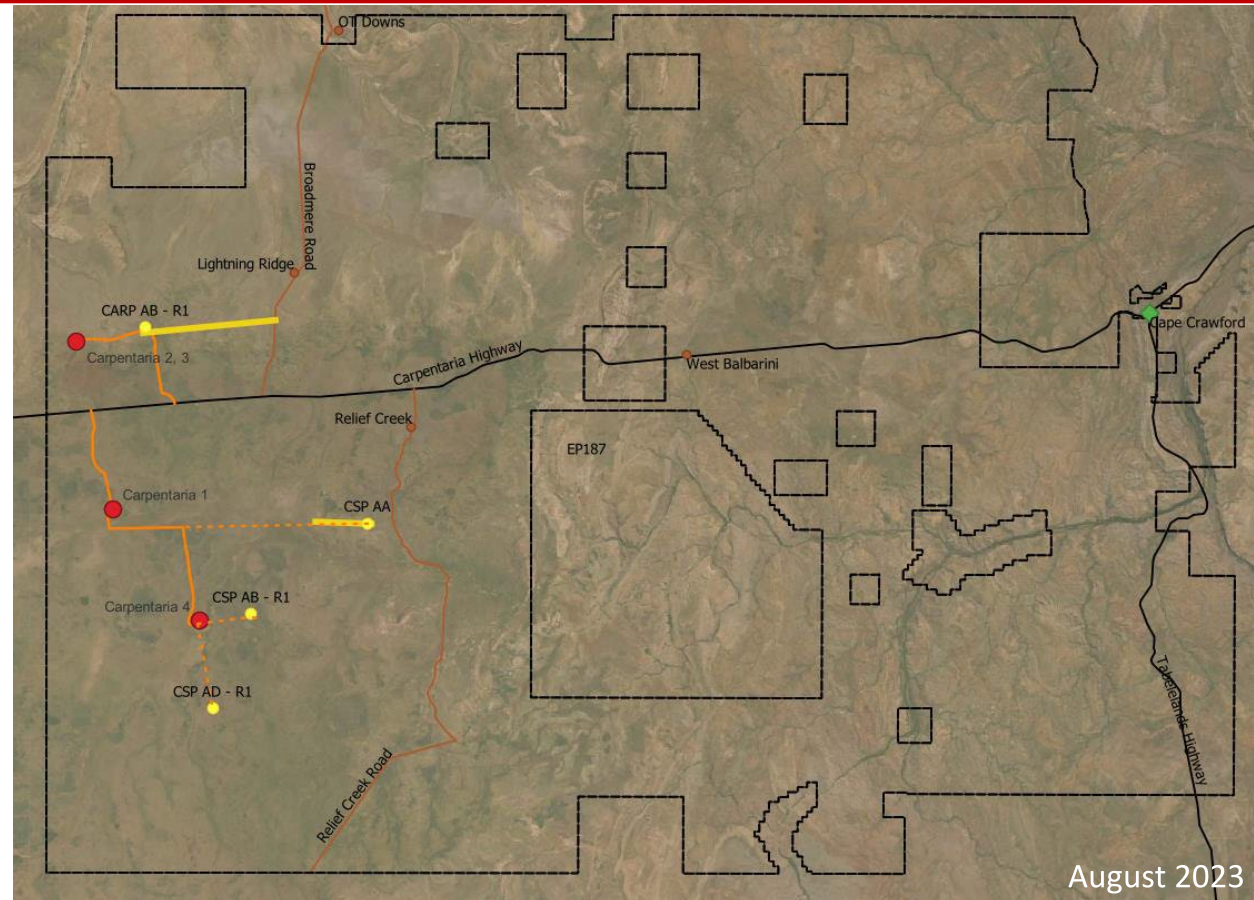
2022/2023

- Carpentaria 2 Horizontal
- Carpentaria 3 Horizontal ongoing

Future works

- Carpentaria 1, 4, 5, 6, & 7 Horizontal wells

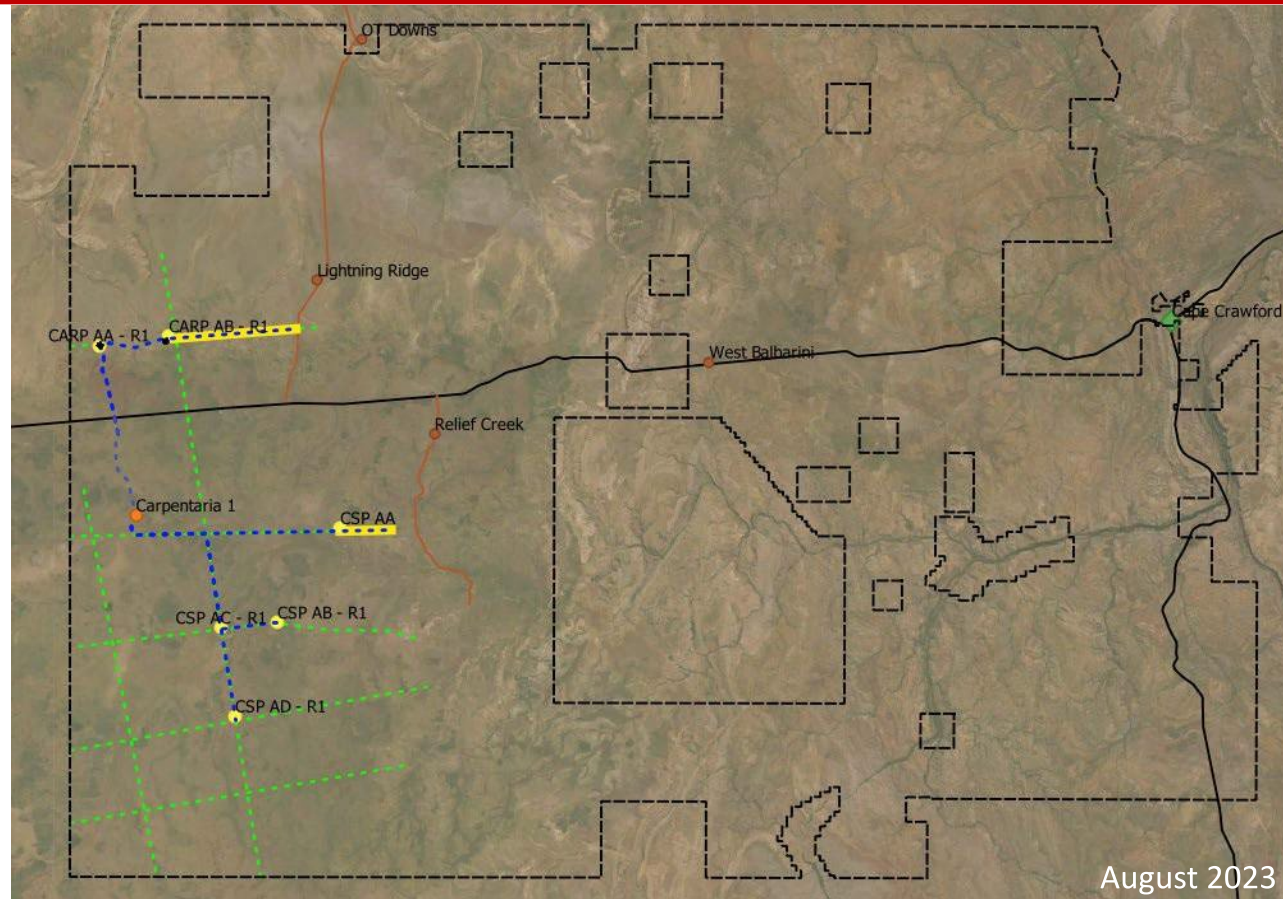
- Orange lines are constructed access tracks
- Dashed lines are planned access tracks
- Red dots are current wellpads
- Yellow dots are planned wellpad locations
- Yellow lines are movement corridors for planned wellpads



