Environment Management Plan
Imperial Oil & Gas

2021-2025 EP187 Work Program
NT Exploration Permit (EP) 187

(IMP4-3)

Report Number: EMP IMP4-3 – Imperial OG 2021-2025 EP187 Program

Prepared for:

IMPERIAL OIL AND GAS

Document Control:

Revision	Description	Date	Author(s)	Reviewer
0	Lodged to DEPWS for review	18/12/2020	DG, JWB	CD
1	Edit based on DEPWS review	15/04/2021	DG, TC, JWB	CD
2	Revised based on DEPWS review	02/07/2021	DG, TC, JWB	CD
3	Revised based on DEPWS review	20/07/2021	DG, TC, JWB	CD

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Executive Summary

a. Introduction

Imperial proposes an infill seismic survey, wellpad and access construction, drilling, Hydraulic Fracture (HF) and Extended Production Test (EPT) program in the Western flank of EP187, commencing Q3 of 2021. Imperial also proposes to install buried wastewater flowlines between wellpads to support the efficient and safe transfer of wastewater for treatment.

This program builds on the 2019 Seismic program and the 2020 Drilling program, which were covered under the "EP187 McArthur Basin - 2019 Work Program"(2109 Seismic EMP), and the "Environment Management Plan (EMP) For 2020 Drilling Program on Ep187" (Drilling EMP) respectively. The 2019 Seismic EMP was approved by the Minister for Environment and Natural Resources in October 2019. The Drilling EMP was approved by the Minister for Environment and Natural Resources on the 2nd of March 2020.

Building on the exploration work programs and experience to date, coupled with encouraging results from these works, Imperial believes the proposed integrated exploration work program offers optimal flexibility to prove the potential of an economically exploitable hydrocarbon resource in EP187. The objective is to drill the minimum number of wells to provide a correct techno-commercial assessment of the entire program; this is the pilot appraisal stage. The pilot program's outcome is successful if it delivers accurate information, be it positive or negative, predicting the program's profitability. Only when these data sets are collected can we advance to field development planning (FDP).

Because of the basin's geographical remoteness, an official wet season period spanning six months and multi-agency clearances and permissions required to undertake work programs, this interrelated EMP is the fit for purpose, cost-effective, environmentally responsible way to progress EP187's exploration and evaluation appraisal pilot stage. Unlike conventional hydrocarbon prospects, play risk analysis and the geological chance of success are not significant issues. In unconventional prospects, estimates of initial productivity, decline production rates, mechanical efficiency and success planning dominate rather than a volumetric determination.

This EMP has been prepared regarding the Petroleum (Environment) Regulations 2016 (NT) and the Code of Practice: Petroleum Activities in the Northern Territory (Northern Territory Government, 2019). This EMP seeks approval to conduct a program of infill seismic acquisition, wellpad and access construction, drilling, HF, EPT, and buried flowline construction and operation along the Western flank of EP187, including all ancillary activities required to conduct the works.

This EMP's objective is to ensure that these regulated activities are carried out in a manner by which the environmental impacts and environmental risks will be reduced to a level that is as low a reasonably practicable (ALARP) and acceptable.

Land clearing will be required for the 2021-2025 EP187 Program for seismic acquisition and wellpad, access track, and flowline construction.

b. Description of the Activities

The regulated activities to be carried out under this EMP are:

- The acquisition of 166km of seismic data requiring the clearing and rehabilitation of up to 58 hectares
- The construction of up to six wellpads requires clearing up to 56 hectares (including firebreaks), constructing up to 2 lined pits per well, drilling water production and monitoring bores and establishing Erosion and Sediment Control devices
- These wellpads will be a combination of single-wellpads and multiwell pads
    - multiwell pads will have a maximum of 4 wells under this EMP
- The use of multi-wellpads, where bottom hole targets can be reached from a surface location without increasing risk, is likely to reduce any potential development's environmental footprint significantly
- The construction of up to 50km access tracks requires clearing up to 12 hectares, constructing an intersection onto the Carpentaria Highway and establishing Erosion and Sediment Control devices
- The construction of up to 6 gravel pits, requiring clearing up to 6 hectares and establishing Erosion and Sediment Control devices
- The drilling up to seven gas exploration wells made up of one horizontal well from the existing Carpentaria 1 wellpad and six wells on new wellpads. The six new wells will be made up of; vertical wells, horizontal wells that plug back and drill out of these vertical wells and dedicated new horizontal wells. If a vertical well is plugged back and drilled out, it will not add to the number of wells under this EMP, i.e., a vertical well plugged back and drilled horizontally will count as one well as the plugged back vertical section will not be re-drilled.
- The evaluation, logging, testing and coring the above wells, including DFIT
- The establishment of bunded tanks pads and tanks fitted with leak detection at the above wellpads
- The Hydraulic Fracturing (HF) of the above seven wells.
- The completion, workover and maintenance of the above seven wells
- The Extended Production Testing (EPT) of the above seven wells, with EPT <=90 days for each well
- The suspension and decommissioning of the above seven wells
- The construction of up to 57km of buried low-pressure wastewater flowlines requires clearing and rehabilitating up to 34 hectares for flowline right of way and establishing Erosion Sediment Control devices
- Routine maintenance and monitoring activities and other minor works ancillary of the above
- Establishment of a temporary camp on the existing Carpentaria 1 wellpad and wellpads to be constructed under this EMP

c. Activity Location

Exploration Permit (EP) 187 is located approximately 85 km southwest of Borroloola within the Carpentaria and McArthur Basins of the Northern Territory. EP187 is situated in the McArthur River's upper reaches; it lies to the west of the Tablelands Highway and is crossed east to west by the Carpentaria Highway. Regulated activities covered by this EMP are along the western flank of EP187, referred to throughout this document as the Location of Regulated Activity. The following figures are provided to give an overview of the proposed regulated activities under this EMP and the cumulative regulated activities so far in EP187;

- Figure E0.1 shows the cumulative and proposed works in EP187
- Figure E0.2 shows the seismic acquisition corridors for works under this EMP, with clearing restrictions
- Figure E0.3 shows the location of proposed wellpads under this EMP
- Figure E0.4 shows the location of proposed access tracks under this EMP
- Figure E0.5 shows the location of proposed flowlines under this EMP

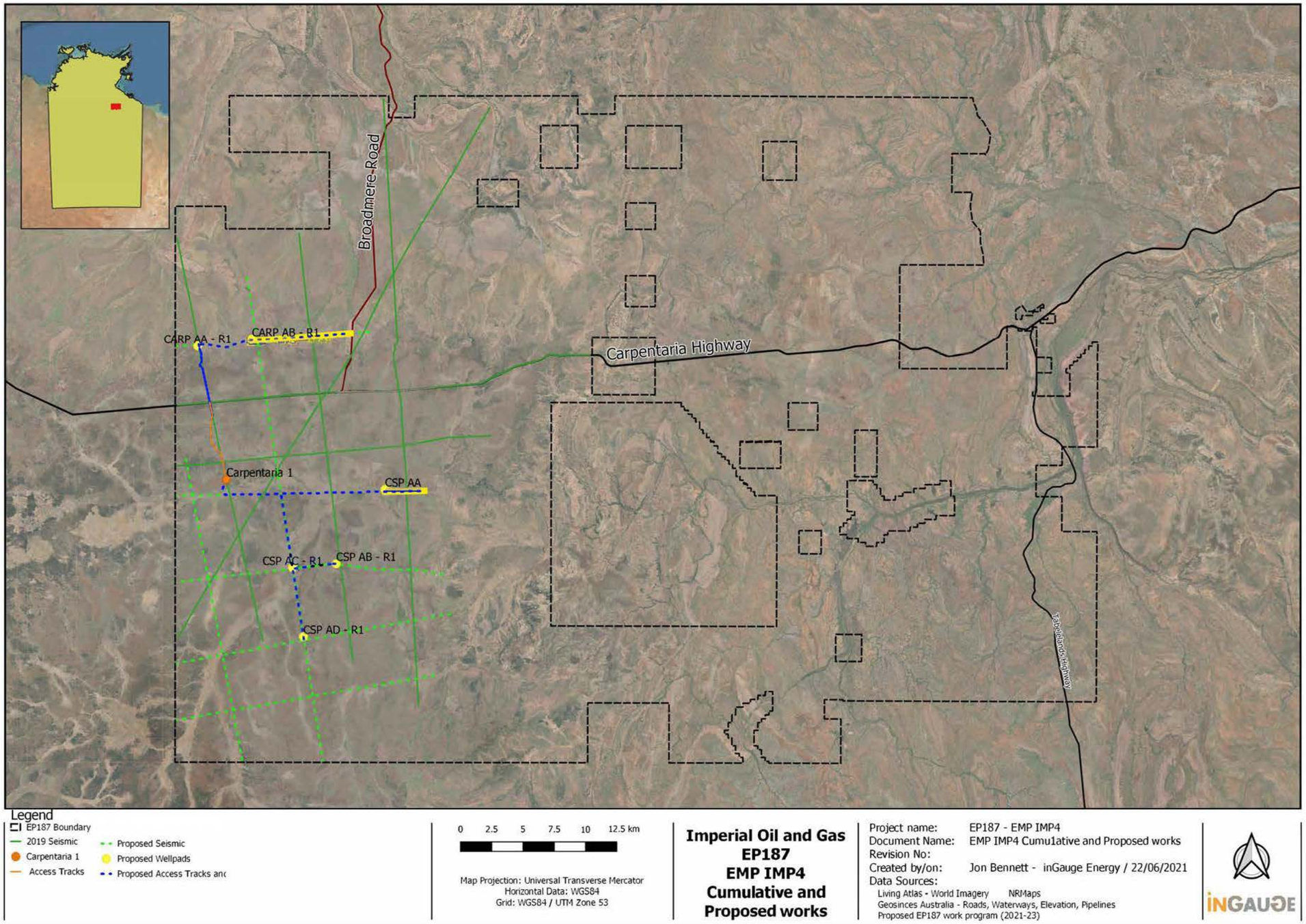

Figure Eo.1: Location of EP187 with cumulative and proposed regulated activities.

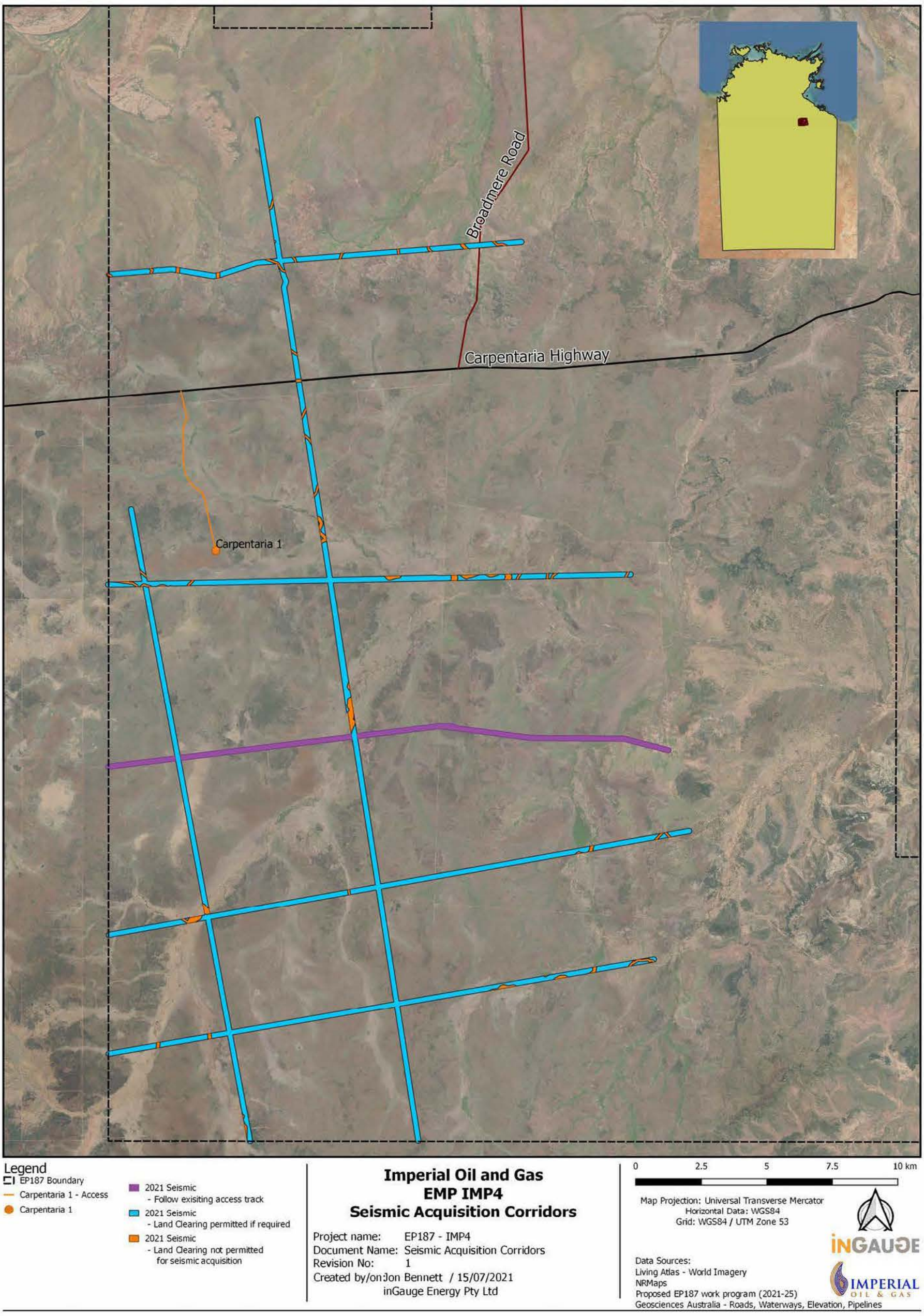

Figure Eo.2: Location of regulated activities under this EMP – Proposed Seismic

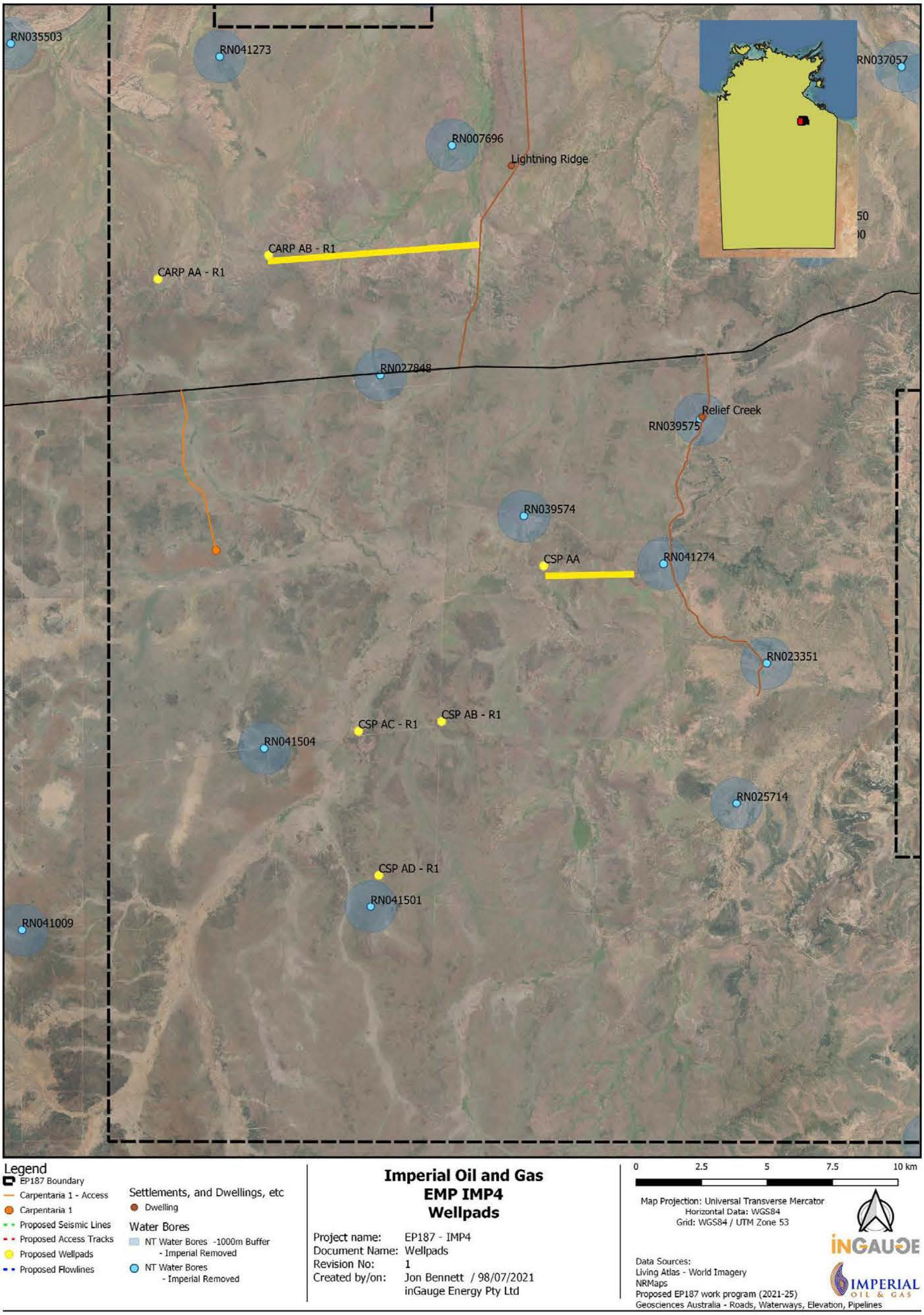

Figure Eo.3: Location of regulated activities under this EMP – Proposed Wellpads

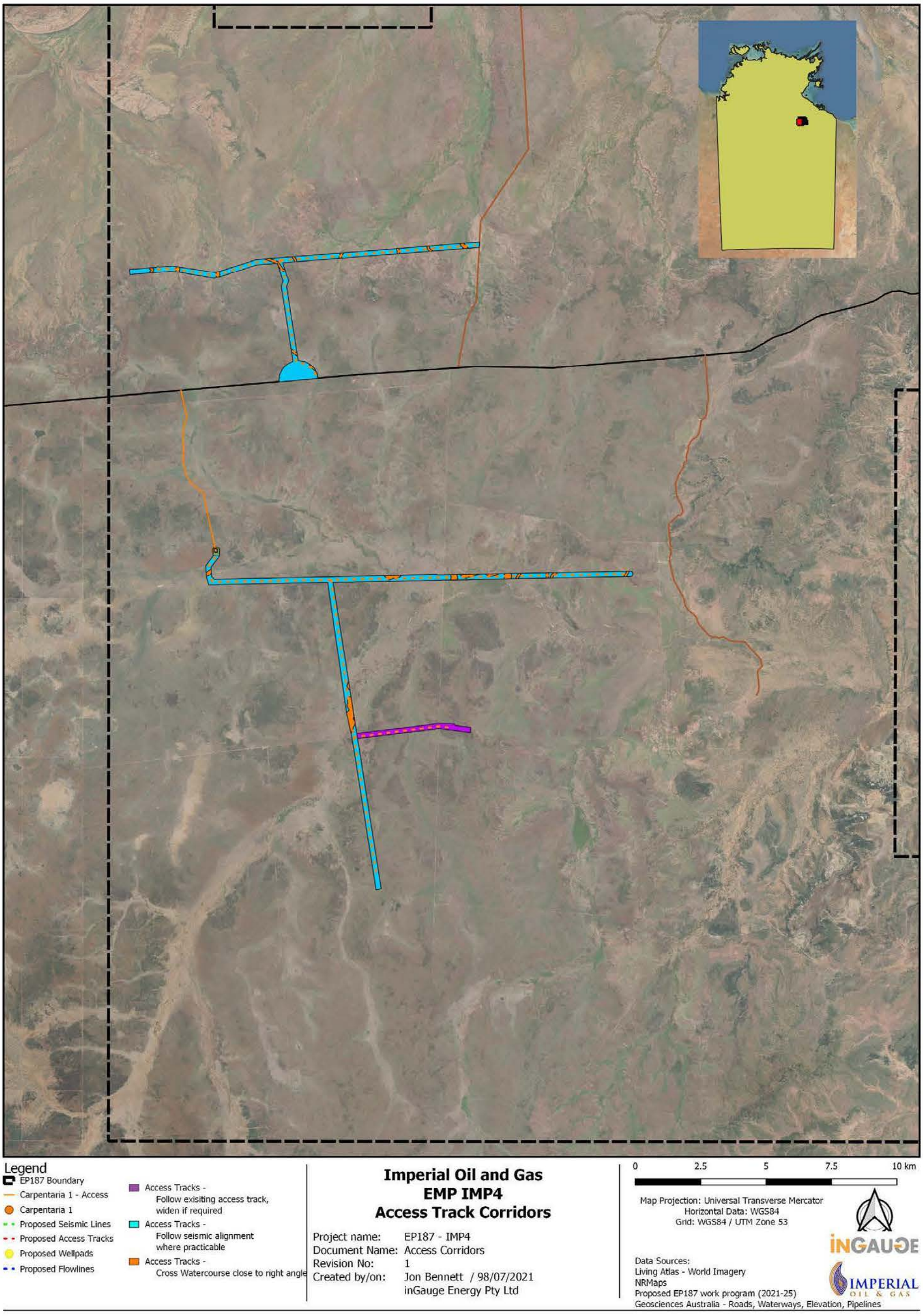

Figure Eo.4: Location of regulated activities under this EMP – Proposed Access Tracks