Planned works for EP187

Under approved EMPs

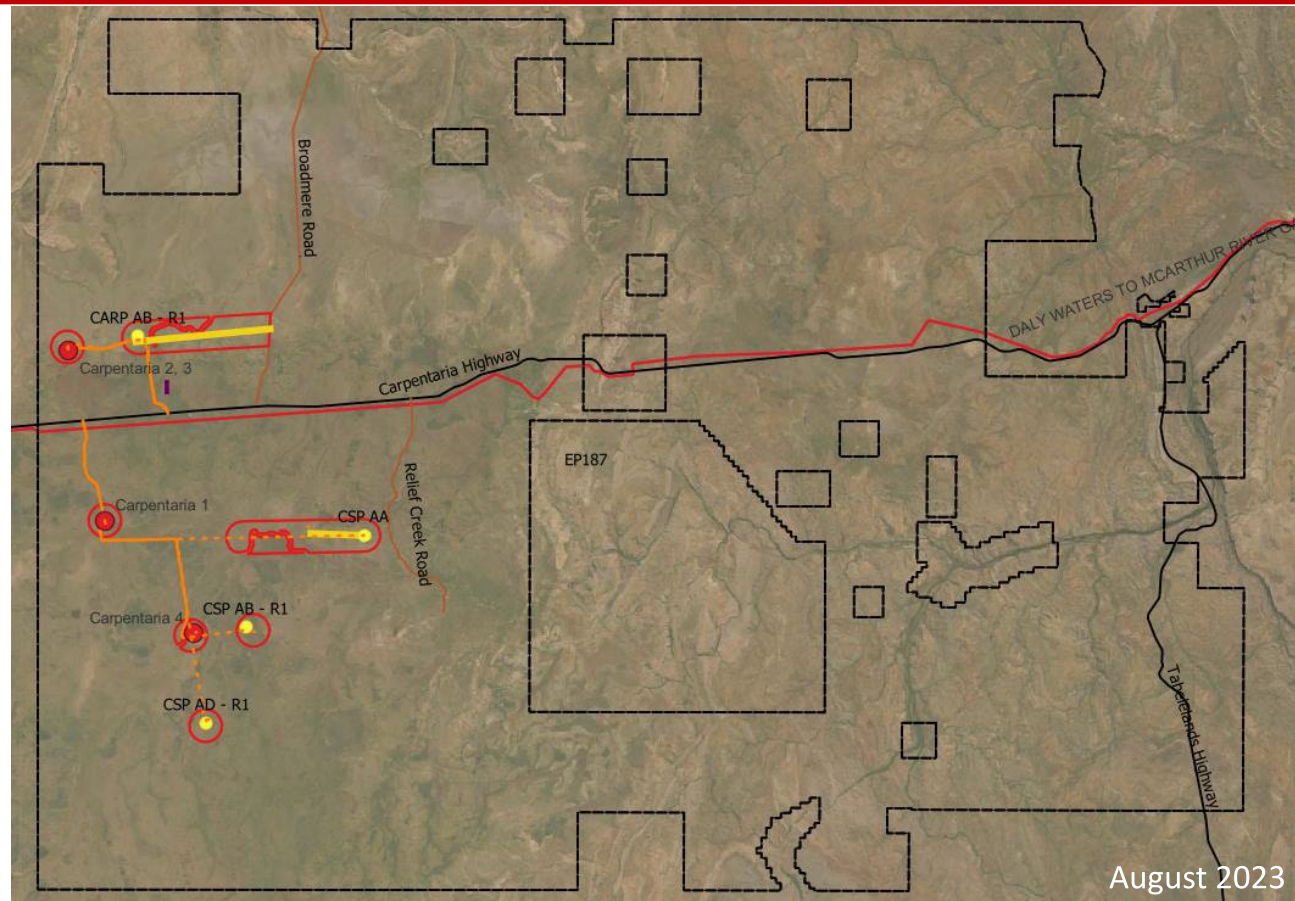
- Up to 4 new wells
 - Wellpads
 - Up to 35km of access tracks
 - Drill as Vertical and Horizontal
 - Hydraulic Fracture
 - Production Test
- Construct up to 58km of buried wastewater flowlines
- Drill a horizontal well from the existing Carpentaria 1 wellbore
 - Hydraulic Fracture
 - Production Test
- These wells may be used as future production wells



August 2023

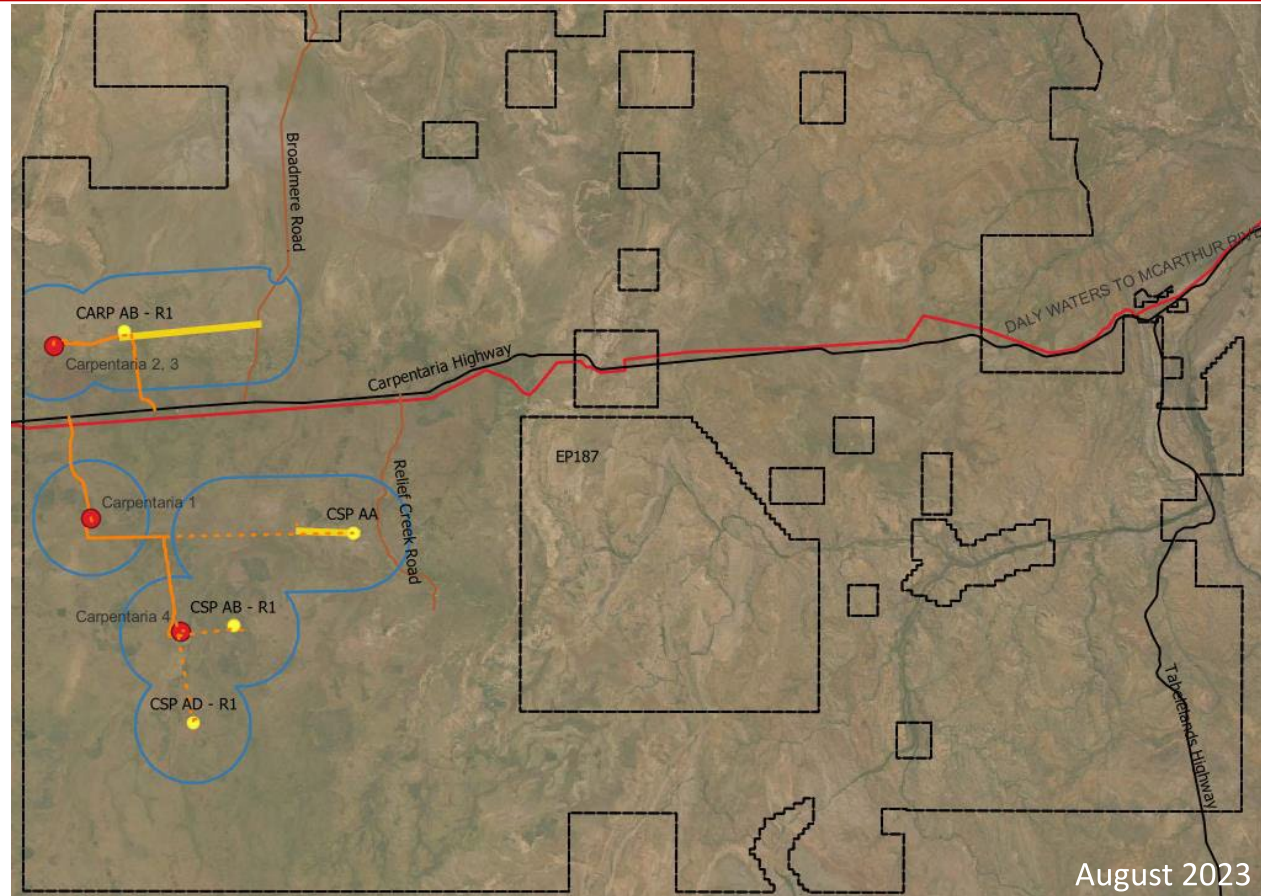
Planned works –187 - Wellpads and Access

- Up to 4 new wellpads
 - Yellow dots & lines how the indicative locations of wellpads
 - Red zones show the area that wellpads may be shifted within
- Up to 35km of Access tracks
 - Orange dashed lines
- Access tracks will follow seismic lines to minimise disturbance
- Traditional Owners will culturally manage first disturbance works



Planned works – EP187 - Wells

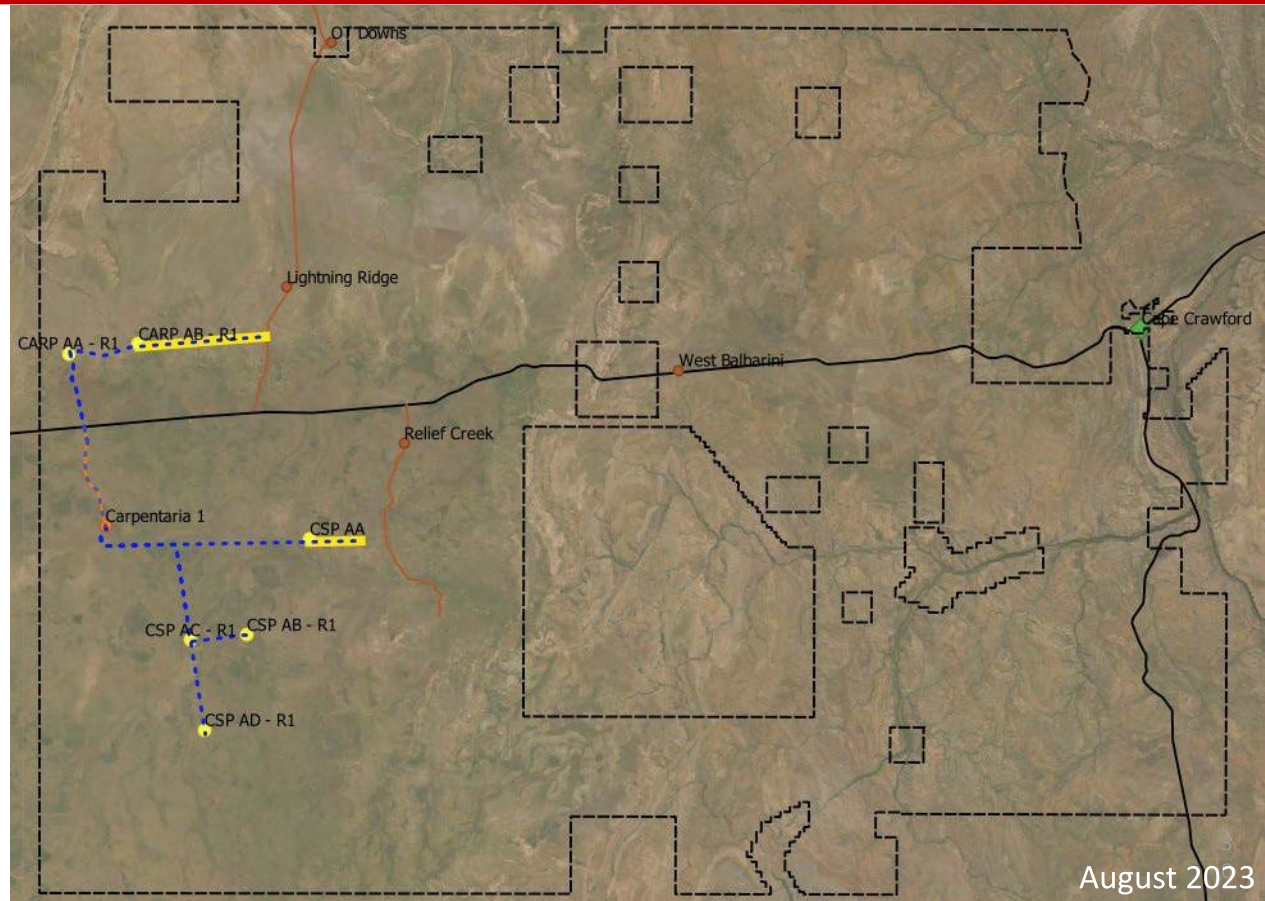
- Up to 4 new wells
- Drill Vertical well
 - Plug Back lower section after getting formation data
 - Drill Horizontal well
 - Hydraulic Fracture
 - Production Test
- Blue lines show the possible subsurface extent of the horizontal well trajectories