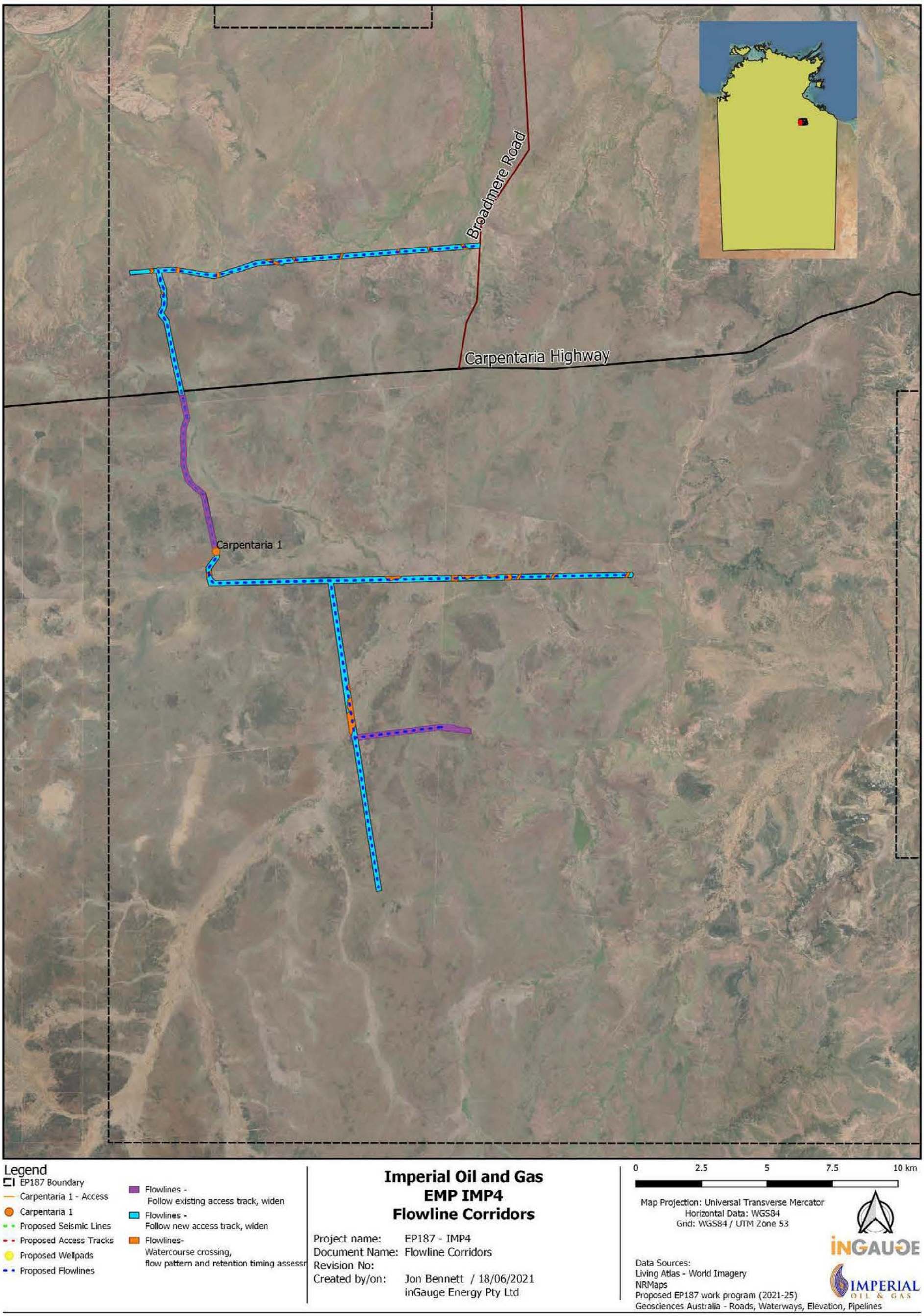

Figure Eo.5: Location of regulated activities under this EMP – Proposed Flowlines

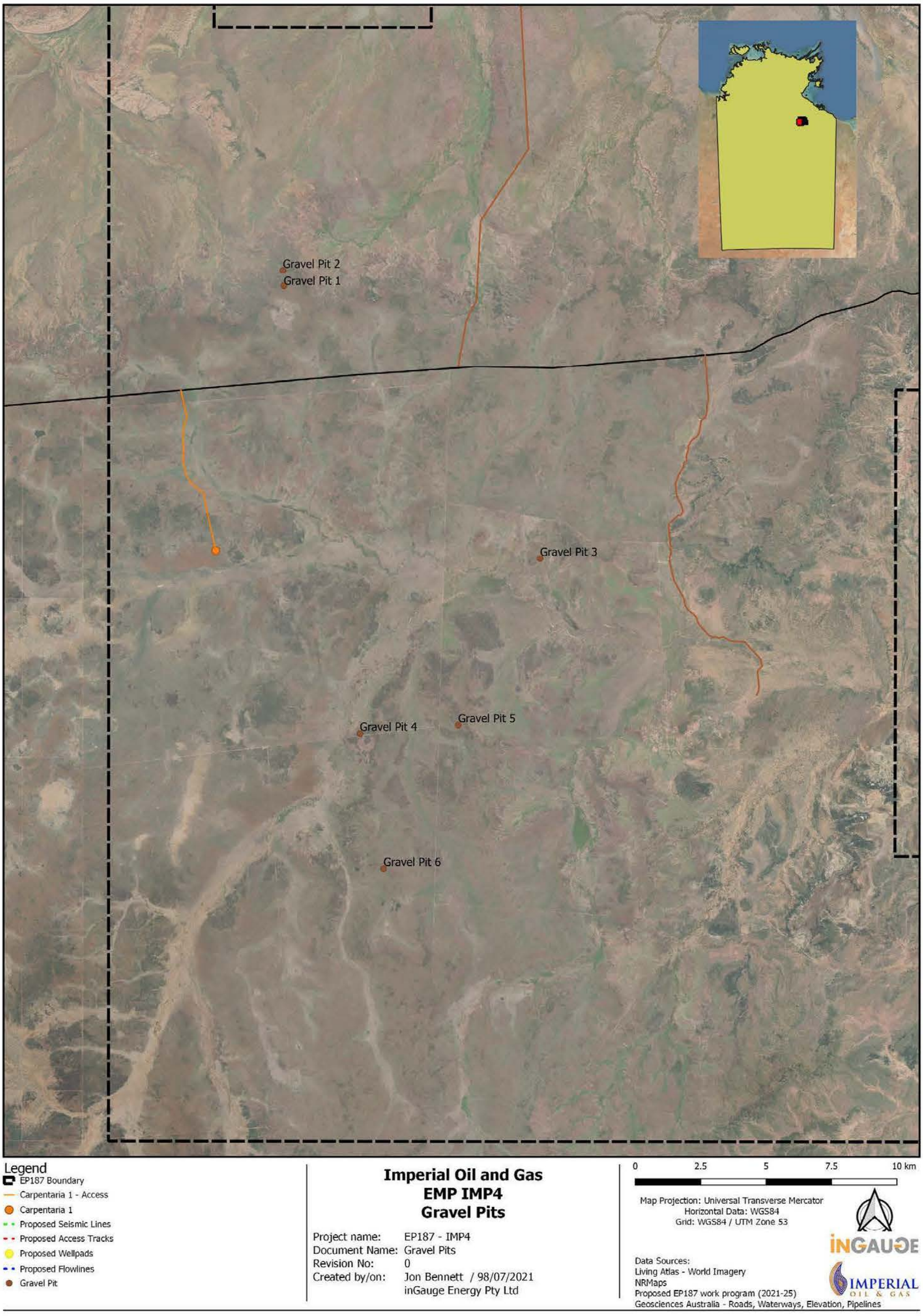

Figure Eo.6: Location of regulated activities under this EMP – Proposed Gravel Pits

d. Existing Environment

The Location of Regulated Activity is situated between The Sturt Plateau, and Gulf Fall, and Upland Bioregion. Undulating plains surround the Location of Regulated Activity; the vegetation comprises mostly of open forests and woodlands dominated by Darwin Stringybark (E. tetrodonta) (DLRM, 2008). The Location of Regulated Activity is interspersed with watercourses of varying stream orders, including the Relief Creek: wellpads constructed under this EMP will be outside of the buffer zones required for watercourses, as per the Land clearing guidelines (DEPWS, 2020).

The Location of Regulated Activity's climate is described as a tropical savannah climate within the humid Zone with a distinct wet and dry season that can experience an average rainfall of between 600 – 800mm per year over the summer wet. The seasonal contrast between the wet and the dry has significant implications for surface water resources. The summer monsoon season brings rain and cyclones, and during this period, the Location of Regulated Activity can experience large rainfall events. The primary groundwater resource in the region is the Gum ridge aquifer.

A search of the NT Fauna and Flora Atlas (NR Maps, 2020) completed on 16 December 2020 recorded one Data Deficient plant species and five fauna species that have been historically recorded within the study area, to which the *Erythrura gouldiae* (Gouldian Finch) was observed in a rest area approximately 22km east of the proposed exploration area. The Protected Matters Search Tool (PMST), on the other hand, identified twelve (12) threatened species and fourteen (14) migratory species that may occur within the area. Eight (8) of the 14 migratory species are specialist marine species and have therefore been excluded from the assessment. One (1) species classified as Critically Endangered (Calidris ferruginea (Curlew Sandpiper)) that is not expected to occur within the area due to the absence of suitable habitat (e.g., Wetland). The likelihood of occurrence can be found in Table 8 of Appendix 01.02

The second threatened fauna species (*Erythrura gouldiae* (Gouldian Finch)) was not identified through NT or Commonwealth database searches but rather included based on observations during field assessment conducted in March 2021. In general, not all of the threatened species indicated through desktop information are expected to occur within the study area due to the absence of suitable habitats for some species. No protected areas or places with historical or cultural significance have been found within a 20km radius of the Location of Regulated Activity.

Environmental values and sensitivities that have the potential to occur in the vicinity of the Location of Regulated Activity are provided in Table E1 below.

Table E1: Summary of the Existing Environment

Area/Theme	Environmental Factors	Environmental Values and Sensitivities	Summary
Land	Terrestrial ecosystems Landforms	Sensitive or significant vegetation	Relief Creek contains riparian vegetation, including eucalypt vegetation with hollows which will be avoided by maintaining buffer distances following Table 19 - Recommended Widths for Riparian Buffers of the LCG 2019 (NRETAS, 2019)

Area/Theme	Environmental Factors	Environmental Values and Sensitivities	Summary
	Terrestrial environmental quality	Groundwater dependent ecosystems	There is low to moderate potential for terrestrial GDEs and aquatic GDEs in the Location of Regulated Activity (BoM, 2020) These will not be impacted as the exploration will adhere to the LCG.
		Threatened fauna species and their habitat	The EPBC PMST identified 13 threatened species that have the potential to occur in the Location of Regulated Activity. Of these, 6 species were identified under the TPWC. One of the threatened species, *The Gouldian Finch*, was observed during the March 2021 survey, 22km East of the Location of the Regulated Activity but a low risk to be impacted.
		Listed migratory species	The EPBC listed 14 migratory species that are at least moderately likely to occur within the study area. Given the narrow nature of clearing, the likelihood of impact is considered low.
		Listed threatened flora species and ecological communities	There are no Threatened Ecological Communities (TECs) or threatened flora listed under the EPBC Act and/or TPWC Act known to occur within the 15km of the Location of the Regulated Activity.
		Soils	The Regulated Activity lies within a region of soils considered to be in their second cycle of erosion which has produced infertile soils with a near-neutral reaction. These 'soils' are akin to alluvial soils in that they show no profile development.
Water	Inland water environmental quality Hydrological processes Aquatic Ecosystems	Groundwater	The Cambrian Limestone aquifer provides regional-scale aquifers for groundwater resources available for pastoral enterprises, domestic bores at homesteads, and town water supplies to several communities across the region.
		Surface water	The McArthur River is the primary watershed of the exploration area. This watercourse drains the area into the Gulf of Carpentaria. The Glyde is the main tributary to the McArthur River and lies to the east of the study area.

Area/Theme	Environmental Factors	Environmental Values and Sensitivities	Summary
		Supply and quantity of water	The study area is part of the Gulf Fall and Upland region and part of the McArthur River's catchment and its tributaries. The McArthur River and its major tributary, the Glyde River, drain a significant portion of the Barkly Tablelands and the Southern McArthur Basin's low-lying country. This region's geology does influence the drainage system and provides an extensive network of ephemeral creeks and streams.
Air	Air quality Atmospheric processes	Air quality is conducive to suitability for the life, health and wellbeing of humans and ecosystems	The Beetaloo Basin methane baseline monitoring program conducted by the CSIRO in 2019 (CSIRO, 2019)is applicable across the operational area of EP187. No significant impact or risks anticipated
People and Community	Community and economy Culture and heritage Human Health	Cultural heritage, sacred sites	Imperial has applied for an AAPA certificate and will supply it to DEPWS when received. An extensive anthropological survey of the land area was conducted in May 2015 by the Anthropology Division of the Northern Land Council (NLC) in conjunction with the land's Traditional Owners before the grant of the tenement An archaeological survey was conducted in December 2020 by Ellengowan Enterprises, an approved NT archaeological consultant (Appendix 01.01)
		People and communities	There are several pastoral properties with livestock and infrastructure in the vicinity of the tenement. The nearest property is OT Downs Homestead, located approximately 20km North-West of the proposed area.

No pest species were observed during the field surveys.

e. Environmental Impacts and Environmental Risks of the activity

An environmental risk assessment was undertaken for this EMP; a summary of the environmental factors and key risks are given below in Table E2.

Table E2: Summary of the Environmental Factors and key risks.

Environmental Factor	Aspects of the Regulated Activities	Key Risk
Land (Flora, Fauna and Environmental quality)	• Land Clearing • Seismic Acquisition • Civil Construction Activities • Suspension and Decommissioning • Flowline construction • Maintenance, monitoring and other minor works ancillary to operations.	• Bushfire from project activities • Disruption on landform and soils from civil works, erosion and sediment control failure and poor rehabilitation • Soil contamination due to overflow, leaks or spills of fluid storage tanks • Soil contamination due to poor waste and chemical management • Soil contamination due to chemical spills, lack of appropriate bunding and poor refuelling, fuel transfer practices and oil and chemical handling • Soil contamination due to flowline failure during pumping and flowback operations. • Introduction and spread of weeds due to vehicle movements • Loss of habitat impacting wildlife • Loss of native vegetation through competition for resources • Introduction of pest species • Loss of riparian vegetation due to inappropriate buffers instated • Loss of sensitive or significant vegetation due to failure in determining appropriate buffer distances
Water (Groundwater & Surface water)	• Land Clearing • Seismic Acquisition • Civil Construction Activities • Drilling Operations • Well Logging • Hydraulic Fracturing • Completion, workover and maintenance • Extended Production Testing • Suspension and Decommissioning	• Reduction in groundwater quantity and quality due to project activities • Contamination of water bodies due to chemical spills, lack of appropriate bunding and poor refuelling, fuel transfer practices, oil and chemical handling and containment failure • Contamination of water bodies due to flowline failure • Contamination of water bodies due to storage (tank/vessels) failure or overflow

Environmental Factor	Aspects of the Regulated Activities	Key Risk
	• Flowline construction • Maintenance, monitoring and other minor works ancillary to operations.	• Impact to terrestrial and aquatic GDEs due to inappropriate buffers instalment • Cross-flow during hydraulic fracture (HF)
Air quality	• Land Clearing • Seismic Acquisition • Civil Construction Activities • Drilling Operations • Completion, workover and maintenance • Extended Production Testing • Flowline construction • Maintenance, monitoring and other minor works ancillary to operations.	• Increased greenhouse gas emissions due to Extended Production testing flaring.
People and community	• Land Clearing • Civil Construction Activities • Flowline construction • Maintenance, monitoring and other minor works ancillary to operations.	• Transport vehicle accidents due to increase in vehicle movements • Vehicle and plant movement on regional roads and access tracks • Bushfire from project activities • Disturbance to heritage sites due to works conducted out of the approved areas • Loss of sensitive or significant infrastructure due to lack of retaining recommended buffer distances as per the NT Land Clearing Guidelines

An acceptable risk has been achieved by implementing control measures that allowed all risks to be reduced to ALARP. Nonetheless, ALARP is not a final position over the life of the project. Ongoing monitoring will allow for the discovery of new mitigation measures that could be implemented. Key environmental risk mitigation areas covered in the EMP include:

- Activities do not impact aquifers
- Management of seismic, construction and flaring to ensure no bushfires occur as a result of the activity
- Management of flowback activities to minimise the release of gas to the atmosphere
- Management of hydraulic fluids and chemicals to ensure no contact with aquifers or pollute soil or soil substrate
- Management of waste and wastewater, including prevention of spills, and
- Mitigating the introduction and spread of weeds.

f. Environmental Outcomes

This EMP has been developed to specifically protect and ensure the integrity of the existing and surrounding environment from risks associated with the project activities through the establishment and implementation of:

- Environmental Performance Outcomes means an outcome that will be achieved if the environmental impacts and environmental risks of a regulated activity are reduced to a level that is:
    - as low as reasonably possible and practical for the activities; and
    - acceptable

The environmental outcomes for regulated activities include:

- Conduct of the regulated activity does not create safety risks for the public or landholders
- Sensitive receptors, significant conservation areas, or listed species or their habitat is not permanently affected by the conduct of the regulated activity
- Terrestrial environmental quality, including surface waters, is not permanently affected by the regulated activity's conduct
- The conduct of the regulated activity does not result in the over-extraction or contamination of groundwater resources
- Local inland water quality is not permanently affected by the conduct of the regulated activity
- Minimise emissions, including greenhouse gases, created by the conduct of the regulated activity.