August 2023

Planned works – EP187 - Flowlines

- Up to 58km of wastewater flowlines connecting the wellpads
 - Dashed blue lines
- Follow access tracks and seismic lines to reduce disturbance
- To allow re-use and recycling of wastewater between wellpads
- To reduce the number of tanks required
- Traditional Owners will culturally manage first disturbance works



Project Water usage



- Imperial has a water extraction license for the activities in EPs 167, 168, 187
- The majority of water is used in Hydraulic Fracturing
- Imperial is re-using Flowback Water where practicable to reduce freshwater requirements
- Only a small volume of water is used in production

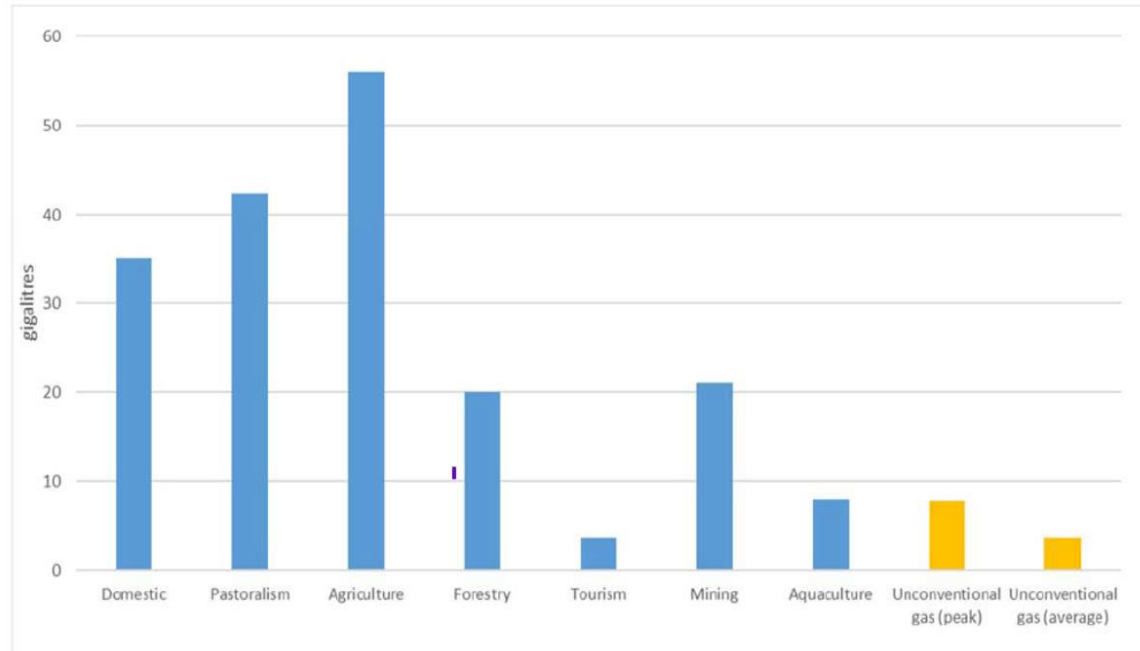


Figure 2-1. Graph comparing estimated annual water use (by industry) in the NT

A “Comparative Impact Study” by EcOz in 2017 found that the water use for gas production is likely to be less than other uses in the NT. <https://frackinginquiry.nt.gov.au/?a=440742>

4.1.2 2023.08.20 – 25 | OCM Story Boards

Examples of what is made from oil and gas



Lipstick and other cosmetics; skin care, shampoo; detergents and other cleaning products; and the containers they come in



Medical and hygiene equipment; some medicines



Fuel and fertilizer for agriculture and gardens



Paint, tyres, plastic trims, synthetic upholstery, carpet and more in motor vehicles. Petrol, diesel and motor oil



Sporting equipment, toys, baby nappies



Recreational and sports equipment, fishing gear and fishing line



Sportswear, shoes, hi-vis and other synthetic clothing



Paint, tools, garden equipment, ocky straps



Hot water, home heating, cooking with gas



Transportation and fuel



Modern and old technology – laptops, solar panels, smartphones, pens, ink for pens and printers



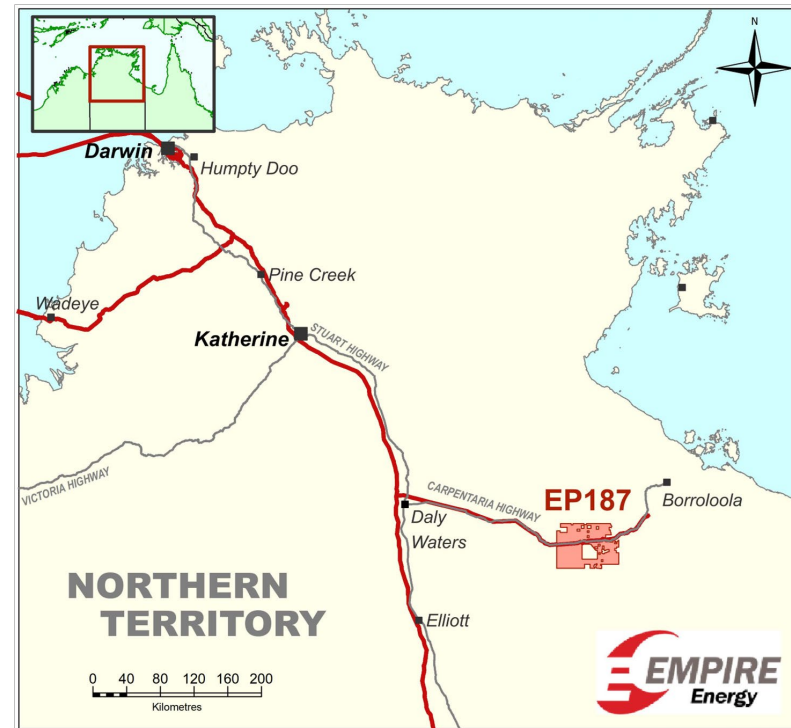
Tackle boxes, tool boxes, lunch boxes and storage containers



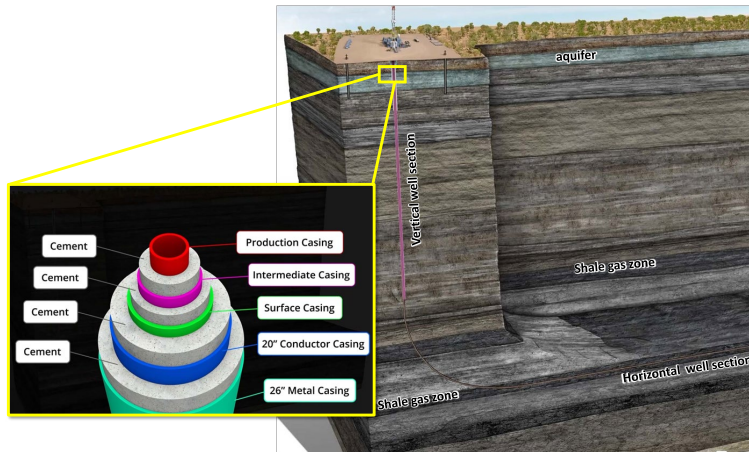
Developing the Beetaloo Sub-basin

Responsible and successful development of the Beetaloo Sub-basin means:

- More jobs for local companies including regional and Aboriginal employment and procurement opportunities.
- We operate with the consent of Traditional Owners and they will receive financial royalty payments.
- Taxes and royalties will be paid to the NT Government which can go towards improving local community services, regional roads, more police, schools, hospitals and infrastructure.
- Production of the resource will contribute to energy security for Australia with more domestic supply to the market.
- More gas supply will be important for supporting the clean, reliable energy transition for Australia and internationally.



Protecting Aquifers and Ground Water



Example cross section of a well head

- **Well Integrity** is about keeping control of any fluids in the well and underground. With good well integrity, the well remains completely separated from the aquifers, the surrounding rock formations and the environment at the surface.

- Metal casing and special engineered cement are important components to maintain well integrity. After a section of the well is drilled, steel casing is inserted and set in place with cement.

- The steel keeps the hole open and the cement stops any fluid flow between the well and the rock formations.

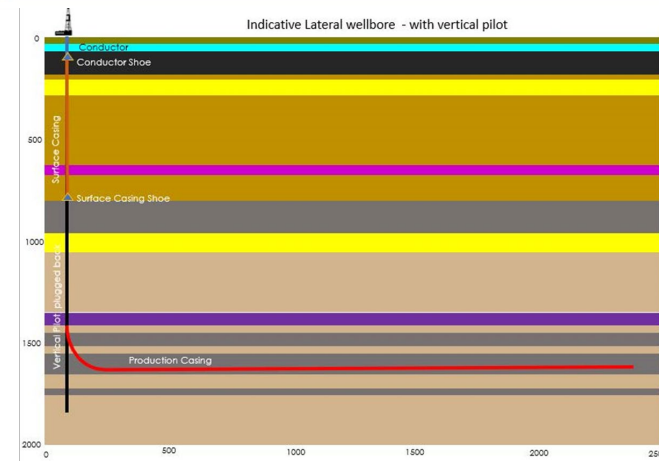
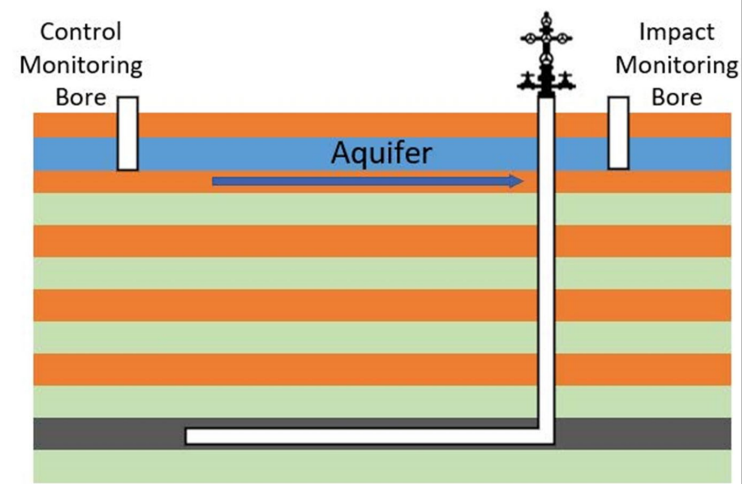
- There are multiple layers of cement and steel casing in any aquifer zones. There is over 600m depth separations between the aquifer and the geological target formation.