For a full Environmental Performance outcome and how the environmental are mentioned in greater detail, refer to Section 7.7.

g. Chemical Risk Assessment

A chemical risk assessment has been completed for all chemicals to be used in the Hydraulic Fracturing process. This risk assessment provides the details about any chemical or other substance that may be in or added to any treatment fluids to be used in the course of Hydraulic Fracturing.

A risk assessment was carried on HF Chemicals; the full risk assessment is provided in Appendix 06.01 (HF Chemical Risk Assessment)

This assessment evaluates potential hazards associated with chemicals and the potential for exposure to human and environmental receptors and potentially hazardous chemicals where exposure pathways are complete quantified potential risks. This chemical risk assessment is supported by a broader assessment of environmental conditions and risks and recommended avoidance, mitigation and management strategies.

A tiered assessment was conducted on the compiled hydraulic fracturing fluid systems using screening of the potential human health and ecological hazards that should be considered for potential exposure to the hydraulic fracturing fluids during transportation, hydraulic fracturing activities (including storage), and subsequent treatment and disposal of flowback.

The tiered assessment includes the following steps:

- Tier 1 – Identify chemicals of low human health and ecological concern that do not require additional chemical risk assessment in the tier assessment process
- Tier 2 – Chemicals that are not identified as a low human health and ecological concern and therefore require an additional risk assessment to characterise potential risks. This is done using a quantitative evaluation of the risks based on the potential complete exposure pathways and Tier 1 assessment

The human health and ecological hazard mitigation information provided in the chemical risk assessment dossiers and SDSs primarily focuses on safe handling, transportation and worker protection.

All chemicals were considered low concern when standard chemical handling, storage and disposal practices were utilised. Based on the outcomes of this assessment, no further management controls were considered necessary.

Imperial aligns its transport, storage and handling of hazardous chemicals with WHS Regulations; this includes all obligations and duties for storage and handling of hazardous chemicals and eliminating risks to workers from potential exposure and the potential requirements for health monitoring.

h. Stakeholder Engagement

Imperial Oil & Gas has established and continues mutually beneficial relationships with the stakeholder groups. Imperial endeavours to generate positive economic and social benefits for and in partnership with the communities.

The level of engagement with identified stakeholders varies, depending on their potential to be affected by the proposed activities. Nonetheless, all engagement process involved "Information, consultation, involvement, collaboration and empowerment" of relevant stakeholders to achieve the best outcome for both parties. The key relevant stakeholder groups whom Imperial has carried out engagements include:

- Traditional Owners
- Northern Land Council
    - as the representative and agent of traditional Aboriginal owners in accordance with the Aboriginal Land Rights (Northern Territory) Act 19076 (Cth), whose functions in accordance with section 23 of the Act include ascertaining and expressing the wishes and opinions of Aboriginals living in the area as to the management of the land, to protect the interests of traditional Aboriginal owners and to consult with traditional Aboriginal owners with respect to any proposal relating to the use of that land
- Landholders within the Location of the Regulated Activity
- S-19 Leaseholders within the Location of the Regulated Activity

Stakeholder engagement carried out to date included the identification of all affected stakeholders and the pursuing their engagement in compliance with the Stakeholder Engagement and Consultation guideline, the NT EPA guidance documents, and the EP Act. The engagement process involved educating stakeholders on the proposed impacts of Imperials operations, building relationships, sharing information, and bringing stakeholder voices into decisions in the ongoing planning and development of the proposed activities and that specific issues could be considered and addressed.

Imperial proactively undertakes future stakeholder engagement. For more information on stakeholder engagement carried out to date and future engagement, see appendix 11.

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Appendix 03 - Environmental Risk Assessment framework

Appendix 04 - Environmental Risk Assessment

Appendix 05 - Erosion and Sediment Control Plan

Appendix 06 – Waste and Wastewater Management Plan

Appendix 06.01 - HF Chemical Risk Assessment

Appendix 07 - Spill Management Plan

Appendix 08 - Fire Management Plan

Appendix 09 - Weed Management Plan

Appendix 10 - Methane Emissions Management Plan

Appendix 11 - Stakeholder Engagement

Appendix 12 - Rehabilitation Management Plan

Appendix 13 -Traffic Impact Assessment

Appendix 14 - Emergency Response Plan

Abbreviation and units

Abbreviations and units used in this EMP and appendices are listed in the table below.

Acronym / Abbreviation	Description
AAPA	Aboriginal Areas Protection Authority
AICS	Australian Inventory of Chemical Substances
ALARP	As low as reasonably practicable
ALRA	Aboriginal Land Rights (Northern Territory) Act 1976
APPEA	Australian Petroleum Production and Exploration Association
BoM	Bureau of Meteorology
Camp wastewater	Treated sewage effluent, and greywater (laundry, showers, sink wastes, etc.) from camp and offices
CEO	Chief Executive Officer
CBL	Cement Bond Log
CLA	Cambrian Limestone Aquifer
Clearing	Removal of above-ground vegetation and associated rootstock
the Code	Code of Practice: Petroleum Activities in the Northern Territory 2019
CPESC	Certified Professional in Erosion and Sediment Control
DAWE	Dept of Agriculture, Water and the Environment
DD	Data Deficient
DDR	Daily Drilling Report
DEPWS	Department of Environment, Parks and Water Security
DoEE	Department of Environment and Energy
DFIT	Diagnostic Fracture Injection Test
DITT	Department of Industry, Tourism and Trade
Drilling EMP	Environment Management Plan (EMP) For 2020 Drilling Program on NT Exploration Permit (EP) 187
Drilling Fluid	Fluids that contain some formation fluids and cuttings of the formation being drilled and other materials used in well drilling activities
D&C	Drilling and Completions
EC	Electrical Conductivity
EMP	Environmental Management Plan
EP	Exploration Permit
AP Act	Environment Protection Act 2019
EPA	Environment Protection Authority (NT)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPS	Environmental Performance Standards
ERA	Environmental Risk Assessment
ESD	Ecologically Sustainable Development
EVNT	Endangered, Vulnerable or Near Threatened

Acronym / Abbreviation	Description
EWCRP	Emergency and Well Control Response Plan
Flowback Fluid	Fluid that is a mixture of hydraulic fracturing fluid and formation fluid that is allowed to flow from the well following hydraulic fracturing
ha	Hectares
IADC	International Association of Drilling Contractors
IMP	Integrity Management Plan
GDE	Groundwater Dependent Ecosystems
GIS	Geographic Information System
GISERA	Gas Industry Social and Environmental Research Alliance
Ground truthing	Field-based assessment of the final proposed locations for ground-disturbing activities,to ensure; • the actual riparian zones and the buffers for drainage depressions, and stream orders 1 to 4, and the location and density of hollow-bearing trees and their buffers are identified and mapped • the presence/absence of the six listed species identified by the Fauna and Flora division to have a low to moderate likelihood of occurrence, including the presence/absence of Grey Falcon nesting locations and Mertens' Water Monitor, is identified • the location wellpads and gravel pits will not require clearing of riparian zones, or their buffers and ensure that there are no active Grey Falcon nesting sites within 300m ,prior to the commencement of ground-disturbing activities.
HF	Hydraulic Fracturing HF
HSEMS	Health Safety Environment Management System
kg	Kilograms
km	Kilometre
KOP	Kick-Off Point
L	Litres
LACA	Land Access and Compensation Agreement
LAG	Local Aboriginal Groups
LCG	Land Clearing Guidelines
LCP	Land Clearing Permit
LoR	Level of Reporting
LWD	Logging While Drilling
m	Metres
mGL	Metres Ground Level
mm	Millimetres
mRT	Metres Rotary Table, referenced to the rotary table height of the original drilling rig, all wellbore geometry is measured in mRT.
MAASP	Maximum Allowable Annular Surface Pressure
MAOP	Maximum Allowable Operating Pressure
MD	Measured Depth

Acronym / Abbreviation	Description
MESP	Maximum Expected Surface Pressure
ML	Megalitres (1,000,000 litres)
MoC	Management of Change
MNES	Matters of National Environment Significance
NAFI	North Australia Fire Information
NEPM	National Environment Protection Measure
NGERS	National Greenhouse Energy Reporting Scheme
NLC	Northern Land Council
Non-operational	Any time when there is not manned activity occurring on the site. A non-operational site may have the following: • Storage of drill cuttings and drilling fluids • Storage of Wastewater • The use of passive monitoring facilities
NRM	Natural Resource Management
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority
NVIS	National Vegetation Information System
OEM	Original Equipment Manufacturer
Operational	Any time when there is manned activity occurring on the site. A short visit to the site for inspection does not constitute site activity.
Panel	Independent Scientific Panel
PL	Petroleum Lease
PM	Project Manager
PMST	Environment Protection and Biodiversity Conservation Act 1999 Protected Matters Search Tool
PPE	Personal Protection Equipment
Produced Water	Naturally occurring water that is extracted from the geological formation following hydraulic fracturing
Project Area	The area surrounding the project that has been used for benchmarking against the LCG
RSWC	Rotary Sidewall Coring (Via wireline)
PPL	Petroleum Pipeline License
SC	Site Coordinator
SEAAOC	South East Asia Australia Onshore Conference
Section 19	Section 19 of the Aboriginal Land Rights (Northern Territory) Act 1976
Seismic EMP	EP187 2D Seismic Work Program Environment Management Plan
SHRR	Significant Hazard Risk Register
SSCC	Sacred Site Clearance Certificate
TEC	Threatened Ecological Communities
TO	Traditional Owners

Acronym / Abbreviation	Description
TOC	Total Organic Content
Traversing	Travel and work through the landscape deviating around large trees, the disturbance will be restricted to removal of rocks and fallen branches and of taller grasses and shrubs whilst retaining the rootstock
TVDSS	True Vertical Depth referenced to sea-level (Australian Height Datum)
WAC	Well Acceptance Criteria
Wastewater	Combination of drilling fluid plus flowback fluid
Wastewater flowline leak	Loss of containment from a wastewater flowline that is detected either visually or by the wastewater flowline leak detection system, which is calibrated for 100l
WBIV	Well Barrier Integrity Validation
TPWC Act	Territory Parks and Wildlife Conservation Act 2014
TD	Total Depth
TVD	True Vertical Depth
WCBD	Well Control Bridging Document
WMP	Weed Management Plan
WOMP	Well Operations Management Plan
the WOMP	Imperial O&G Carpentaria 1 EP187 Well Operations Management Plan
WoNS	Weed of National Significance
WWMP	Wastewater Management Plan

1. Introduction

1.1 Background and Purpose

Imperial Oil & Gas Pty Limited ("Imperial") is the operator and 100% owner of Exploration Permit (EP) 187, which is located approximately 85 km southwest of Borroloola within the Carpentaria and McArthur Basin in the Northern Territory, as shown in Figure 1.1. EP187 is situated in the McArthur River's upper reaches; it lies to the west of the Tablelands Highway and is crossed east to west by the Carpentaria Highway.

Throughout the Beetaloo Sub-basin's eastern margin, the Velkerri - Amungee - Shales have been proven to contain hydrocarbons. Two fellow operators having fracture stimulated and produced hydrocarbons to surface in measurable quantities.

Imperial is proposing a Seismic infill acquisition, drilling, Hydraulic Fracture (HF) and Extended Production Test (EPT) program in EP187, commencing in 2021 covered by this EMP. Throughout this document, this program of works is referred to as the Project, and the Project area is referred to as the Location of the Regulated Activities.

Previous seismic activities in EP187 were carried out under EP187 2D SEISMIC WORK PROGRAM ENVIRONMENT MANAGEMENT PLAN (2019 Seismic EMP).

Previous drilling activities in EP187 were carried out under ENVIRONMENT MANAGEMENT PLAN (EMP) FOR 2020 DRILLING PROGRAM ON NT EXPLORATION PERMIT (EP) 187 (2020 Drilling EMP).

Building on the exploration work programs and experience to date, coupled with encouraging results from these works, Imperial believes the proposed integrated exploration work program offers optimal flexibility to prove the potential of an economically exploitable hydrocarbon resource in EP187. The objective is to drill the minimum number of wells to provide a correct techno-commercial assessment of the entire program; this is the pilot appraisal stage. The pilot program is successful if it delivers accurate information, be it positive or negative, providing a prediction of the program's profitability. Only when these data sets are collected can we advance to field development planning (FDP). Because of the basin's geographical remoteness, an official wet season period spanning six months and multi-agency clearances and permissions required to undertake work programs, this interrelated EMP is the fit for purpose, cost-effective, environmentally responsible way to progress EP187's exploration and evaluation appraisal stage.

For any additional work not included in this EMP, Imperial will seek approval before activities commence.

Imperial is committed to undertaking site activities in a manner that minimises and controls the impacts on the environment, including potential effects on pastoral lessees and Traditional Owners (TO), who are also the landholders over the area in which this regulated activity will occur.

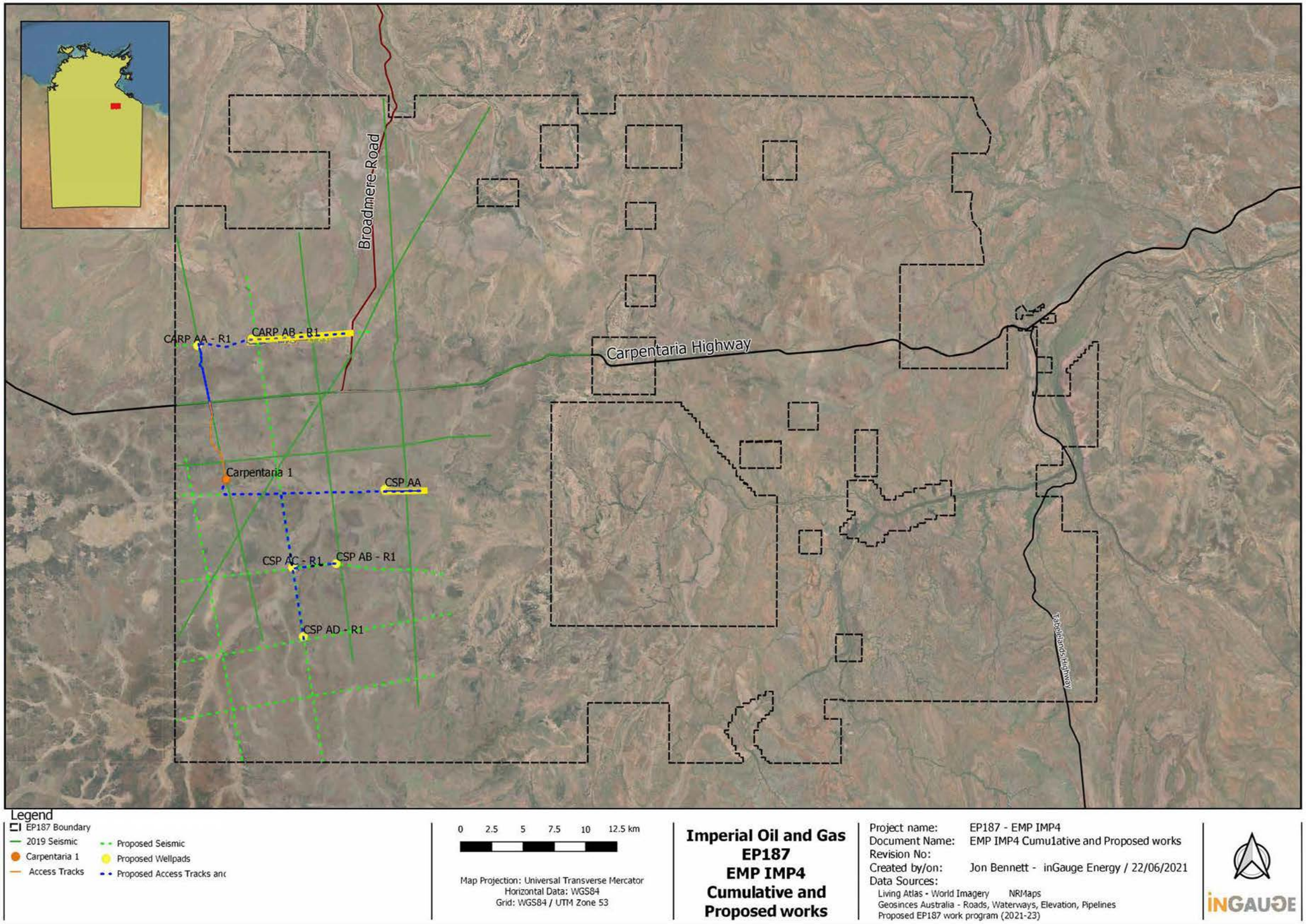


Figure 1.1: Location of EP187 with cumulative and proposed regulated activities

1.2 Titleholders Details

Table 3 provides details of the permit titleholder and titleholder nominated liaison person.

Imperial will notify and provide updated details to the Department of Industry, Tourism and Trade (DITT) and the Department of Environment, Parks and Water Security (DEPWS) in the case that there is a change in the contact details for the titleholder or liaison person.

Table 3: Details of Titleholder and Nominated Liaison Person

Titleholder Details	Liaison Contact Person
Name: Imperial Oil & Gas Pty Limited	Name: Alex Underwood
Address: Level 19, 20 Bond Street, Sydney NSW 2000	Position: Chief Executive Officer
Telephone: 02 9251 1846	Company: Imperial Oil & Gas Pty Limited
	Address: Level 19, 20 Bond Street, Sydney NSW 2000
	Telephone: 02 9251 1846
	Email: info@empiregp.net

2. Environmental Legislation and other requirements

2.1 Legislation requirements

A summary of legislation requirements, associated project environmental approvals and Imperial's actions and intent for each are provided in Table 4 below.