- Specialised electric logs are used to check the integrity of the cement and casing protecting the aquifer.



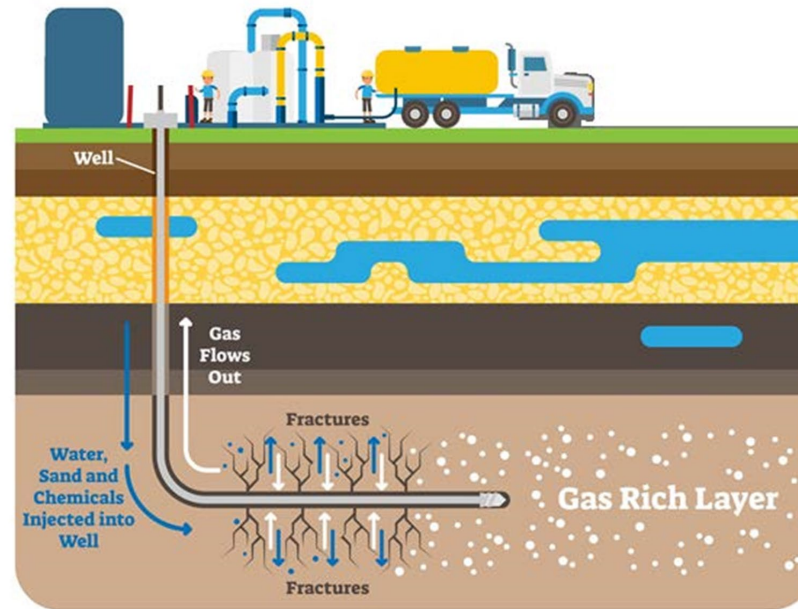
More about water

- We understand how important aquifers are to Traditional Owners, pastoralists and the community.
- Both geological and engineered barriers are in place to protect the underground aquifers. There are multiple controls in place to protect the environment and groundwater.
- Groundwater is regulated in the NT and groundwater monitoring is required.
- Groundwater monitoring allows us to monitor natural groundwater variation and detect any groundwater impacts that may occur.
- Before, during and after stimulation, water levels and quality are monitored with a control bore and impact bore located on the wellpad.
- All water monitoring results are submitted to the Regulator and are available to the public online: <https://depws.nt.gov.au/onshore-gas/onshore-gas-in-the-northern-territory/industry-compliance-and-reporting/groundwater-monitoring-results>



Hydraulic Fracture “Stimulation”

- “Stimulation” is the technical process designed to release gas trapped in shale rocks deep underground.
- “Stimulation” is always required for shale gas production and is sometimes used in conventional production.
- Fluids are pumped into the well under pressure until the rock develops fractures. The fluid is 99.5% water and sand.
- The fluids carry sand grains (proppant) which get into the fractures to stop them from closing when pumping stops, enabling the gas to flow to the surface.
- The fractures allow the gas to flow from pore spaces into the well bore and to allow gas to be extracted from the shale.
- Fractures extend horizontally by a few hundred metres and tens of metres vertically.
- Vertical fracture height growth is restricted by overlying rocks which form barriers.

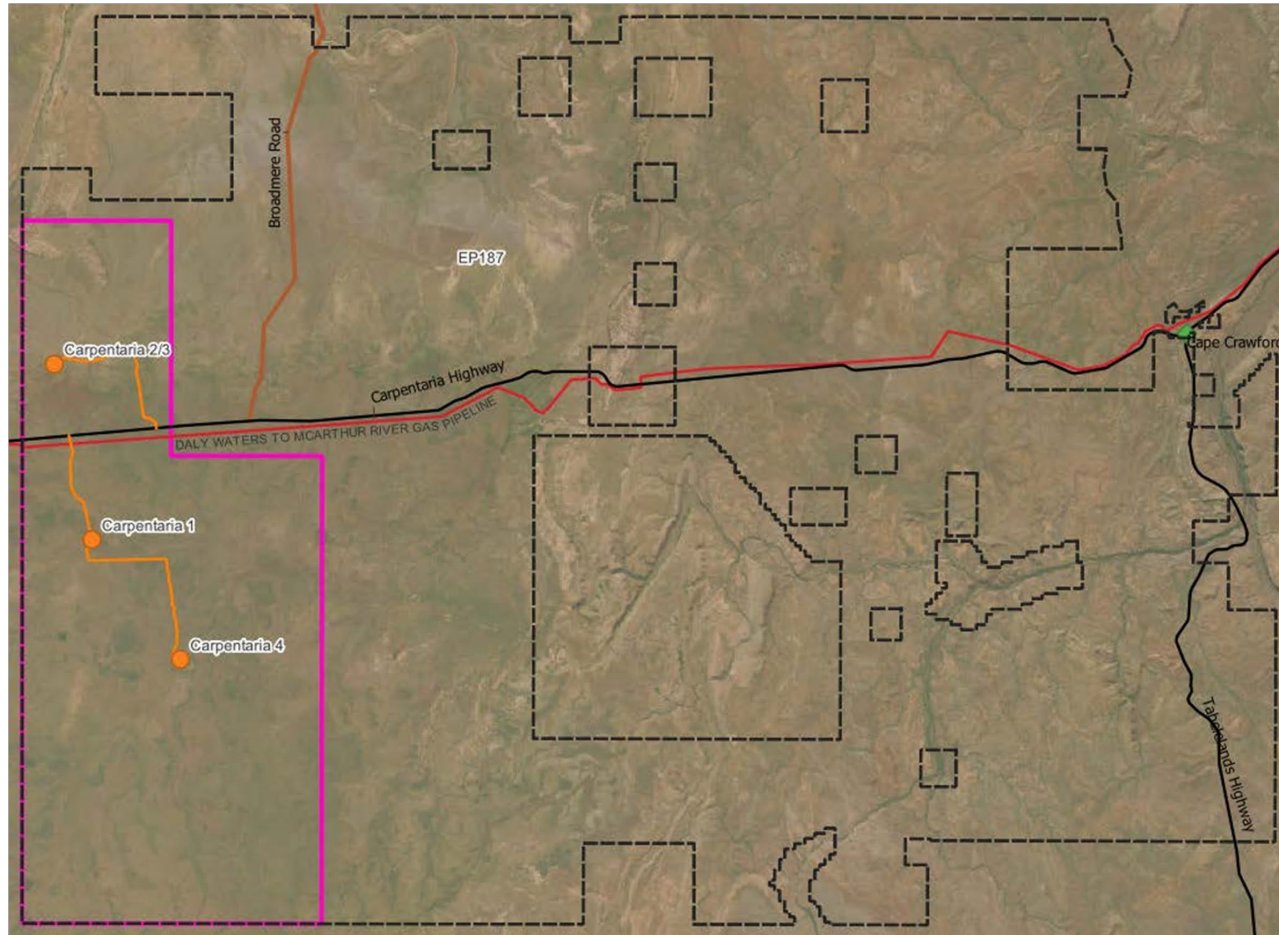


Key facts

- In EP187 there is around 1 km to 1.5 km of rock between the fracked zones and the shallow water sources.
- World-wide there have been millions of wells stimulated. The fracking process has been used safely in Australia over the last 60 years.