Table 4. Summary of Legislation Requirements

Legislation	Requirement	How Imperial meets the requirements	Administrator
Northern Territory			
Petroleum Act 1984	Petroleum exploration licenses are required in the areas where activities are proposed	• Exploration permits obtained	Department of Industry, Tourism and Trade (DITT)
	Compensation to be paid to native title holders and owners/ occupiers of land where petroleum activities are proposed	• Exploration Agreements obtained with Native titleholders • Compensation paid to owners and occupiers for all activities proposed under this EMP	
	The NT Schedule of Onshore Petroleum Exploration and Production Requirements (' NT Schedule'), should be listed. It covers key regulatory requirements for operational management of well activities in conjunction with the NT Code of Practice for Petroleum Activities.	• Requirements addressed in the WOMP	
Petroleum (Environment) Regulations 2016 (NT)	Ensuring all regulated activities have an approved EMP	This EMP has been developed to satisfy this requirement	Department of Environment, Parks and Water
		EMP is revised every 5-years	

Legislation	Requirement	How Imperial meets the requirements	Administrator
	s 30 Requirement for the current plan s 18 Revision required at the end of each five years		Security (DEPWS)
	s 10(2) legislative requirements include the requirement to comply with the code of practice s 4A. The code of practice is the Code of Practice: Onshore Petroleum Activities in the Northern Territory	The EMP has been developed following the Code of Practice, including all mandatory requirements applicable to the regulated activities. Specific cross-references to the clauses in the Code are included in the EMP, as relevant.	
Code of Practice: Onshore Petroleum Activities in the Northern Territory	The Code of Practice applies to all conventional and unconventional oil and gas exploration, appraisal, development and production and ancillary activities in the Northern Territory.	Every section of the EMP has been developed following the requirements presented in the Code	DEPWS
Bushfires Management Act 2016 and associated regulations	Compliance with total fire bans and fire permitting	Imperial will not undertake flaring or the lighting of fires during periods of total fire bans and will obtain a permit where flaring occurs during declared fire danger periods	Bushfires NT
	Requirements for occupiers to prevent and control fires	Addressed through Imperial's Bushfire Management Plan (Appendix 08), which includes bushfire preventative and response measures	

Legislation	Requirement	How Imperial meets the requirements	Administrator
Environment Protection Act 2019 (NT)	Clause 6a proponent is required to provide a referral to the NT EPA of the proposed action that may have the potential to impact on the environment	A detailed review of and assessment against each prescribed Environmental Objectives for each Environmental Factor was conducted in relation to the proposed Hydraulic Fracturing Program, which is discussed in Section 3.11 and Appendix 04 (Risk Assessment Table). Imperial believe the proposed activity does not represent any potential impact on the environment; therefore, it does not require an EIA.	Northern Territory Environment Protection Act (NT EPA) DEPWS
Territory Parks and Wildlife Conservation Act 1976 (NT)	Prohibits impacts to protected places, impacts to threatened Fauna and Flora and interference with protected wildlife	Appendix 01 Description of the Existing Environment Appendix 04 Environmental Risk Assessment Sections 5. Section 7.5.4 Monitoring and tracking	DEPWS
Waste Management and Pollution Control Act 1998	Requirements covering general environmental duty, waste management, including waste management hierarchy, waste transportation and waste disposal requirements	Appendix 04 Environmental Risk Assessment Appendix 06 Waste and Wastewater Management Plan Appendix 07 Spill Management Plan	NT EPA
	S12 General environmental duty applies to activities outside of the lease area, or if a spill or leak occurs that leaves the lease area, or 1km from the centerline of a flowline	Appendix 04 Environmental Risk Assessment Appendix 06 Waste and Wastewater Management Plan Appendix 07 Spill Management Plan Appendix 12 Rehabilitation Management Plan	

Legislation	Requirement	How Imperial meets the requirements	Administrator
	S14 Duty to notify of incidents causing or threatening to cause pollution: Applies if an incident occurs outside of the lease area, or if a spill or leak occurs that leaves the lease area, or 1km from the centerline of a flowline, that causes or threatens to cause material or serious environmental harm	Section 7.6 of this EMP	
Weed Management Act 2001 (NT)	Requires the occupier of the land (in this case Imperial) to • prevent the land being infested with a declared weed • prevent a declared weed or potential weed on the land spreading to other land • notify the weeds officer of the presence of the declared weed • comply with any declared weed management plans	Imperial will comply with the requirement of this Act through the implementation of weed prevention, detection and eradication controls through its approved weed management plan.	Weed Management Branch, Department of Environment, Parks and Water Security (DEPWS)
Water Act and Water Regulations 1992 (NT)	The Act requires that a license be obtained to take groundwater for hydraulic fracturing	Imperial has obtained a Water Extraction License (WEL) GRF10316 covering water usage required to complete exploration activities.	Water Resources Division, Department of Environment, Parks and Water Security (DEPWS)
	The take of surface water for petroleum activities is prohibited	No surface water take is proposed under this activity	
	Prohibits wastewater releases to surface water bodies or reinjection	No wastewater release to surface water proposed	

Legislation	Requirement	How Imperial meets the requirements	Administrator
Land Clearing Guidelines 2020 (NT)	The Land Clearing Guidelines identifies recommended buffers as follows: Section 4.3.3 Property boundary buffers: • 25m for <8ha • 50m for 8 to 20ha • 100m for 20 to 100ha • 200m for >100ha Section 4.3.5.1 Road buffers: • where land proposed for clearing is adjacent to a public road reserve retain minimum 50 m wide native vegetation buffer. • the clearing and future use of the land shall not prevent or impede the drainage of the public road Section 4.4.6 Sensitive or significant vegetation value types retain: • Low – 50m • Medium – 100m • High – 250m Section 4.4.7 Riparian areas related to the stream order classification of the waterway: • Drainage depression – 25m • 1st Order – 25m • 2nd Order – 50m • 3rd & 4th Order – 100m • ≥5th Order – 250m	It is not anticipated that the proposed activities will cause any significant or long-term impact on the recommended vegetation buffers. An ecologist will be on site before, or during, clearing operations to undertake ground-truthing for ground disturbing activities in advance of any ground disturbance to ensure the actual riparian zones and the buffers for drainage depressions, and stream orders 1 to 4, and the location and density of hollow-bearing trees and their buffers, are checked and regulated activities are avoided in sensitive areas. Decision tree to be implemented prior to tree clearing of larger trees Some minor disturbance of the grass and shrub cover may occur, but progressive rehabilitation is anticipated to see the impact to be only short term. Install buffer zones and distances into on-site tablets so machine operators have a visual alert when reaching buffer distances Section 6.3 & Appendix 12 – Rehabilitation Management Plan	DEPWS

Legislation	Requirement	How Imperial meets the requirements	Administrator
Work Health and Safety (National Uniform Legislation) Act 2011	Requires for workers and workplaces to implement the national health and safety framework. This includes hazardous chemical assessments, hazardous chemical register, access to safety data sheets, labelling, and the use, handling, generation and storage of hazardous chemicals at a workplace	Imperial has a Safety Management Plan that outlines how the requirements of the Act are achieved. This includes the management of chemical storage dossiers, safety data sheets (SDS) and appropriate procedures and controls to prevent worker exposure to hazards. Imperial will notify NT Worksafe if required under the legislation.	NT WorkSafe, Department of the Attorney-General and Justice
Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Regulations 2011	Requires implementing all required signage, spill management, reporting and licensing requirements for chemical transportation during drilling and stimulation activities	Any chemical transported and stored for exploration activities is undertaken to comply with these requirements.	NT Worksafe, Department of the Attorney General and Justice
Heritage Act	Requirements to avoid impacts to heritage places and objects	Imperial completed desktop studies and field scouts to confirm the presence/absence of heritage places and objects within the vicinity of the proposed activities	Heritage Branch, Department of Tourism and Culture
Northern Territory Aboriginal Sacred Sites Act 1989	For Imperial to attain an AAPA certificate	Imperial has applied for an AAPA certificate and will supply it to DEPWS when received.	Aboriginal Areas Protection Authority (AAPA)
Environmental Protection and Biodiversity Conservation Act 1999 (Cth)	For Imperial to follow the legal framework the EPBC Act outlines.	Imperial has followed the self-assessment referral process as outlined in the EPBC Act.	Department of Agriculture, Water and Environment

Legislation	Requirement	How Imperial meets the requirements	Administrator
National Greenhouse and Energy Reporting Act 2007	An Act that requires operators who generate emissions over a threshold to report information related to greenhouse gas emissions, greenhouse gas projects, energy consumption and energy productions of corporations.	Appendix 10. Methane Emissions Management Plan	Department of Industry, Science, Energy and Resources
National Environment Protection Council Act 1994 (National Environment Protection (Assessment of Site Contamination) Measure 1999) (NEPM)	This Act provides a nationally consistent approach to the assessment of site contamination to ensure sound environmental management practices to protect human health and the environment	Imperial uses the NEPM to assess the risk of contamination and for the assessment of the drilling fluids for disposal.	Department of Agriculture, Water and Environment
Native Title Act 1993	Legislation that provides for ways in which future dealings affecting native title may proceed and the recognition and protection of native title.	Implementation of Exploration Agreements, in collaborations with the NLC	Prime Minister and Cabinet
Dangerous Goods Act 2012 (NT)	Dangerous goods licenses are held when required	Imperial will ensure that a dangerous goods licenses are held by Imperial or contractor if applicable	NT WorkSafe
Public and Environmental Health Act 2016 (NT)	Wastewater treatment systems are subject to requirements of the Act.	Imperial aligns its operations to ensure that the Wastewater treatment systems meet the requirements of the Act and that the sewerage plants meet the NT Code of Practice for Small Onsite Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent.	Department of Health (DoH)

Legislation	Requirement	How Imperial meets the requirements	Administrator
Radiation Protection Act 2016 (NT)	Requirements for the management of radiation for the health and safety of community and protection of the environment	Imperial complies with the Act proper handling of and disposal of drill cuttings.	Department of Health (DoH)

2.2 Relevant Agreements and Operating Consents

Imperial will ensure that all necessary consents and approvals are in place before the commencement of any activity proposed under this EMP. All works will be undertaken according to the terms and conditions stipulated in the NLC agreements.

2.3 Code of Practice: Petroleum Activities in the Northern Territory 2019 and relevant guidelines

The Code of Practice: Petroleum Activities in the Northern Territory 2019 (the Code) applies to all activities involved in conventional and unconventional oil and gas exploration, appraisal, development and production and ancillary activities in the Northern Territory. The Code covers all petroleum activities, including all petroleum well types, exploration, appraisal, development, monitoring, injection and production wells.

In addition to compliance with the Code; contractors undertaking activities will be required to comply with the following environmental standards, guidelines and codes of practice:

- The Imperial Oil & Gas Pty Ltd Health Safety Environment Management System (HSEMS)
- Australian Petroleum Production and Exploration Association (APPEA) Code of Conduct and Environmental Practice (2008)
- NT EPA Environmental Factors and Objectives (NT EPA, 2019)
- Code of Practice: Petroleum Activities in the Northern Territory (2019)
- Vegetation Retention Technical Note No. 12 Erosion and Sediment Control Guidelines. DLRM
- Clearing Methodology Technical Note No. 18 Erosion and Sediment Control Guidelines DLRM

2.4 Referral under NT and Commonwealth legislation

2.4.1 Referral under the Environment Protection Act 2019 (EP Act)

Imperial has assessed the regulated activities under this EMP in conjunction with a suitably qualified person in line with the Environment Protection Act 2019 (EP Act) and the Environment Protection Regulations 2020 (EP Regulations). The self-assessment of the potential environmental impacts due to the proposed activities was conducted using the screening tool available on the guidelines provided by the NT EPA (NT EPA b., 2019), which took into consideration:

- Hazardous nature
- Site selection
- Construction and operation that may give rise to impact sources and pathways for impacts to environmental values and sensitivities outside the development footprint
- The residual or ongoing impacts at the end of life of the proposed activities
- The cumulative impacts that could result as a combination of smaller impacts arising from the proposed activities

Imperial does not believe the proposed actions require to be referred under the Environment Protection Act 2019 as they do not have the potential to impact the environment significantly. Planning, assessment and works took into account:

- The principles of ecologically sustainable development
- The environmental decision-making hierarchy
- The waste management hierarchy
- Ecosystem-based management
- The impacts of a changing climate, and
- Public and stakeholder consultation.

2.4.2 EPBC Act self-assessment

The Environment Protection and Biodiversity Conservation Act 1999 enables the Australian Government to join with the states and territories in providing a national scheme of environment and heritage protection and biodiversity conservation. The EPBC Act's objective is to protect the environment, especially matters of national environmental significance, conserve Australian biodiversity, enhance the protection and management of important natural and cultural places, etc. Referral of the project to the Department of Environment and Energy is required if the proposed action will have or is likely to have a significant impact.

The EPBC PMST identified the search area as having potential habitat for no nationally threatened flora species, 13 threatened terrestrial species and 14 migratory species listed under the EPBC Act. Eight (8) of the 14 migratory species are specialist marine species and have therefore been excluded from the assessment (including estuarine crocodiles as no suitable habitat exists within the Location of the Regulated Activity). The likelihood of occurrence within the proposed activities is presented in the Baseline Ecological Assessment available in Appendix 01.02. The proposed program will not directly impact these species' habitat, and a significant impact on these species or their habitat is considered remote. The proposed program will not require referral under the EPBC Act.

3. Description of the regulated activity

A detailed description of the regulated activities to be carried out under this EMP can be found in Appendix 02.

Works described in this EMP will only be conducted where they are not limited by conditions on the relevant AAPA Authority Certificate. Otherwise, if required, this EMP will be amended so works can be consistent with the issued Authority Certificate.

3.1 Overview of the activities proposed

The regulated activities to be carried out under this EMP are:

- Acquisition of 166km of 2 D Seismic data
- Construction of up to six wellpads
- Construction of up to 50km of access tracks
- Drilling up to a total of seven gas exploration wells
    - One horizontal gas exploration well from the existing Carpentaria 1 wellpad
    - Up to six new gas exploration wells on new wellpads, being either;
        - Vertical exploration wells
        - Horizontal exploration wells
        - Horizontal exploration well where the vertical pilot well has been plugged back before drilling the horizontal well
        - A combination of single-wellpads and multiwell pads
            - Multiwell pads will have a maximum of four wells per pad
- Evaluation, logging, testing and coring the above seven wells, including DFIT
- Establish bunded tanks pads and tanks fitted with leak detection at the above wellpads
- Hydraulic fracture of the above seven wells
- Completion, workover and maintenance of the above seven wells
- Extended Production Testing (EPT) of the above seven wells
    - With EPT <=90 days for each of the above seven wells
- Well suspension and decommissioning of the above seven wells
- Construction and operation of up to 57km of buried low-pressure wastewater flowlines
- Routine maintenance and monitoring activities
- Any other minor works that are ancillary of the above

Establish a temporary camp on the existing Carpentaria 1 wellpad and wellpads constructed under this EMP

Table 5 below shows the main key components of the regulated activity. Table 6 presents the Cumulative impacts of the regulated activities covered under this EMP and previous EMPs.

Table 5: Key components of the regulated activity

Component	Proposed
AAPA certificate:	TBA
Total area of exploration lease (EP187):	4,427 km²
Total area of disturbance under this EMP:	166 Ha
Number of new exploration wells:	Seven
Groundwater:	Gum Ridge aquifer
Extraction license # and volume:	GRF10316, 85ML/year An application has been made to increase this water licence volume to cover the proposed activities
Number of bores (include #s):	Two – RN041678 & RN41800 6 control monitoring/production and 6 impact monitoring/production bores to be added
Estimated total groundwater usage:	434.28 ML (over 7 wells)
Control bore/s:	Six to be added
Impact bore/s:	Six to be added
Timeframe:	
Activity duration:	Q3 2021 – Q4 2025 (includes well-testing)
Duration of drilling operations:	Four to six weeks per well
Duration of hydraulic fracturing operations:	One to two weeks per well
Duration of well production testing:	90 days per well
Personnel:	
Operational workforce:	~40 during drilling, ~25 during HF, ~1-4 during Extended Production Testing
Camp capacity:	~40 persons
Traffic movements:	
Peak movements for all activities (per day):	~50
Average movements per day for the first three months per well:	~10-30
Average movements per day for the balance	~1-10
Truck load-out: Wastewater transport:	Average 8 trucks per well
Tanks:	
Closed-topped storage tanks	Up to 50 ML (per wellpad)
Maximum number of closed topped storage tanks	Up to 2 (per wellpad)
Open Topped treatment tanks	Up to 50 ML (per wellpad)
Maximum number of open-topped treatment tanks	Up to 2 (per wellpad)
Low-Pressure Wastewater Flowline length	Up to 57km

Component	Proposed
Flowback Fluid:	
Volume – initial predicted:	~25 ML (per well)
Volume– predicted for off-site disposal:	<1 ML (per well)
Produced Water:	
Volume – initial predicted:	0 ML
Volume– predicted for off-site disposal	0 ML
HF Fluid, Proppant and emissions:	
HF Fluid (total):	385ML total (for up to 50 stages per well)
Proppant usage (total):	59,000 Tonne total (for up to 50 stages per well)
tCO_2-e emissions:	249892.4 (cumulative)
Drilling cuttings and residue drilling fluid:	790m^3 (per well)

3.1.1 Cumulative Impact of regulated activities

Table 6. Cumulative impacts of activities covered under this EMP and previous EMPs.

Activity/Aspect	Seismic and Drilling EMPs	EMP IMP 3.3 (one well pad)	EMP IMP4.3 (This EMP)	Total
Vegetation clearing	Cleared 70 hectares for seismic Cleared 1.4 hectares for well pad Cleared 4 hectares for access tracks	Clear 10.5 hectares for wellpad extension and access tracks	Clear 166 hectares for seismic, wellpads, access tracks, gravel pits and wastewater flowlines	252 hectares
Water Extraction	License obtained (GRF10316) for extraction of 85ML per annum from bores RN0416878 & RN041800 Water to be used as follows: 0.5ML estimated for dust suppression 5.6 ML estimated for the drilling program.	Water to be used as follows: 7.5ML estimated for hydraulic fracturing and dust suppression	Estimated water use is as follows: 0.5 ML per wellpad 0.5 ML for dust suppression (per well) 2.5 ML for drilling (per well) 55 ML for hydraulic fracturing (per Well) 1ML/month for road and site maintenance 0.1ML for vehicle washdowns Table 16 outlines the estimated water use for this EMP. Total use is 434.28 ML. Table ***17*** has a breakdown of annual water usage estimates.	447.88 ML
Camp	Established temporary 30-person camp Includes approval of camp wastewater treatment system and irrigation of treated camp wastewater	No new camp works required. We will use the existing campsite and existing approval of the camp wastewater treatment system. Estimated 20 people will use the camp for two months.	Temporary camps will located on the existing Carpentaria 1 wellpad and on other wellpads constructed under this EMP for activities under this EMP. Estimated 40 people will use the camp for four months.	Utilise Constructed wellpads
Flowback and Produced water	Not applicable	Estimated will result in 4 ML of Flowback Fluid and Produced Water per well Requires establishment of enclosed tanks and evaporation pit	Estimated will result in 25 ML of Flowback Fluid and Produced Water, per well Requires establishment of closed topped storage tanks and open-topped treatment tanks	Estimated 179ML

Activity/Aspect	Seismic and Drilling EMPs	EMP IMP 3.3 (one well pad)	EMP IMP4.3 (This EMP)	Total
Closed topped Storage tanks	Not applicable	Will establish up to 2 closed topped tanks Will manage with 0.5m freeboard	Will establish up to 12 closed topped storage tanks, with up to 2 per wellpad Will manage with 0.5m freeboard	Up to 14 tanks
Open topped Treatment Tanks	Not applicable	Will establish 1-2 open-topped treatment tanks Freeboard to be managed according to the season, with 1.1m of freeboard during the wet season, and 0.5m of freeboard during the dry season	Will establish up to 2 open-topped treatment tanks per wellpad Freeboard to be managed according to the season, with 1.1m of freeboard during the wet season, and 0.5m of freeboard during the dry season	Up to 14 tanks
Pits	Established up to 2 pits Managed according to the season, with 1.1m of freeboard during the wet season and 1m of freeboard during the dry season	Utilise existing pits Freeboard to be managed according to the season, with 1.1m of freeboard during the wet season and 0.5m of freeboard during the dry season	Will establish up to two pits per wellpad Freeboard to be managed according to the season, with 1.1m of freeboard during the wet season and 0.5m of freeboard during the dry season	Up to 12 pits
Gravel pits	Not applicable. No gravel pits have been established for this project.	Not applicable No gravel pits have been established for this project.	Up to 6 gravel pits to be established	Up to 6 gravel pits to be established
Chemical storage	Established a dedicated chemical store, bunded to 110% of the largest volume OR Double skinned tanks used, earthen bund around well site	Establish a dedicated chemical store, bunded to 110% of the largest volume OR Double skinned tanks used, earthen bund around well site	Hazardous chemicals are to be stored within secondary containment with sufficient capacity to hold 110% of the volume of the largest container stored or with a double-lined/walled storage tank.	Per wellpad
Water flowlines	Not applicable	Not applicable	Construct up to 57 km of low pressure buried wastewater flowlines to allow efficient transfer of fluids between wellpads.	Up to 57 km

3.1.2 Cumulative Impacts in conjunction with other activities near the permit area

Based on a search of publicly available information, Imperial has established the cumulative effects of the activities under this EMP, previous Imperial EMPs, the exploration for, or the production of, petroleum or extractive minerals in or near the permit area for the regulated activities. These cumulative impacts are presented in Table 7.

Table 7: Cumulative impacts for activities near the permit area.