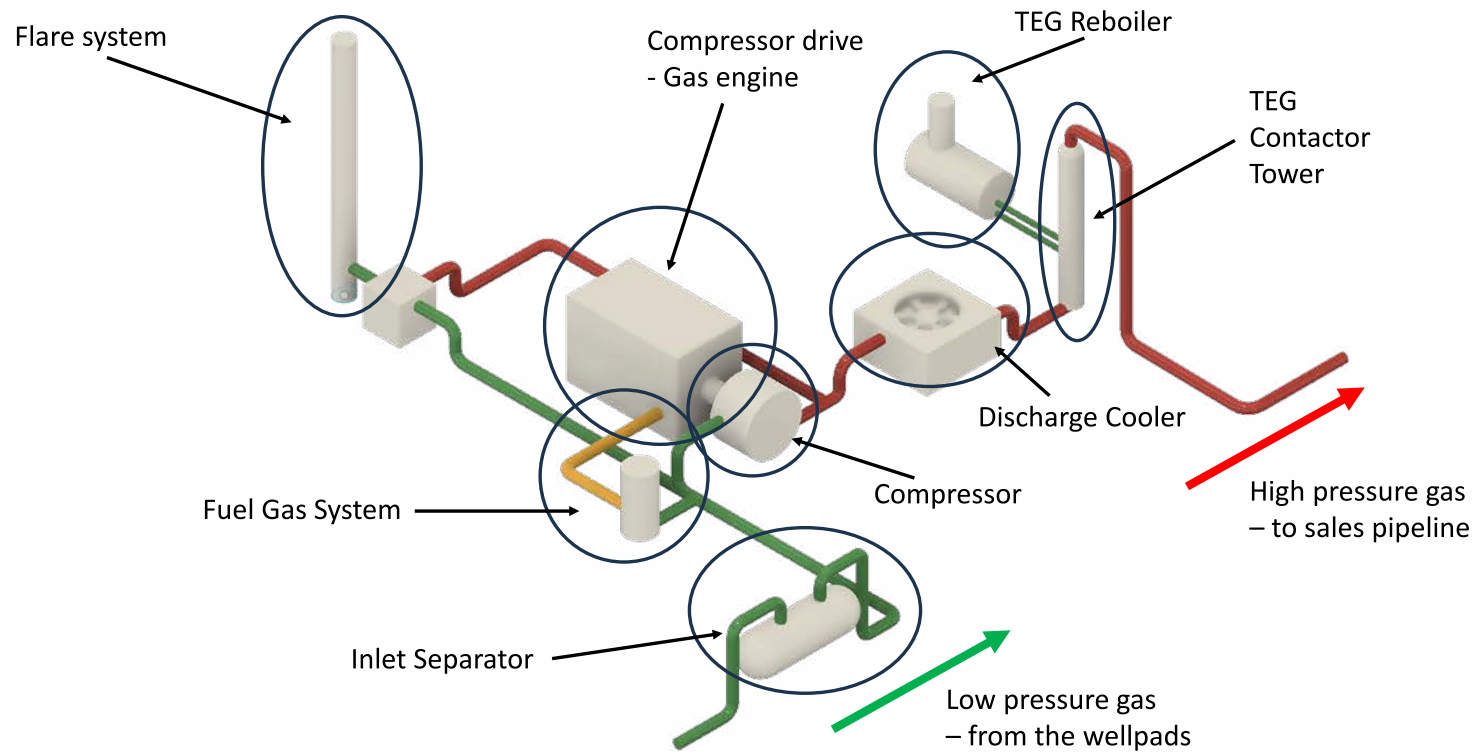


Location of Activities



Compressor Station Major Components

A compressor station is made up of multiples of these major components and other support equipment:



Compressor Station Overview



4.1.3 2023.11.20 | OCM Presentation Slide Pack (December)

4.2 NLC Work Program Submission

4.2.1 2023.10.13 | Initial Work Program



Work Program

Imperial O&G

2024 - 2029 EP187 Work Program

NT Exploration Permit (EP) 187

Report Number: EP187 2021-23 - NLC Work Program - Ro
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Work Program

Prepared for:

IMPERIAL OIL AND GAS

Document Control:

Revision	Description	Date	Author(s)	Reviewer
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Appendices

The following Appendices support this EMP:

Appendix 01 -	Work Methods for Project Activities
Appendix 02	Shapefiles for Work Program Activities

Summary

This Work Program relates to the Petroleum Exploration permit EP187 located approximately 85 kilometres south-west of Borroloola within the Beetaloo Sub-basin and greater McArthur Basin.

Imperial proposes a multi-year Work Program in the Western flank of EP187, commencing in 2024.

This program builds on the fieldwork carried out under the previous 2019 to 2023 Work Programs.

Imperial is providing a multi-year Work Program to ensure that Imperial's full development plan, subject to current gas pipeline constraints, is communicated to the directly affected traditional owners. Imperial will further consult with the directly affected traditional owners if there are changes to the plan. Potential changes to the plan may entail altering the timing of activities between program years, and/or the movement of planned works within the movement areas, as shown in Figure 7.

Extended well testing is required to determine whether the shale gas resource identified is commercially exploitable, which would require a material amount of gas to be flared or vented to the environment. Given this, in order to reduce the environmental impacts of the flaring or venting, not to waste the gas resource unnecessarily, provide economic benefits to traditional owners, and to provide some revenue to Imperial to offset the costs involved in the extended production testing; Imperial proposes to seek the agreement of traditional owners, the NLC and the NT Minister responsible for the Petroleum Act to the use of the gas that would otherwise be flared or vented as appraisal gas which can be sold with revenues to Imperial and royalties to traditional owners and the Territory.

If Imperial can establish the commercial viability of the shale gas resource Imperial would expect to lodge an application for a production license and to seek to negotiate a production agreement with the NLC (on behalf of the traditional owners) as contemplated by the existing Exploration Agreement.

This Work Program represents a fit for purpose, cost-effective, and environmentally responsible way to progress EP187's ongoing development given the basin's geographical remoteness, an official wet season period spanning six months, and multi-agency clearances and permissions required to undertake site works.

This Work Program has been prepared having regard to clause 13 of the Exploration Deed, Exploration Permit Application 187 between Imperial Oil and Gas Pty Ltd and The Northern Land Council.



Work Program

This Work Program seeks approval to conduct a program along the Western flank of EP187 comprising:

- Construction of up to 4 Wellpads
- Construction of up to 30km of access tracks
- Construction of up to 60km of water/wastewater flowlines
- Construction of up to 60km of gas gathering flowlines
- Drilling of up to 10 new wells
- Hydraulic Fracture of up to 10 new wells
- Construction of wellpad facilities on up to 6 wellpads
- Operation of up to 6 wellpads
- Construction of a Water/wastewater facility
- Handling, storage, treatment and re-use of Flowback water and Produced formation water
- Drilling of up to 40 new water bores
- Construction of a compressor station
- Operation of a compressor station
- Construction of a sales gas pipeline
- Construction of a solar farm
- Operation of a solar farm
- Construction of an operations camp
- Operation of an operations camp
- Continued use of works carried out under previous Work Programs
- Including all ancillary activities required to conduct the above works.

This Work Program's objective is to ensure that the activities are carried out in a manner by which the impacts and risks to traditional owners, their culture and society and to the environment will be reduced to a level that is as low a reasonably practicable (ALARP).

Land clearing will be required for this Work Program, including for:

- Wellpads
- Access tracks
- Gas and water/wastewater flowline Right of Ways
- Water/wastewater facility
- Compressor station and associated facilities
- Solar farm
- Sales gas pipeline Right of Way
- Campsite
- Gravel pits
- Laydown yard
- Warehouse/workshop.

Imperial has engaged a consultant to carry out an archaeological survey of the proposed work area and the report for this survey will be provided to NLC when available.

(a) Work Program Location

Imperial has selected a proposed location for the activities and a buffer to allow moving locations to reduce the on-ground impacts and allow for optimisation of sub-surface considerations in line with previous Work Programs. The proposed locations of Wellpads to be constructed for relevant activities to be carried out on under this Work Program are listed in Table 1.

Maps showing the proposed locations of the activities to be carried out under this Work Program, including buffer to allow moving on-site are included as follows:

- Figure 1, showing:
 - Existing infrastructure carried out under previous work programs
 - Extent of the Production Agreement negotiation area
- Figure 2, showing:
 - The proposed location of wellpads and access tracks
 - Existing infrastructure carried out under previous work programs
- Figure 3, showing:
 - The proposed location of:
 - Compressor station and associated facilities
 - Solar farm
 - Campsite
 - Water/wastewater facilities
 - Sales gas pipeline
 - Existing infrastructure carried out under previous work programs
 - The location of the Daly Waters to McArthur River Mine Gas Pipeline
- Figure 4, showing:
 - The proposed location of wellpads and gas flowlines
 - Existing infrastructure carried out under previous work programs
- Figure 5, showing:
 - The proposed location of wellpads and water/wastewater flowlines
 - Existing infrastructure carried out under previous work programs
- Figure 6, showing:
 - The proposed location of wellpads and access tracks
 - The extent of proposed lateral Drilling and Hydraulic Fracturing activities under this Work Program
 - Existing infrastructure carried out under previous work programs
- Figure 7, showing:
 - The proposed location of wellpads and access tracks
 - The extent of infrastructure movement areas to be utilised under the work program.
 - Existing infrastructure carried out under previous work programs.

Shapefiles of the proposed activities, and their relevant movement areas are provided as part of this Work Program (appendix 2).

Mapping does not have coordinates shown as the labels obscure too much detail on the maps.

Table 1: General Well Information

General Well Information		
Carpentaria 2/3 (Existing wellpad) (MGA94, Zone 53)	Latitude Longitude Easting Northing	S 16.70086° E 135.102344° 510911 8153533
Carpentaria 4 (Existing wellpad) (MGA94, Zone 53)	Latitude Longitude Easting Northing	S 16.858123° E 135.171868° 518308 8136132
Wellpad BA (New wellpad) (MGA94, Zone 53)	Latitude Longitude Easting Northing	S 16.727199° E 135.107884° 511500 8150620
Wellpad BB (New wellpad) (MGA94, Zone 53)	Latitude Longitude Easting Northing	S 16.714247° E 135.149216° 515907 8152050
Wellpad BC (New wellpad) (MGA94, Zone 53)	Latitude Longitude Easting Northing	S 16.928549° E 135.184301° 519625 8128340
Wellpad BD (New wellpad) (MGA94, Zone 53)	Latitude Longitude Easting Northing	S 16.824890° E 135.204896° 521830 8139805
Wellpad BD (central) (New wellpad) (MGA94, Zone 53)	Latitude Longitude Easting Northing	S 16.856118° E 135.209013° 522265 8136350

Work Program

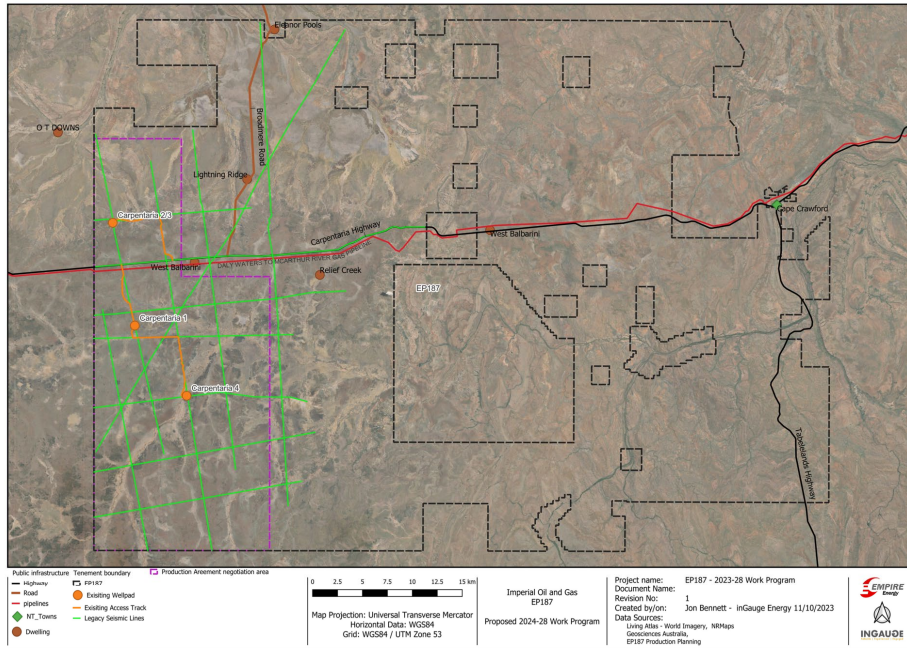


Figure 1: Existing infrastructure and Production Agreement negotiation area

Work Program

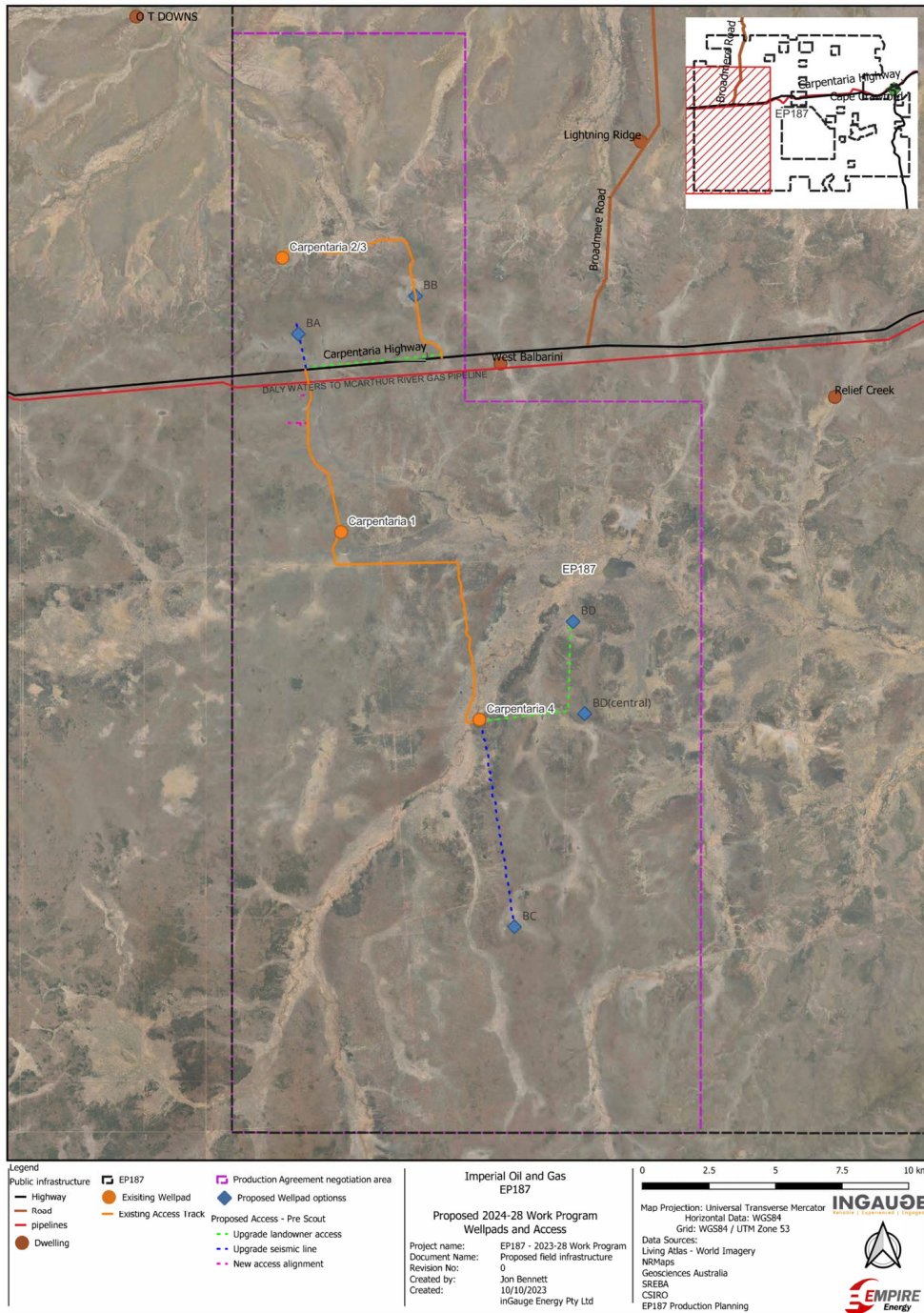


Figure 2: Location of proposed wellpads and access tracks

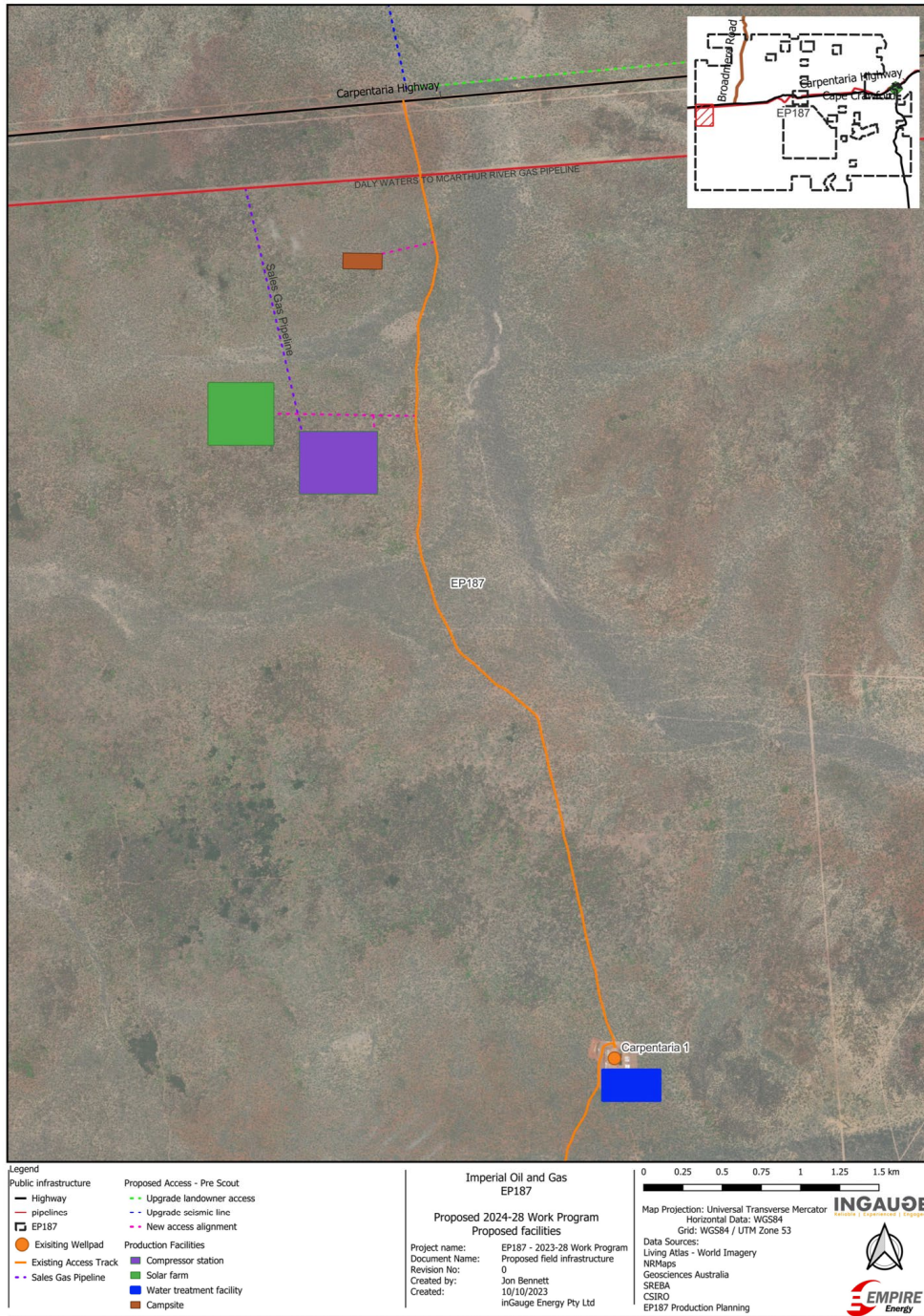


Figure 3: Location of proposed facilities and access tracks

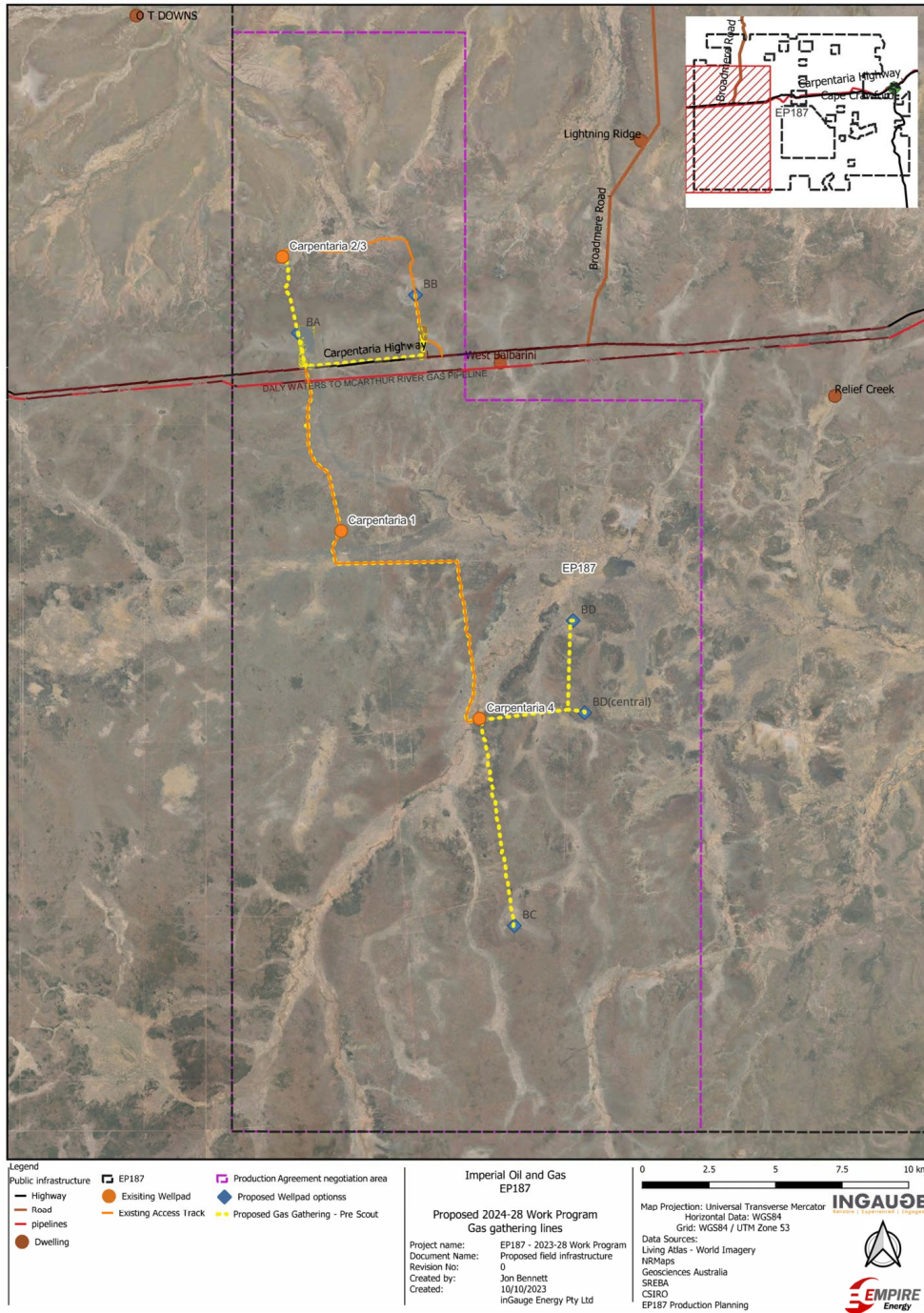


Figure 4: Location of proposed wellpads and gas flowlines

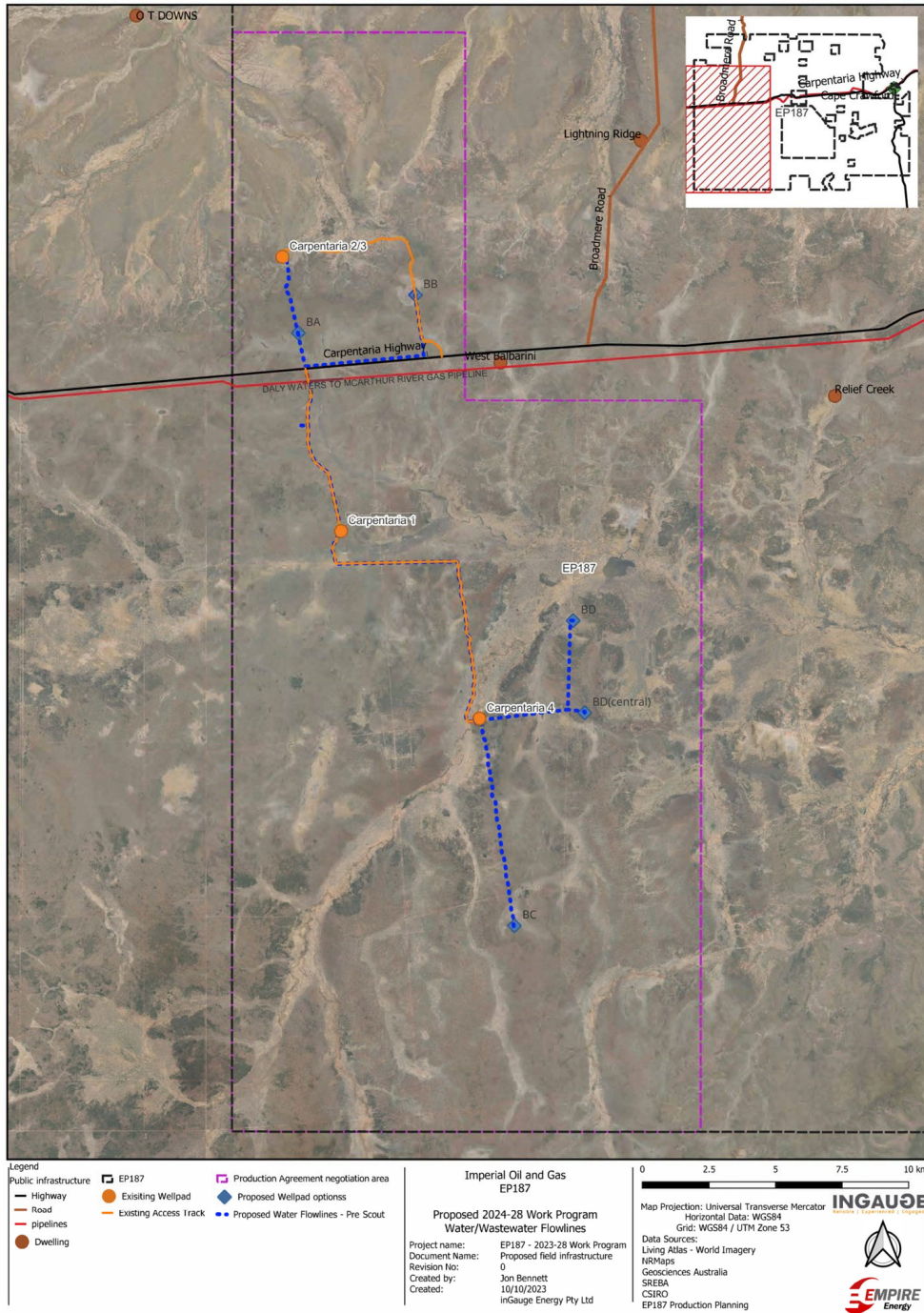


Figure 5: Location of proposed wellpads and water/wastewater flowlines

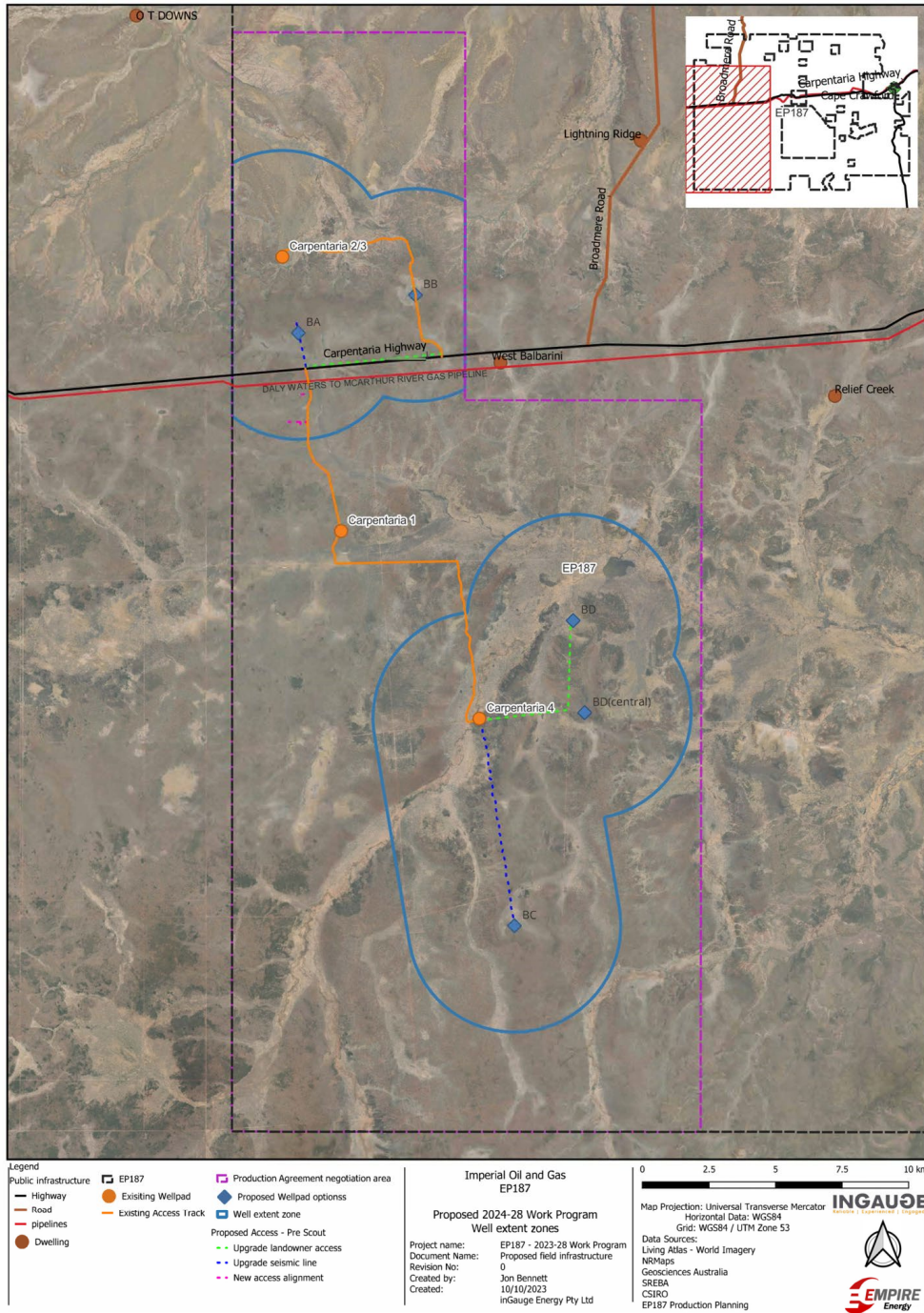


Figure 6: Location of proposed wellpads and well drilling extent

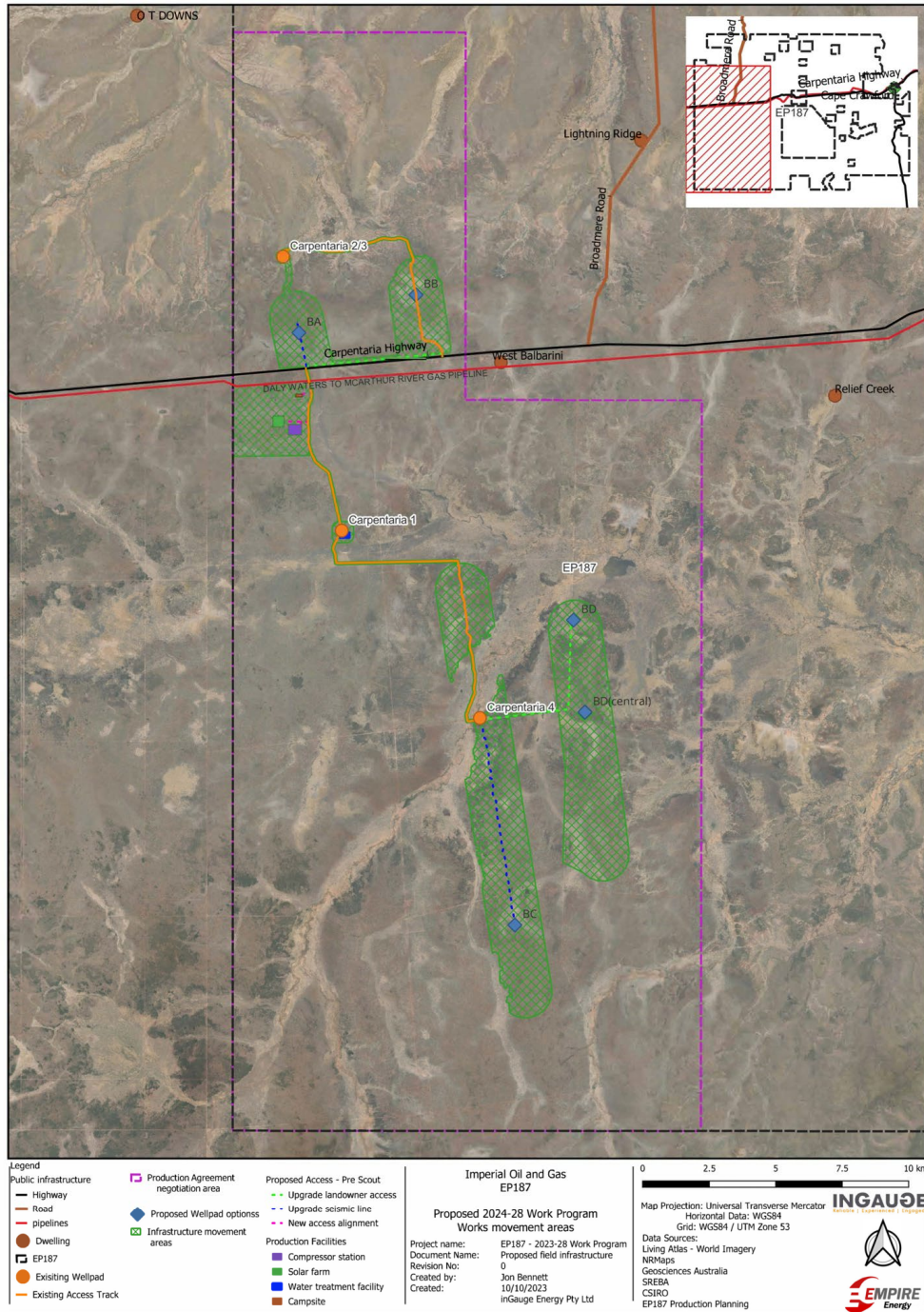


Figure 7: Location of infrastructure movement areas

(b) Work Program Activities

The regulated activities to be carried out from 2024 through 2028 under this Work Program are listed below.

Work Program activities:

- Acquisition of 2D Seismic data:
 - No Seismic acquisition currently planned under this work program
 - Imperial may carry out maintenance and rehabilitation works on legacy 2D seismic acquisition lines constructed under previous work programs
- Extend Carpentaria 2/3 and Carpentaria 4 wellpads
- Construction of up to four new wellpads:
 - Clear up to 45 hectares for four well pads
 - Construct wellpads, (indicative layout Figure 8)
 - Establish lined ponds, (indicative layout Figure 8)