Activity/Aspect	Unit of measure	Cumulative impact
Vegetation Clearing	Hectare	399
Water extraction from the Gum Ridge Aquifer (including Public Water Supply)	ML per annum	953
CO_2 Emissions	**tCO_2-e**	632,034

The cumulative vegetation clearing for all approved EMPs and this EMP is 399 Hectares, representing 0.0014% of the Beetaloo Sub-basin. Even though the 399Ha is a very small proportional impact, it is overstated. Areas reported as cleared for seismic activities predominately do not require the removal of mature trees as the equipment operates between the trees in most areas. More information regarding 2D seismic acquisition methodologies is available in Appendix 02.

The annual cumulative groundwater extraction from all licenced bores from the Gum Ridge aquifer of 953ML is well below the sustainable extraction rate of 14,128,000ML per annum DEPWS (2018). Water Resources believes that the addition of 100Ml per annum for the activities under this EMP will have a negligible effect. A DEPWS Water Resources Division assessment found that the impact of drawdown on the Gum Ridge Formation from this extraction is unlikely to create a significant drawdown effect that would affect other users.

The cumulative greenhouse gas emissions from the petroleum and mining activities across the McArthur Basin of approximately 632,034 tCO_2-e are equivalent to 3.1% of the 2019 Northern Territory emissions.

3.2 Timing and personnel requirements of the regulated activity

An indicative project schedule, including estimated start dates and durations of regulated activities, is provided in Table 8 and Figure 3.1 below.

Table 8 also shows the forecast personnel requirements for the project.

Whilst Imperial will avoid heavy operations during the local wet season; there will be site operations during the wet season as defined by the Code.

Table 8: Indicative Project Schedule and Personnel Requirements

Activity	Estimated commencement	Estimated duration	Personnel Required
2D Seismic Program	Q3 2021	Six weeks	30-40
Civil Construction for Carpentaria 2	Q3 2021	Four weeks	10-15
Civil Construction for Carpentaria 3	Q3 2021	Four weeks	10-15
Drilling, including testing and evaluation of Carpentaria 2	Q3 2021	4-6 weeks	40

HF of proposed Carpentaria 2	Q4 2021	Two weeks	25
Extended Production Test and Flowback Fluid and Produced Water management of Carpentaria 2	Q4 2021	Three Months	2-5
Drilling, including testing and evaluation of Carpentaria 3 and 4	Q2 2022	4-6 weeks	40
HF of proposed Carpentaria 3	Q2 2022	Two weeks	25
HF of proposed Carpentaria 4	Q2 2022	Two weeks	25
Extended Production Test and Flowback Fluid and Produced Water management of Carpentaria 3 and 4	Q3 2022	Three Months	2-5
Drilling, including testing and evaluation of Carpentaria 5 and 6	Q2 2023	4-6 weeks	40
HF of proposed Carpentaria 5 and 6	Q3 2023	Two weeks (each)	25
Extended Production Test and Flowback Fluid and Produced Water management of Carpentaria 5 and 6	Q3 2023	Three Months	2-5
Drilling, including testing and evaluation of Carpentaria 1 and 7	Q2 2024	4-6 weeks	40
Extended Production Test and Flowback Fluid and Produced Water management of Carpentaria	Q3 2024	Two weeks (each)	25
Extended Production Test and Flowback Fluid and Produced Water management of Carpentaria	Q3 2024	Three Months	2-5
Installation of water flowline between wellpads	To be determined	Four weeks (each)	10-20
Well suspension, Plugging and Abandonment	To be determined	Four weeks (each)	15-30

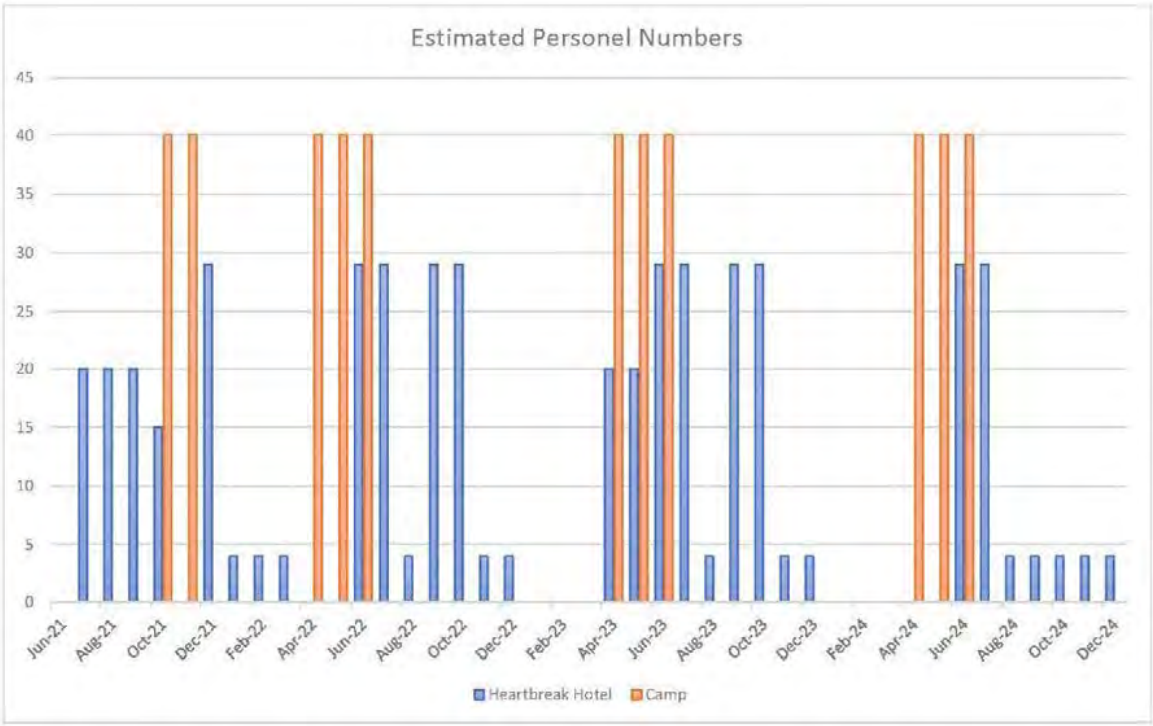
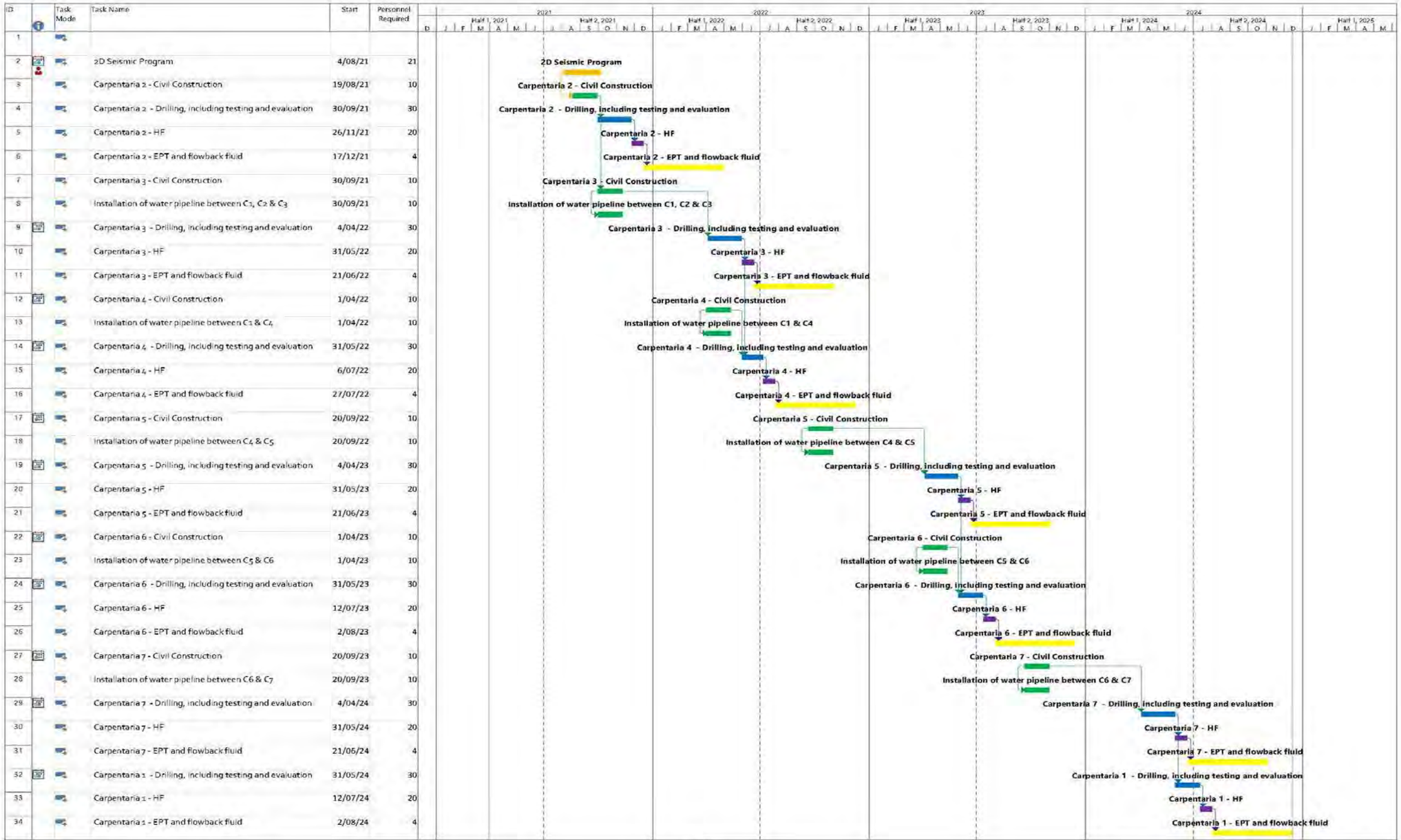


Figure 3.1 Estimated Personnel numbers

ID	Task Mode	Task Name	Start	Personnel Required
1				
2		2D Seismic Program	4/08/21	21
3		Carpentaria 2 - Civil Construction	19/08/21	10
4		Carpentaria 2 - Drilling, including testing and evaluation	30/09/21	30
5		Carpentaria 2 - HF	26/11/21	20
6		Carpentaria 2 - EPT and flowback fluid	17/12/21	4
7		Carpentaria 3 - Civil Construction	30/09/21	10
8		Installation of water pipeline between C1, C2 & C3	30/09/21	10
9		Carpentaria 3 - Drilling, including testing and evaluation	4/04/22	30
10		Carpentaria 3 - HF	31/05/22	20
11		Carpentaria 3 - EPT and flowback fluid	21/06/22	4
12		Carpentaria 4 - Civil Construction	1/04/22	10
13		Installation of water pipeline between C1 & C4	1/04/22	10
14		Carpentaria 4 - Drilling, including testing and evaluation	31/05/22	30
15		Carpentaria 4 - HF	6/07/22	20
16		Carpentaria 4 - EPT and flowback fluid	27/07/22	4
17		Carpentaria 5 - Civil Construction	20/09/22	10
18		Installation of water pipeline between C4 & C5	20/09/22	10
19		Carpentaria 5 - Drilling, including testing and evaluation	4/04/23	30
20		Carpentaria 5 - HF	31/05/23	20
21		Carpentaria 5 - EPT and flowback fluid	21/06/23	4
22		Carpentaria 6 - Civil Construction	1/04/23	10
23		Installation of water pipeline between C5 & C6	1/04/23	10
24		Carpentaria 6 - Drilling, including testing and evaluation	31/05/23	30
25		Carpentaria 6 - HF	12/07/23	20
26		Carpentaria 6 - EPT and flowback fluid	2/08/23	4
27		Carpentaria 7 - Civil Construction	20/09/23	10
28		Installation of water pipeline between C6 & C7	20/09/23	10
29		Carpentaria 7 - Drilling, including testing and evaluation	4/04/24	30
30		Carpentaria 7 - HF	31/05/24	20
31		Carpentaria 7 - EPT and flowback fluid	21/06/24	4
32		Carpentaria 1 - Drilling, including testing and evaluation	31/05/24	30
33		Carpentaria 1 - HF	12/07/24	20
34		Carpentaria 1 - EPT and flowback fluid	2/08/24	4



Page 1

Figure 3.2: Project Schedule

3.3 Vehicle Movements and traffic

For the initial civil operations, the equipment is likely to be sourced locally, and therefore the traffic impact is minimised.

There will be approximately 30 truck movements for drilling operations to mobilise the drilling rig to the site for each mobilisation, plus a further 20 truck movements to mobilise drilling fluids, casing, cement, fuel, etc., per well for drilling operations. These truck movements consist primarily of road trains arriving at the start of the drilling operations and again at the end of operations during demobilisation. Where the wells can be drilled in sequence, the same rig is likely to be used for both wells and will therefore not require an additional mobilisation reducing the number of vehicle movements. After the drilling campaign, there will be a further 30 truck movements to demobilize the rig.

There will be approximately 20 truck movements for hydraulic fracture stimulation operations to mobilise the HF stimulation equipment. Mobilisation of proppant, chemicals, fuel, etc., to each wellpad for HF operations is expected to require 130 truck movements. A further 20 truck movements to demobilise equipment. There will be no dominant traffic flow direction for the program's supplies delivery. Traffic is likely to be roughly split between the north (from Darwin) and south (Queensland and South Australia).

There will be a daily commute by 4WD to mobilise and demobilise Civil Construction, Seismic acquisition and HF crews from Cape Crawford to the Location of the Regulated Activity for the duration of those operations. There will be a twice-daily commute by 4WD to mobilise and demobilise crews from the camp to the drilling for the duration of drilling operations. There will be a twice-weekly commute by 4WD to Daly Waters during the Extended Flowback and Testing (EPT) Operations and irregular truck movements to maintain the operations, estimated at one truck each every two weeks.

Imperial has engaged an independent traffic assessment based on a very optimistic schedule to give a "worst-case" scenario for traffic impacts. This Traffic impact assessment is attached as Appendix 13. In summary, this report finds that; "Based upon information provided by InGauge, daily traffic volumes along the Carpentaria Highway are not forecast to exceed 150 vehicles per day throughout the exploration program. Accordingly, volumes are expected to remain well below the 150 vehicles per day 'limit' associated with single (centrally sealed) carriageway rural roads identified in the relevant Austroads' Guide. As such, the traffic volumes associated with the proposed exploration program will be readily accommodated."

The estimated traffic volume for the 2021 EP187 Work Program is shown in Table 9. A summary chart showing the weekly total truck movements throughout the project duration is shown in Figure 3.3.

The highest potential truck movements occur in weeks where the schedule shows a nominal overlap between the drilling rig de-mobilising and the frac spread mobilising to the site. This peak is modelled at 75 truck movements in a week. For a two well drill and fracture stimulate campaign, occurring over a 16 week period, the total combined average for truck movements per week is calculated as 18.76 truck movements per week.

Table 9: Estimated operational trucking requirements

Activity	Total Truck Movements (per Activity)	No Weeks per Activity	Average Truck Movements per Week – During that Activity
Drilling Rig Mobilisation/Demob	60	2	30
Drilling Operations	24	6	4
Well Materials	20	6	3.33
Completions Rig	10	2	5
HF Spread Mobilisation/Demob	40	2	20
HF Operations	8	2	4
HF Materials	130	2	65

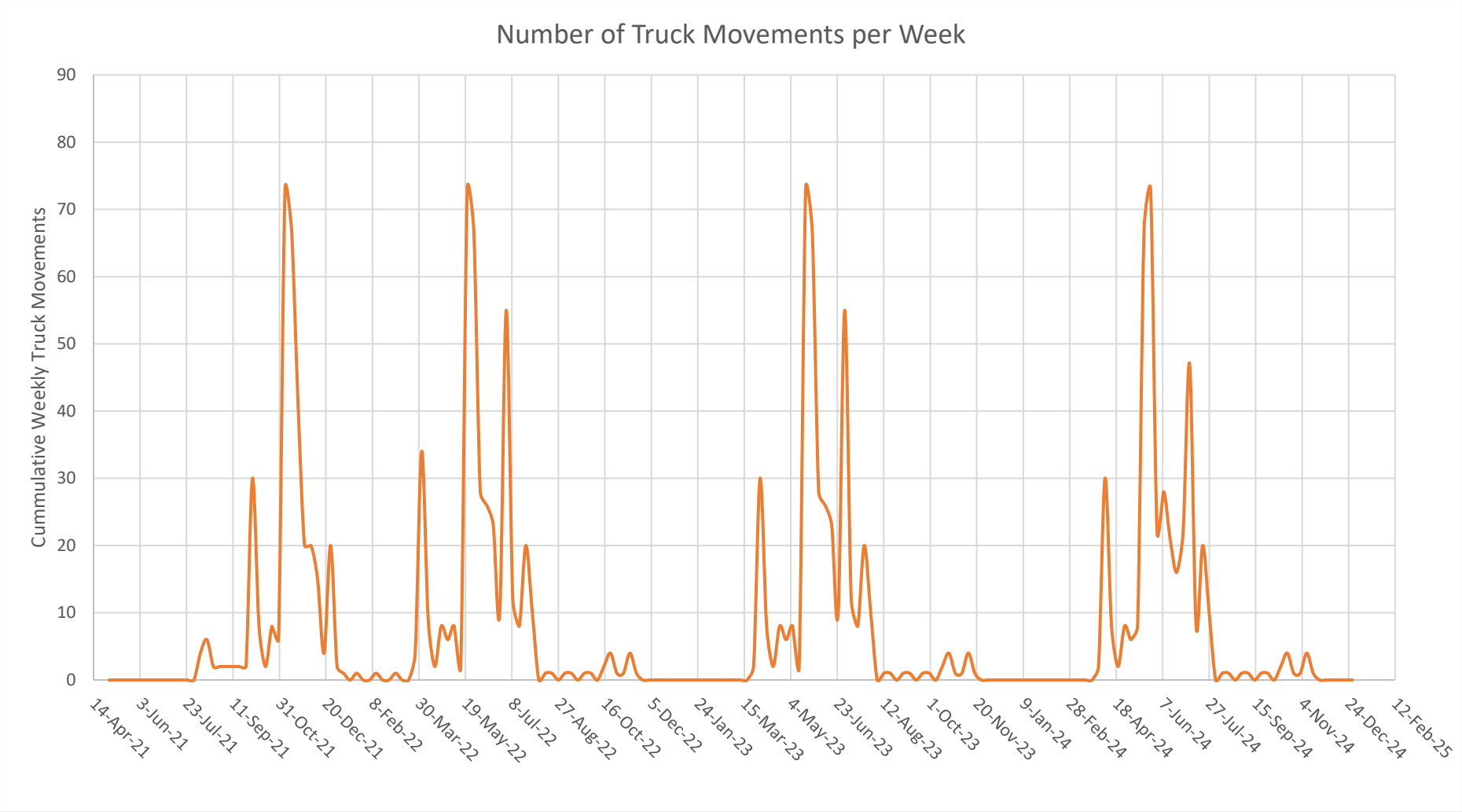


Figure 3.3: Number of Truck Movements per week

3.4 Equipment and services mobilisation

The potential traffic-related impacts of the regulated activities carried out under this EMP, including Seismic acquisition, civil construction, drilling, stimulation, well testing, and ongoing operations, are not considered significant as supported by the Traffic Impact Assessment carried out for the project. This assessment advised that the additional vehicle movements generated will be adequately accommodated by installing a planned T-intersection on the highway and work zone management.