 - Construct Flowback fluid/Produced water tanks, (indicative layout Figure 8)
 - Drill water production and monitoring bores on wellpads
 - Establish Erosion and Sediment Control devices on wellpads
- Construction of up to 30km of access tracks to up to four well pads:
 - Clear up to 20 hectares for access tracks, as per Figure 2, (indicative layout Figure 9)
 - Establish Erosion and Sediment Control devices on access tracks
- Construction of a compressor station:
 - Clear up to 10 hectares for compressor station
 - Construct compressor station (indicative layout Figure 11)
 - Establish Erosion and Sediment Control devices on compressor station site
- Construction up to 2.5km of a sales gas pipeline from the compressor station to the existing Daly Waters to McArthur River Mine Gas Pipeline:
 - Clear up to 3 hectares for sales gas pipeline
 - Install up to 2.5km of high pressure buried gas pipeline as per Figure 2
 - Establish Erosion and Sediment Control devices on pipeline Right of Way
- Construction of a solar farm:
 - Clear up to 20 hectares for solar farm
 - Construct solar farm (indicative layout as per Figure 12)
 - Establish Erosion and Sediment Control devices on solar farm site



Work Program

- Construction of up to 60 km low-pressure gas gathering flowlines between well pads and compressor station:
 - Clear up to 60 hectares for flowline Right Of Way (ROW)