Traffic associated with exploration activities has some higher peaks during mobilisation of equipment but is generally small and of short duration. The access to the Location of the Regulated Activity is via the Carpentaria Highway, approximately 202km East of the Stuart Highway intersection and 60km West of Cape Crawford. The Carpentaria Highway has a 100km/h posted speed limit in the project's vicinity and is generally a two-way road with a mixture of double and single lane sealed strips. The majority of equipment to be utilised for the regulated activities carried out under this EMP will mobilise to the site from Queensland or South Australia. The majority of equipment will come via the Tableland highway to Cape Crawford, then west to the site, with the balance coming via the Stuart Highway to the Highway Inn, then East to the site. The majority of materials will be shipped via the Stuart Highway to the Highway Inn, then East to the site.

The peak maximum anticipated traffic movements associated with all of the regulated activities under this EMP would be for the mobilisation and demobilisation of the equipment "Spreads" (the term used to describe the various trucks and equipment needed) for drilling and HF activities into the Location of the Regulated Activity. The peak maximum traffic movement associated with this project will be approximately 50 truck movements over the mobilisation and local movement of approximately 15 light vehicles per day. The duration of the mobilisations and demobilisations will be approximately five days each at the start and end of each drilling or HF campaign. Imperial will design and construct the internal access tracks so that equipment and personnel in field movements avoid using public roads as much as the quality and location of the in-field roads allow.

The peak maximum anticipated traffic movements of civil construction, Seismic acquisition, completions, workover and EPT equipment are anticipated to be minor, with a peak of 15 vehicle movements for several days during equipment mobilisation and demobilisation. Average daily traffic additions during the remainder of the project period are likely to be 10-15 movements per day for the first month of each well, reducing down to one or two movements per day for the remainder of the period once the wells undergo testing.

3.5 Site Selection

The planning, design and location of petroleum infrastructure to be constructed and operated under this EMP have been carried out in line with Land Clearing Guidelines as published on the Department of Environment Parks and Water Security (DEPWS) website.

All petroleum infrastructure, including petroleum wells and flowlines, have a setback distance of at least 2km from an existing or proposed habitable dwelling, including all buildings or premises where people reside or work, schools and associated playgrounds, permanent sporting facilities and hospitals or other community medical facilities.

Imperial has carried out a Baseline Ecological Assessment of the proposed infrastructure locations, and site selection has been guided by this assessment; see Appendix 01.02 for the assessment report. The Baseline Ecological Assessment allows for Imperial to undertake specific considerations to biodiversity protection.

Non-linear infrastructure, including wellpads, has been located to avoid flooding, sheet flow, high slope areas, and proximity to watercourses. Wellpads constructed under this EMP will be outside of the buffer zones required for watercourses, as per the Land clearing guidelines. An ecologist will be available on-site before or during clearing operations to undertake ground-truthing prior to ground-disturbing activities to ensure riparian zones, buffers for drainage depressions and different stream orders, location and density of hollow-bearing trees are located and recommended NT Land clearing guideline buffers applied.

Route selection for linear disturbances has been carried out to minimise interference with wet season water flow paths, and infrastructure exposure to flooding, steep slopes and alignments that will require large cut and fills have been avoided where possible.

Access tracks and buried flowlines constructed under this EMP will have three creek crossings of the ephemeral Relief Creek. Imperial has applied for a 100m wide corridor to place the linear infrastructure to fine-tune the alignment and reduce the on-site impact. Relief Creek's crossings will be oriented close to perpendicular to the creek's flow direction to reduce the crossing's impact and be constructed as a bed level. Flowlines and ancillary services will be buried except under the criteria of A.3.1 (e) of the Code.

Gravel pits will be located within the Land Type B zones, as shown in Figure 3.5, using the same site selection criteria as wellpads.

Due to the above site selection, erosion and sediment impacts will be minimised; please refer to Section 3.17.3 for Erosion and Sediment Control information.

Due to the design and site layout of the narrow clearing corridor of linear infrastructure and the non-linear infrastructure's isolation, wildlife movement's impact will be minimal.

Known sensitive receptors, critical habitats, important habitats and cultural heritage sites have been avoided during corridor selection. A wide corridor has been identified to carry out construction activities; this will allow the actual disturbance to be deviated to avoid environmental and cultural areas identified during construction activities.

The area of vegetation to be cleared for infrastructure development (including wellpads, roads and flowline corridors) has been minimised through efficient design and, where possible, use of existing infrastructure and the co-location of shared infrastructure, e.g.:

- Seismic lines have been routed in a way that will allow future access tracks and flowlines to follow the same alignment

- Flowlines will follow access track alignment or other pre-disturbed areas to reduce the clearing required for construction, operation and maintenance.
- If a flowline is required to cross the Carpentaria 1 Highway, approvals with TCSD will be sought before works commence
- Site selection and layout has been carried out to;
    - Ensure potential environmental nuisance has been avoided and minimised
    - Reduce impacts on existing landscape amenity to a level that is as low as reasonably practicable (ALARP) and acceptable by:
        - Minimising the surface footprint of all aspects of development
        - Ensuring that infrastructure located close to a major public road or locations with high existing amenity value is designed and located in a way that minimises long-term amenity impact.

3.5.1 Site Selection – Land Types and working corridors

Imperial has selected a proposed location for the activities under this EMP and has added a buffer to allow moving locations to reduce the on-ground impacts, as per previous EMPs.

The preferred locations for wellpads have been chosen to reduce on-ground impacts while giving a good understanding of the resources of EP187. The wellpad locations will be verified using seismic data analysis interpretation, wellpads will be moved within the buffers if required by the seismic, whilst maintaining a low impact on the environment.

- Figure 3.4: Location of regulated activities under this EMP – Land Type A
    - Showing the buffer for the movement of seismic lines, access tracks, and flowlines allows moving locations to reduce the on-ground impacts while meeting program objectives.

- Figure 3.5: Location of regulated activities under this EMP – Land Type B
    - Showing the buffer for the movement of wellpads and gravel pits to allow moving locations to reduce the on-ground impacts while meeting program objectives

- Figure 3.6: Location of regulated activities under this EMP – Land Type C
    - Showing the extent of lateral Drilling and Hydraulic Fracturing activities under this Work Program

- Figure 3.7: Location of regulated activities under this EMP – Proposed Seismic
    - Showing the working corridors and the associated land clearing practices for the proposed seismic acquisition activities under this EMP

- Figure 3.8: Location of regulated activities under this EMP – Proposed Wellpads
    - Showing the proposed wellpad locations under this EMP, along with non-Imperial water bores and dwellings
- Figure 3.9: Location of regulated activities under this EMP – Proposed Access Tracks
    - Showing the working corridors and the associated land clearing practices for the proposed access tracks under this EMP
- Figure E0.5: Location of regulated activities under this EMP – Proposed Flowlines
    - Showing the working corridors and the associated land clearing practices for the proposed wastewater flowlines under this EMP

Shapefiles of the proposed activities and their relevant buffers are provided to DEPWS as part of this EMP.

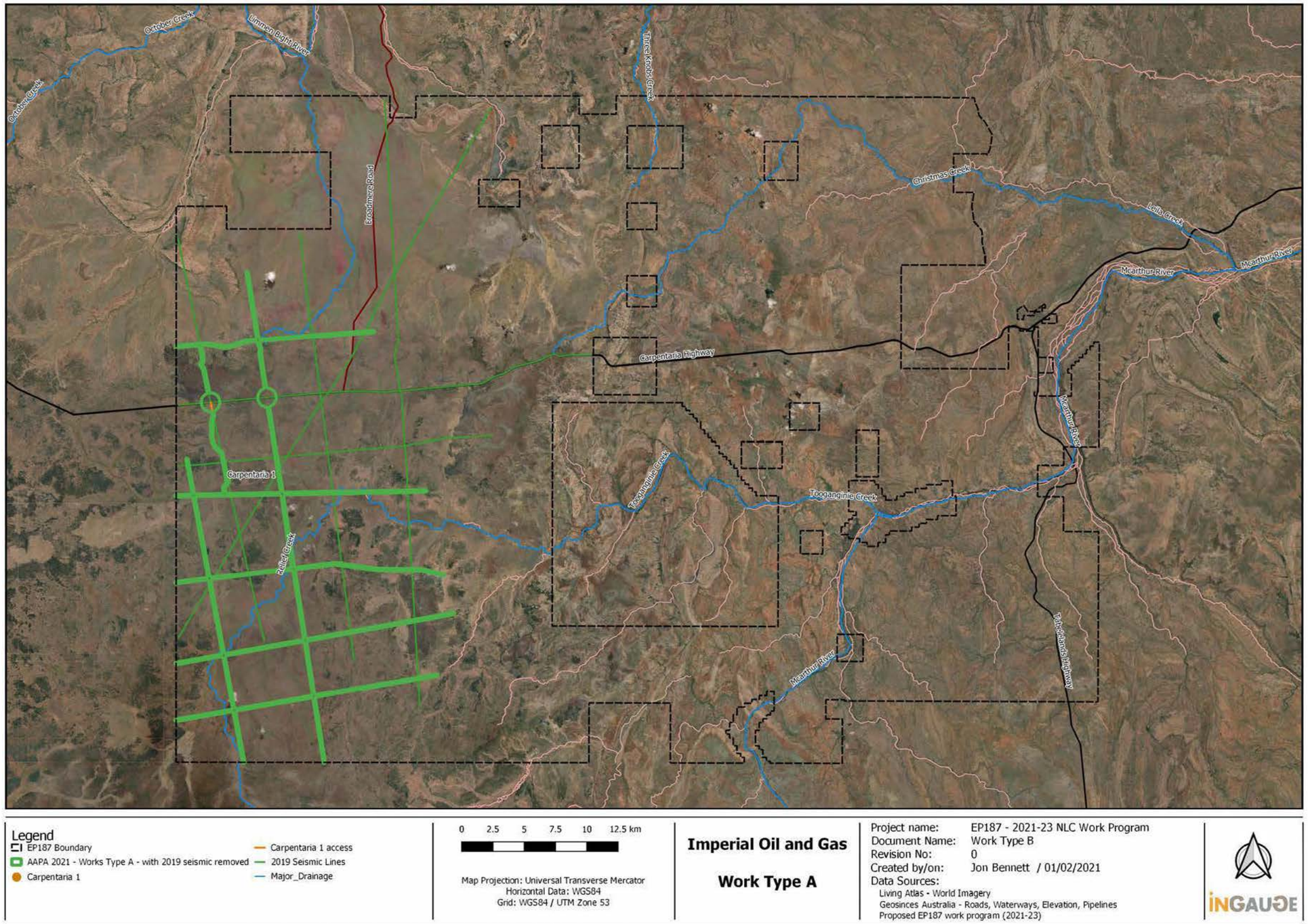


Figure 3.4: Location of regulated activities under this EMP – Land Type A

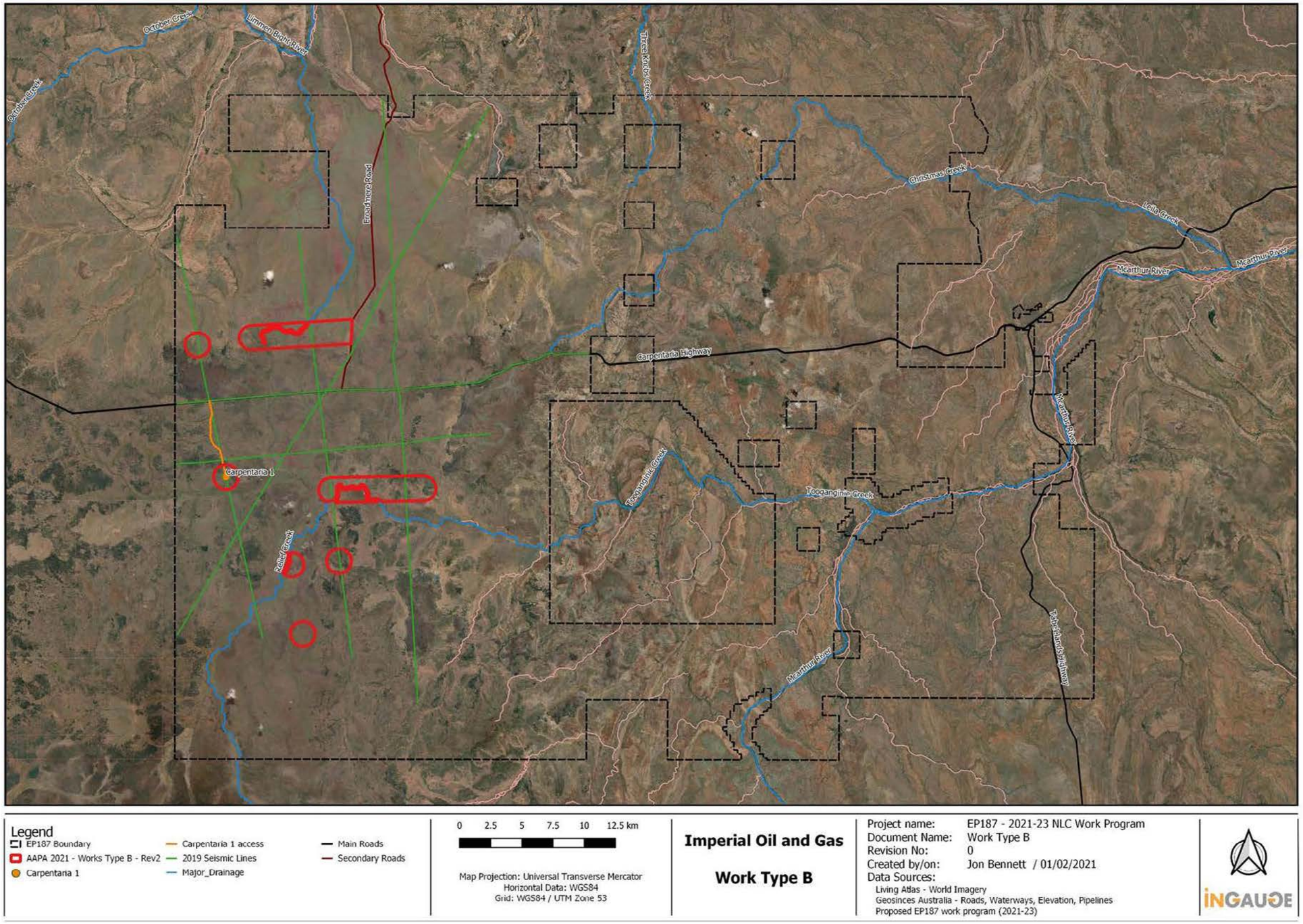


Figure 3.5: Location of regulated activities under this EMP – Land Type B

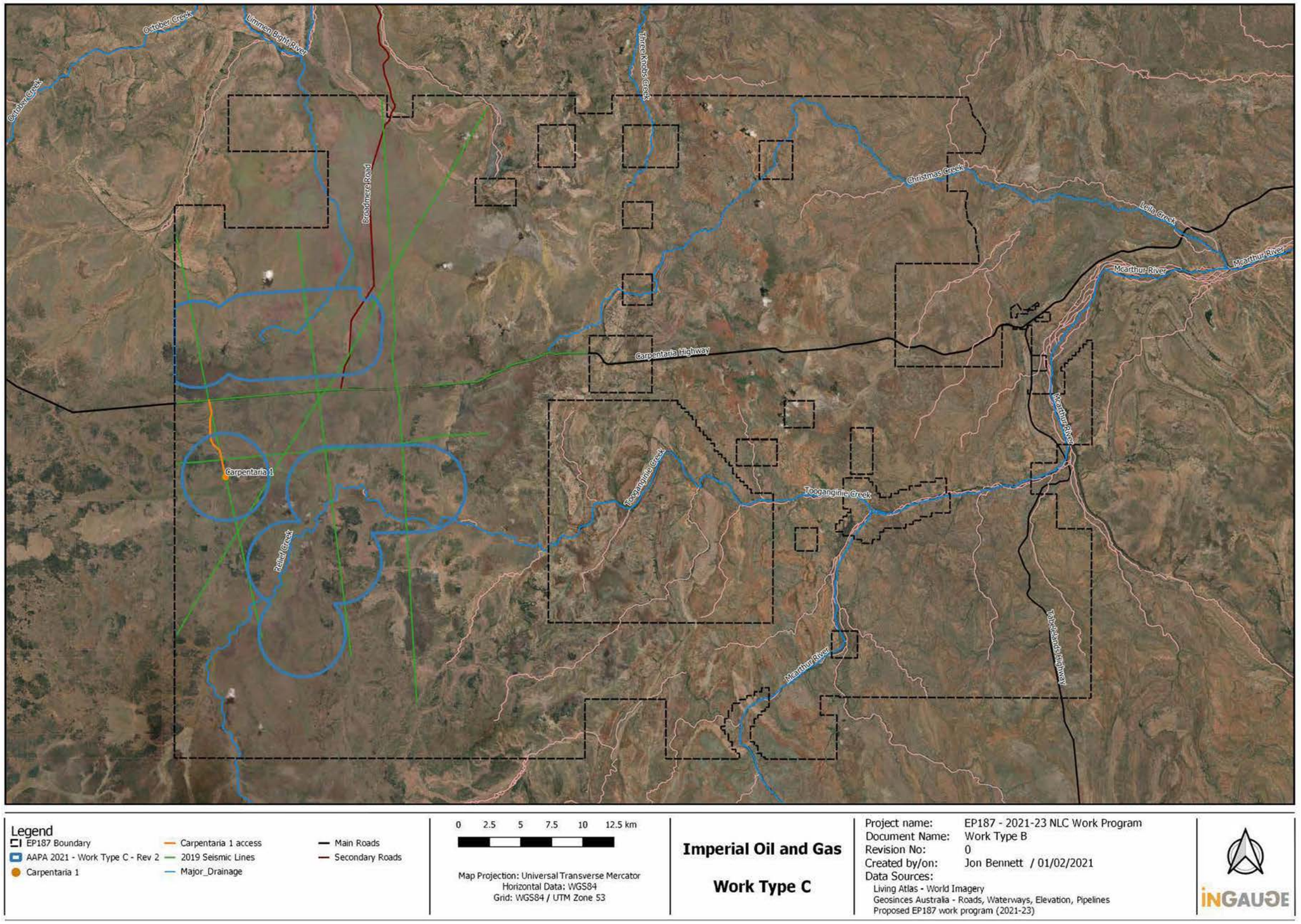


Figure 3.6: Location of regulated activities under this EMP – Land Type C

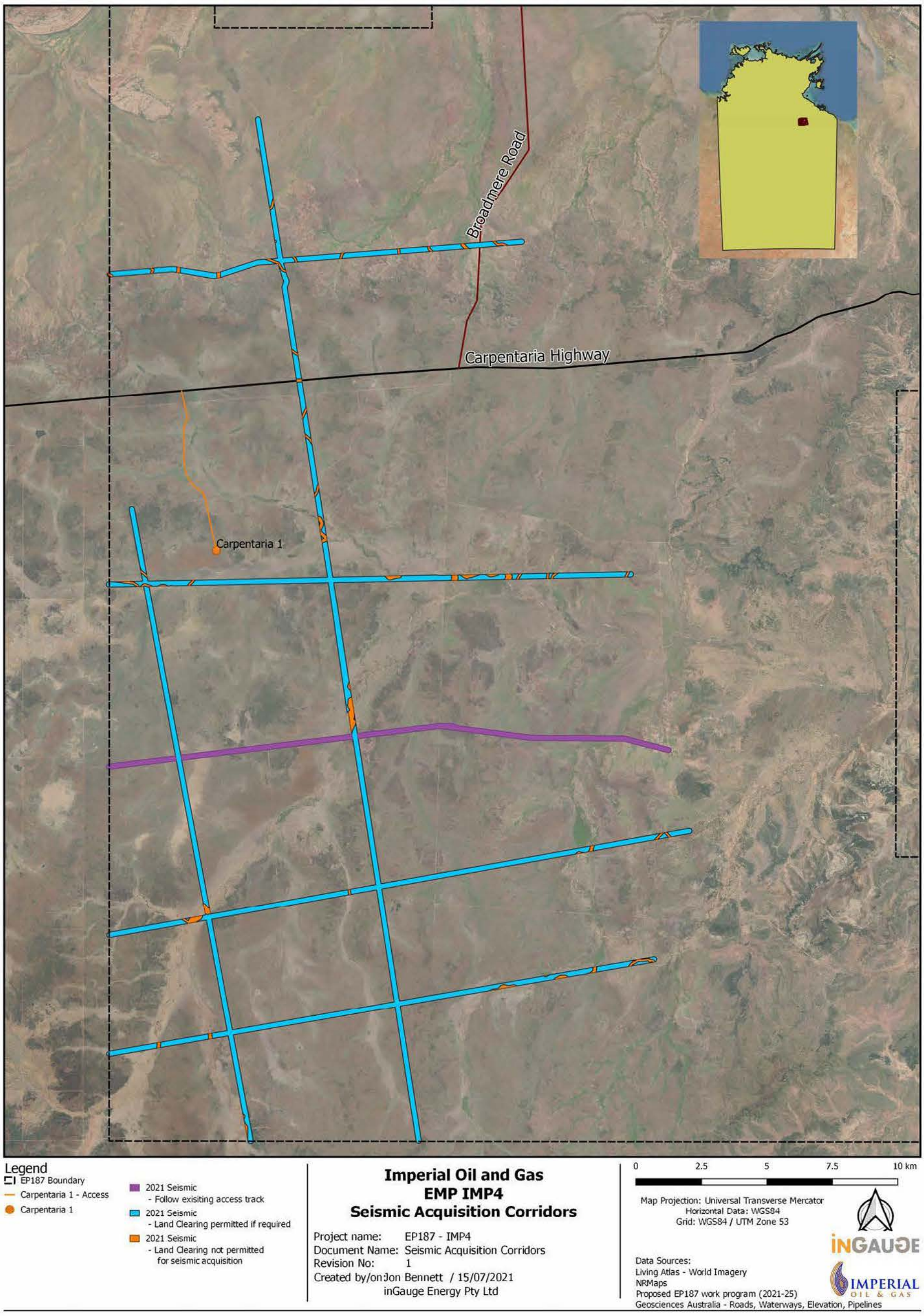


Figure 3.7: Location of regulated activities under this EMP – Proposed Seismic

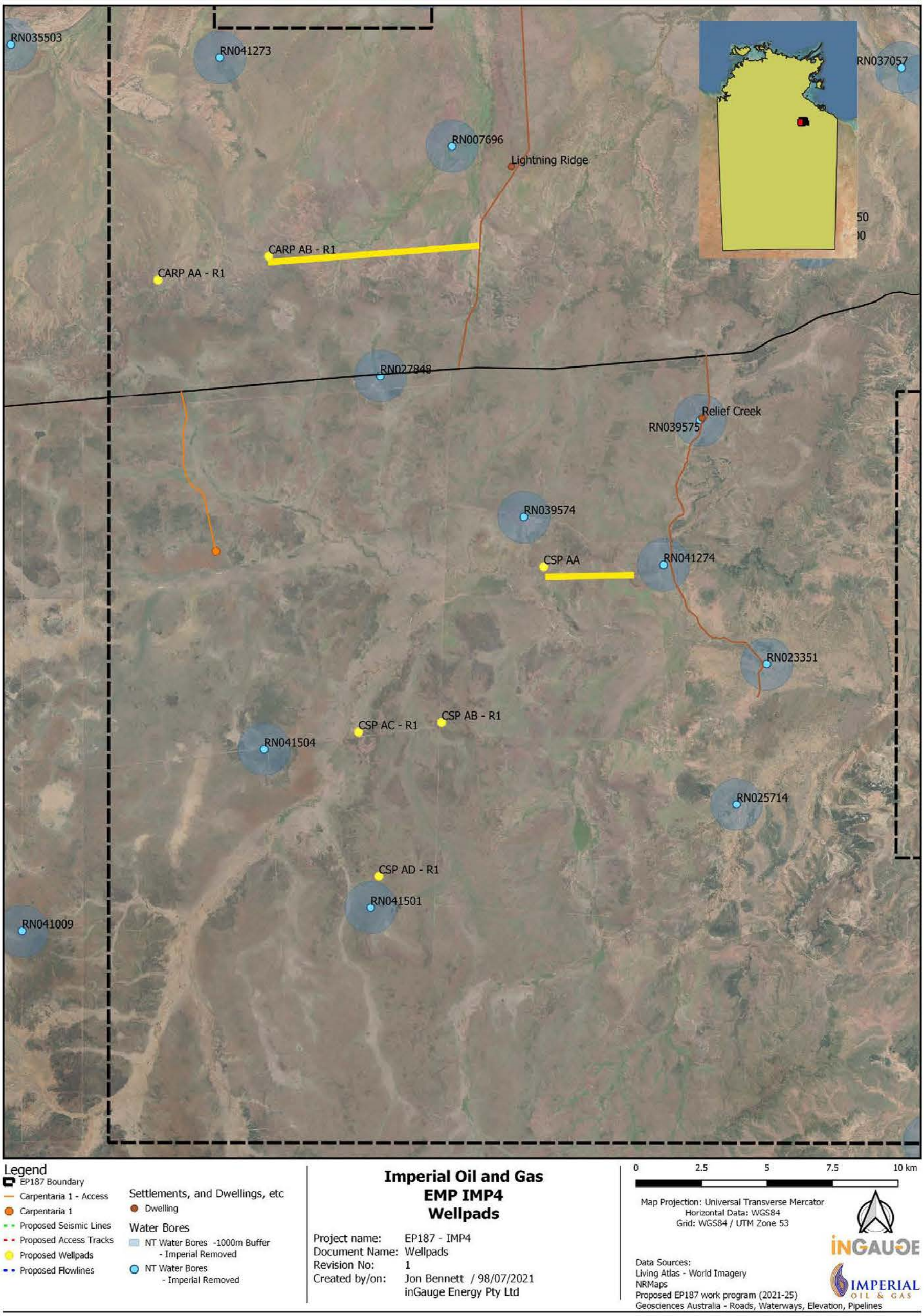


Figure 3.8: Location of regulated activities under this EMP – Proposed Wellpads

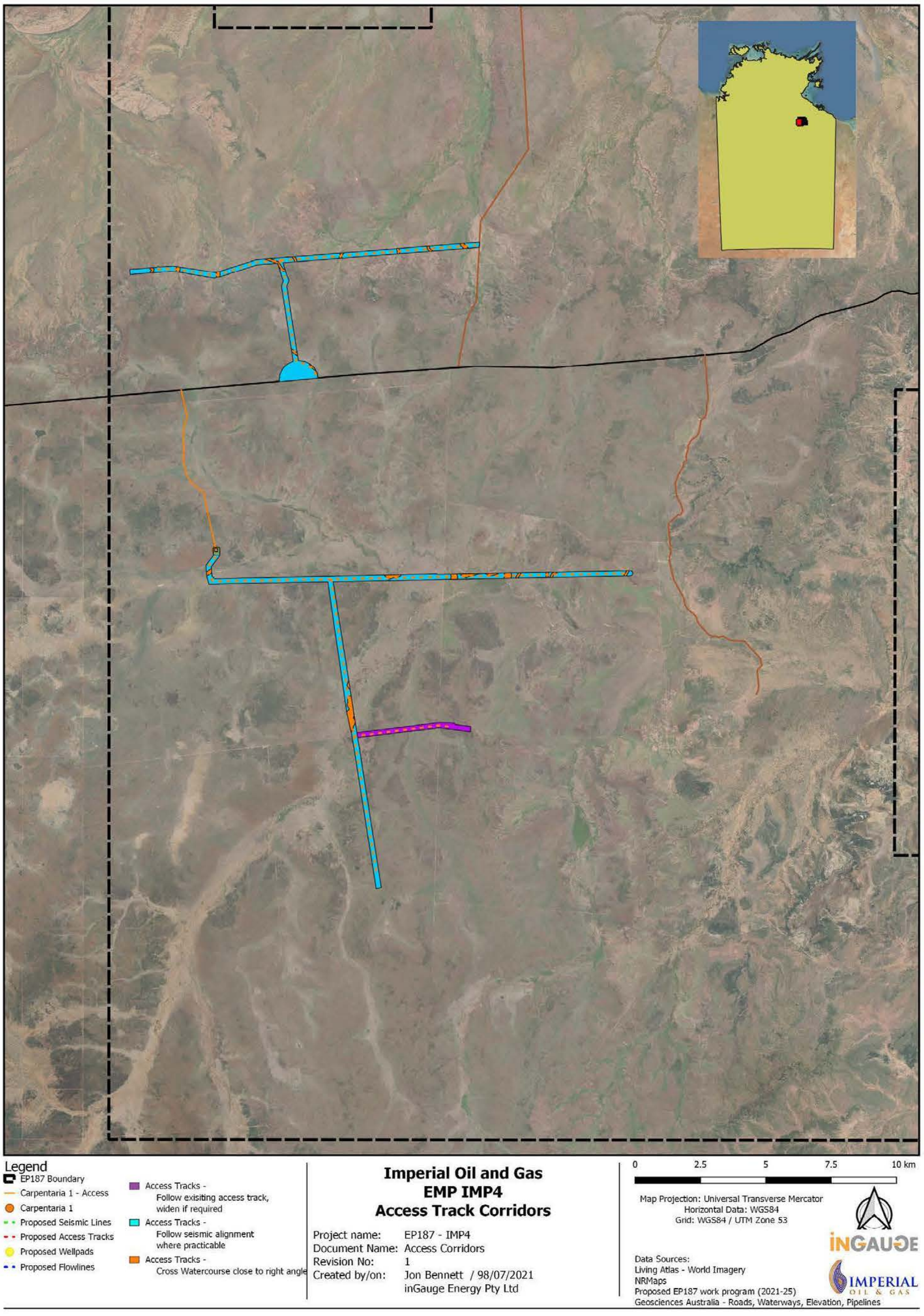


Figure 3.9: Location of regulated activities under this EMP – Proposed Access Tracks

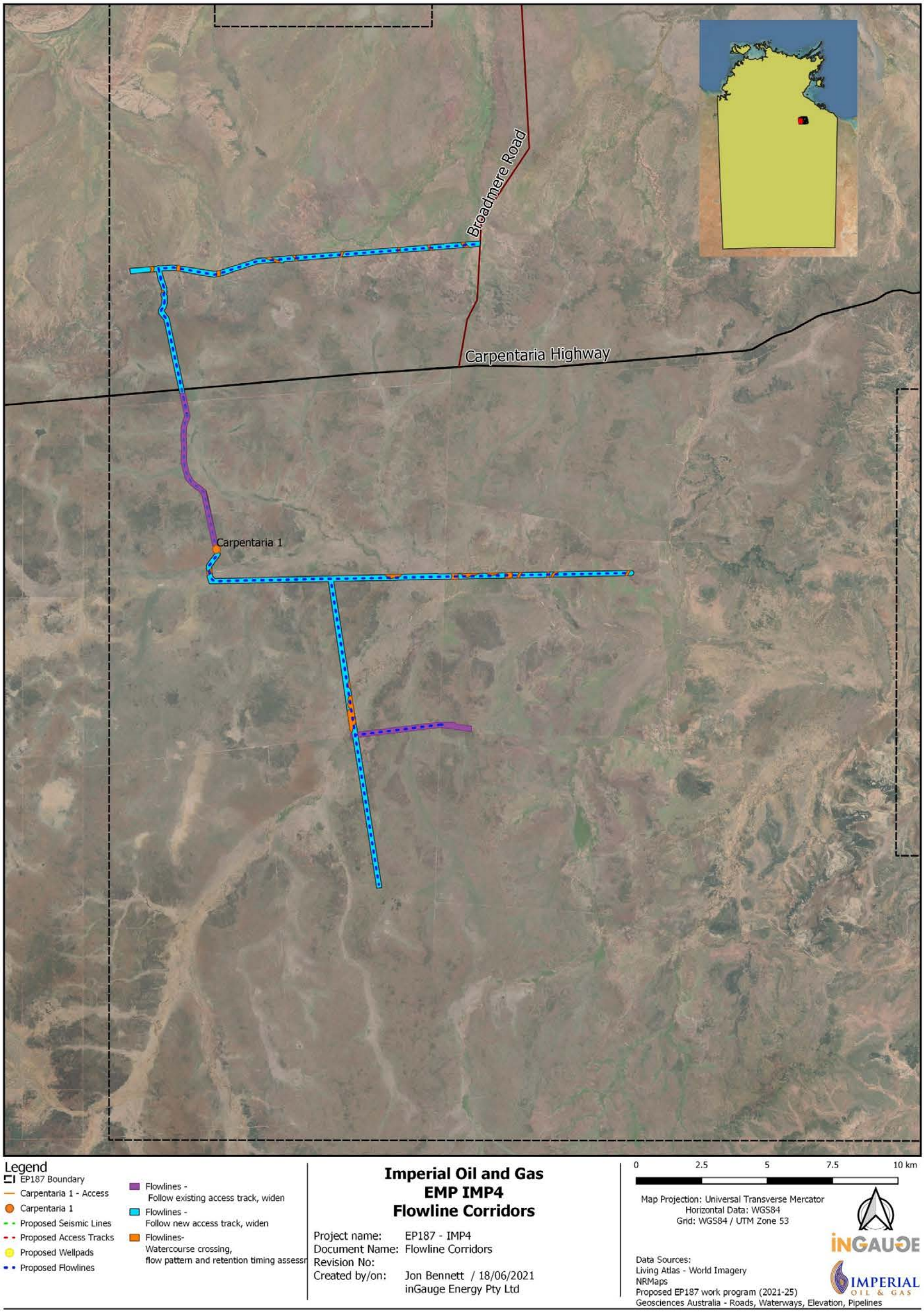


Figure 3.10: Location of regulated activities under this EMP – Proposed Flowlines

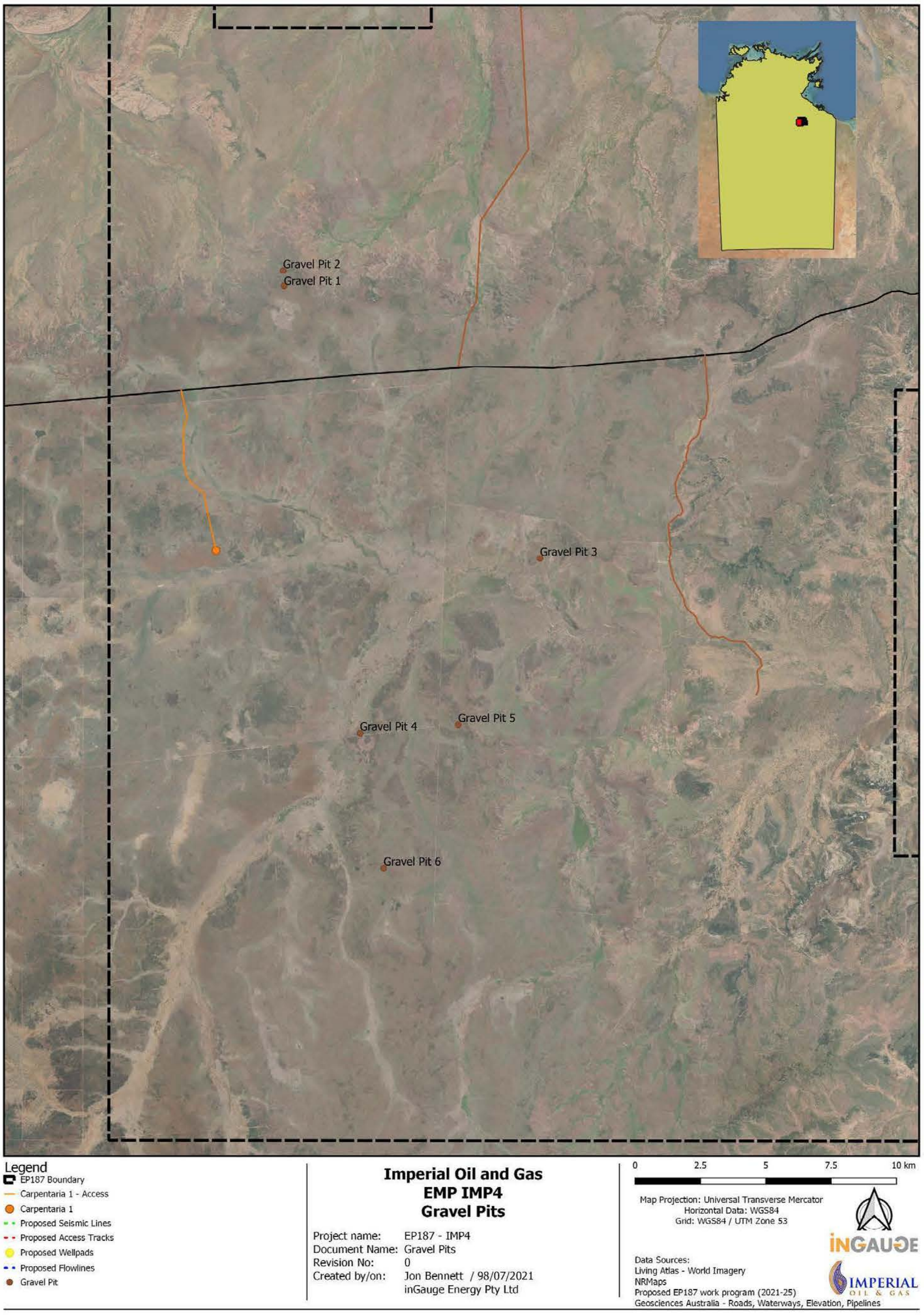


Figure E3.11: Location of regulated activities under this EMP – Proposed Gravel Pits

Alignments for seismic acquisition and the construction of linear infrastructure has been aligned to utilise existing disturbances where practical.

3.5.2 Site Selection – Desktop alignments

Imperial has undertaken a desktop assessment of the ability to work within the construction corridors whilst minimising the impact, the methodology for this desktop assessment is as follows;

- Stream order mapping from NR Maps was visually aligned with watercourses visible on the latest available satellite imagery.
    - Where Imperial's planned works run parallel with a watercourse, the alignment was placed to the side of the watercourse closest to the planned works, as shown in Figure 3.12
    - Where Imperial's planned works cross a watercourse, the alignment was placed in the centre of the watercourse
- These realigned stream orders were buffer in line with the land clearing guideline buffer distances
    - 20m was added to the required buffer distance to give a conservative desktop assessment and allow for the fact that buffers are measured from the edge of the riparian zone rather than watercourse centrelines
- An indicative working route was desk topped for each location where seismic acquisition lines or linear infrastructure is planned to cross or be close to a watercourse; the results for these desktop work routes are shown in Figure 3.13 through Figure 3.42, inclusive.

Figure 3.12: Desktop alignment of watercourse closest to planned works

Figure 3.13 through Figure 3.42, inclusive, are indicative work routes only; when viewing these figures, the following must be noted;

- All figures have extra 20 m added to buffers specified in Land Clearing Guidelines as a precaution until such time riparian zones are ground-truthed.
- Ground-truthing of the riparian zones at each location where the seismic line crosses a drainage line or stream will occur before the seismic work is undertaken at those locations.

Where necessary, the seismic line will be realigned to allow buffers following the Land Clearing Guidelines

- These buffers may be expanded, depending on the value of the riparian vegetation, following the Land Clearing Guidelines requirement for a 250 m buffer where there is high-value vegetation
- Seismic line routes will also be realigned to avoid areas identified as having a high density of hollow-bearing trees, as per the requirements of the Land Clearing Guidelines.