 - Install up to 60 km of buried low-pressure gas gathering flowlines, (indicative layout Figure 9)
 - Establish Erosion and Sediment Control devices on flowline ROW
- Construction of a Water/Wastewater facility:
 - Clear up to 10 hectares for Flowback fluid/Produced water facility
 - Construct Flowback fluid/Produced water facility, (indicative layout Figure 10)
 - Establish Erosion and Sediment Control devices Flowback fluid/Produced water facility
- Construction of up to 60 km low-pressure water flowlines between well pads and water treatment facility:
 - To be constructed on same ROW as gas flowlines (indicative layout Figure 9)
 - Install up to 60km of buried low-pressure water flowlines
- Drilling gas wells from the six wellpads (Carp 2/3, Carpentaria 4 and four new wellpads):
 - Drill up to 10 gas wells from the six wellpads
 - Evaluate, log, test and core above wells, including DFIT
- Hydraulic Fracture stimulation of the above wells
- Completion, connection and workover maintenance of the above wells
- Production Testing of the above wells
- Gas production of the above wells
- Sale of gas from the above wells
- Well suspension and decommissioning of the above wells
- Routine maintenance and monitoring activities
- Any other minor works ancillary of the above.

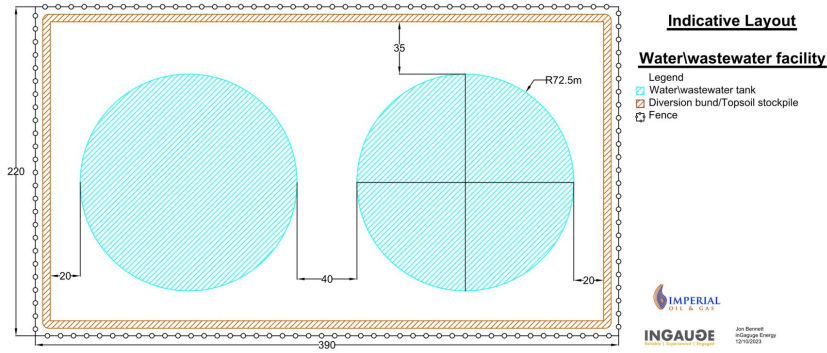


Figure 10: Indicative Water/Wastewater facility layout

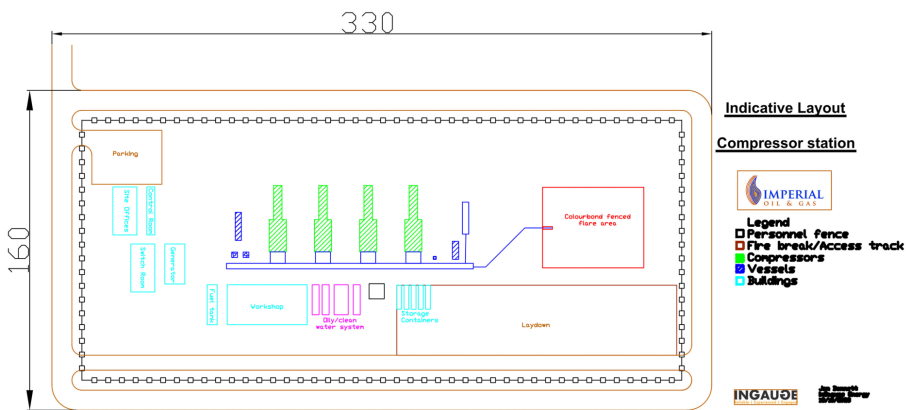


Figure 11: Indicative Compressor Station layout