Land clearing for the seismic acquisition will not be carried out within the watercourse or GDE buffers. An on-site assessment will be carried out during seismic acquisition operations to locate a point where the seismic acquisition equipment can cross the watercourse without clearing. If a suitable crossing point cannot be found, seismic acquisition equipment will be transported around the watercourse crossing point. Refer to Appendix 1 for minimum width buffer and GDEs value determination.

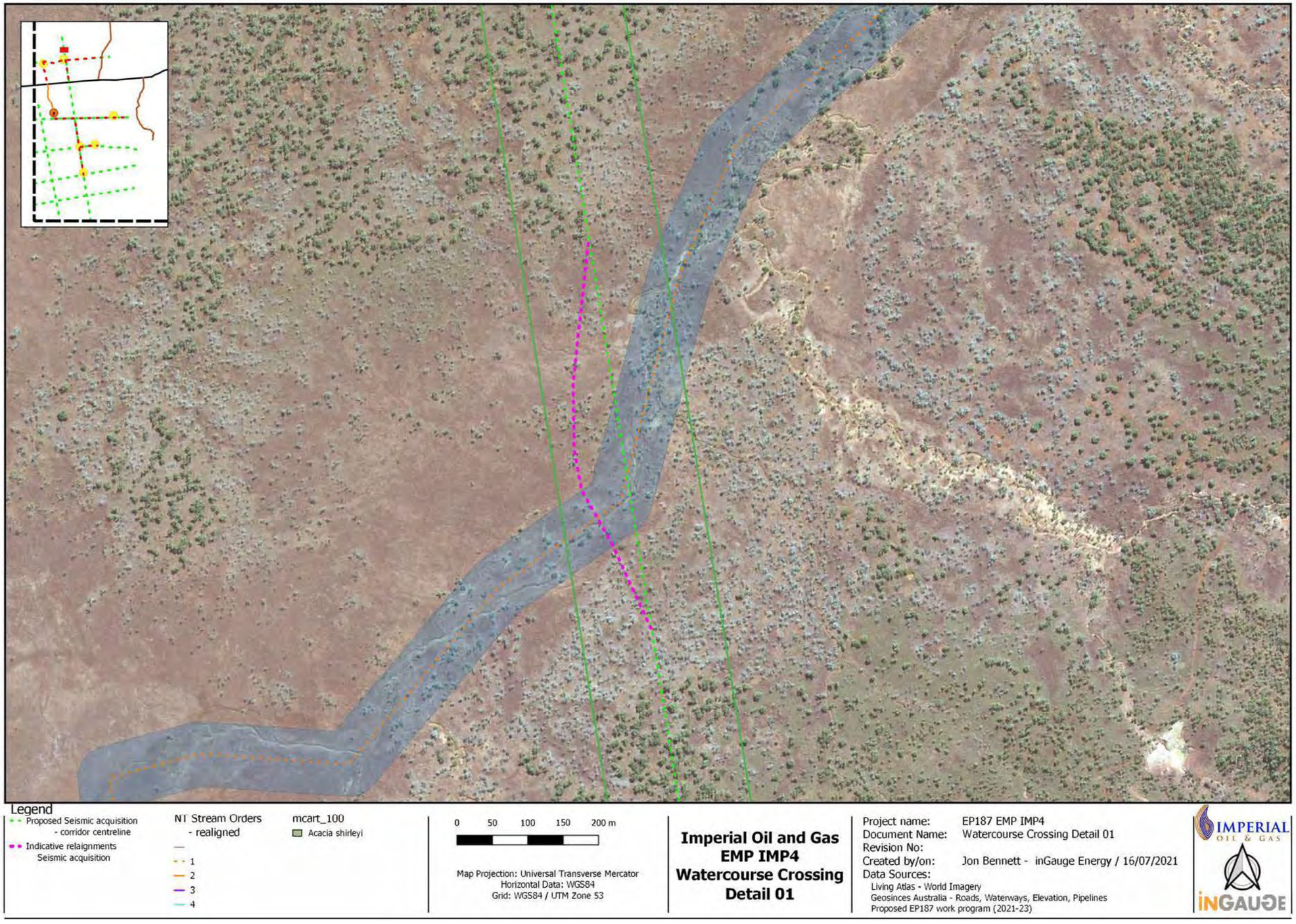


Figure 3.13: Watercourse Crossing Detail 01

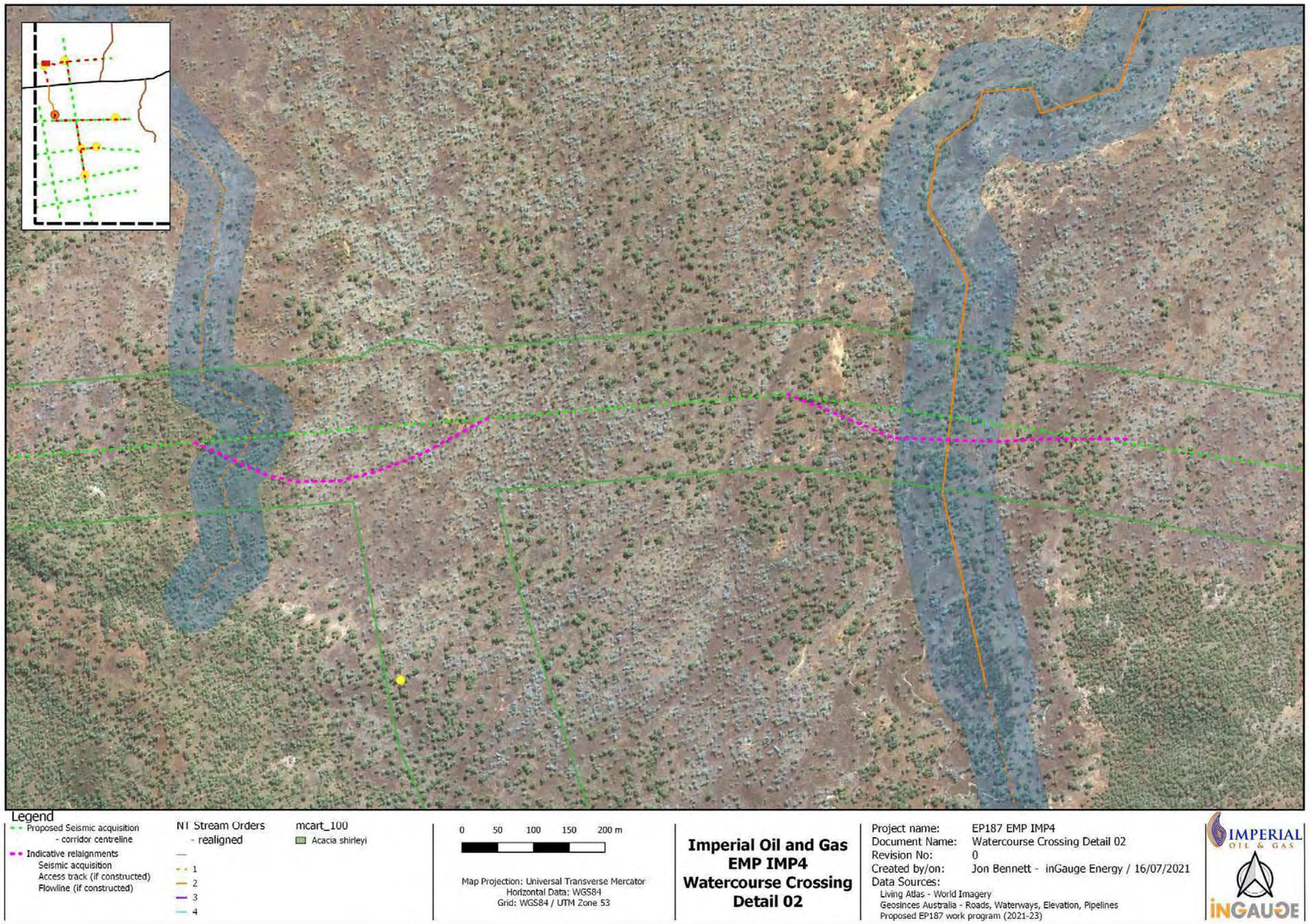


Figure 3.14: Watercourse Crossing Detail 02

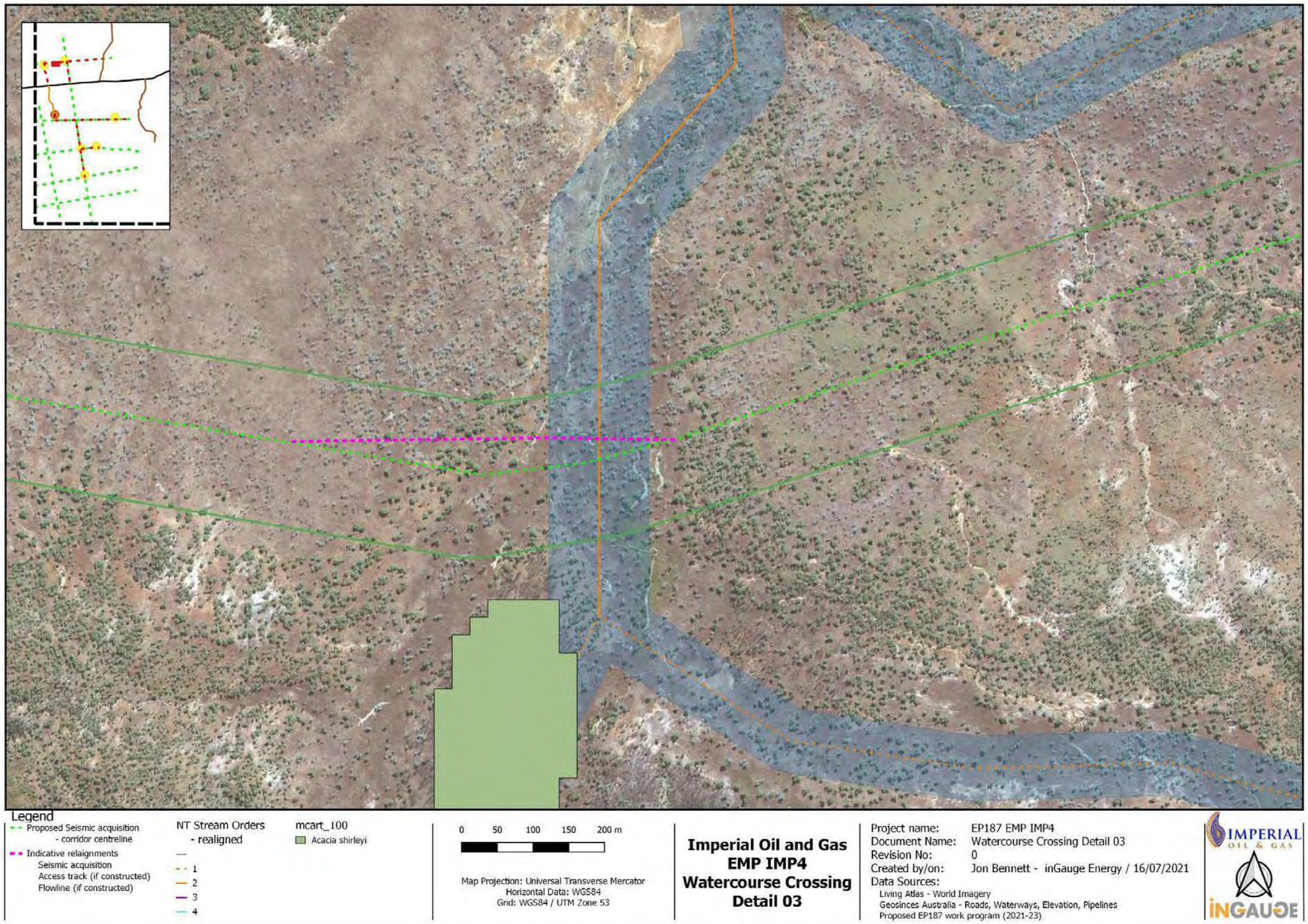


Figure 3.15: Watercourse Crossing Detail 03

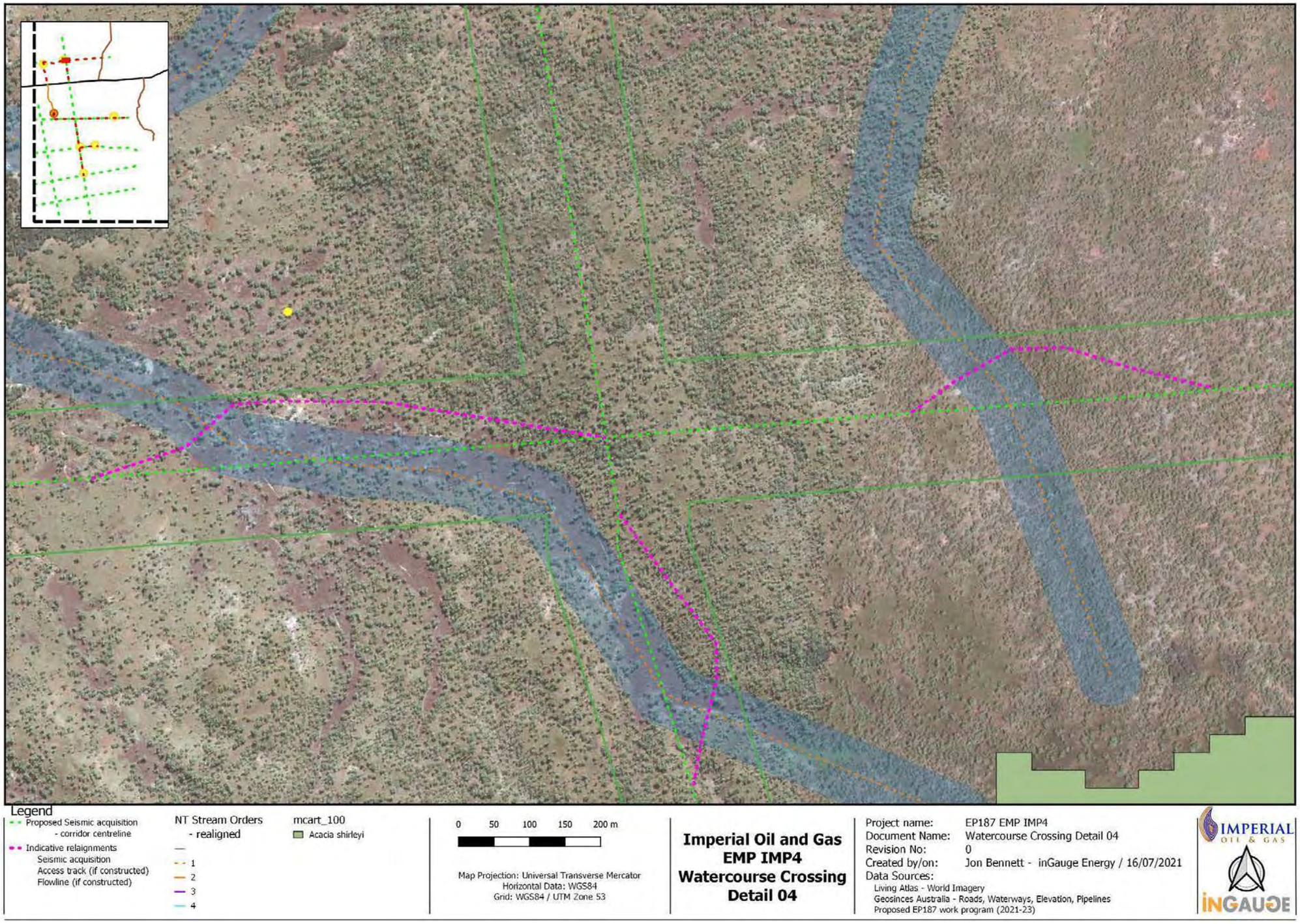


Figure 3.16: Watercourse Crossing Detail 04

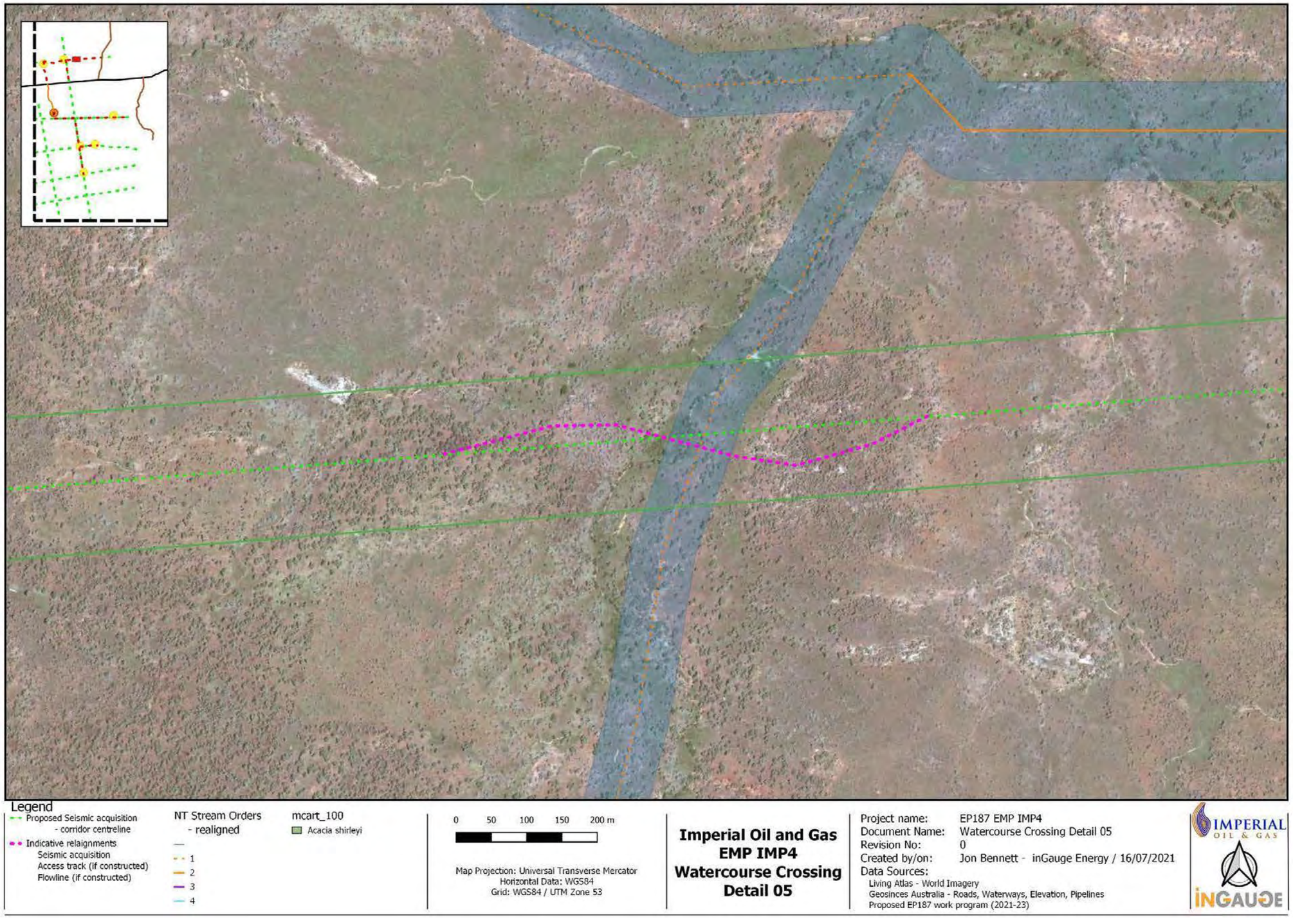


Figure 3.17: Watercourse Crossing Detail 05

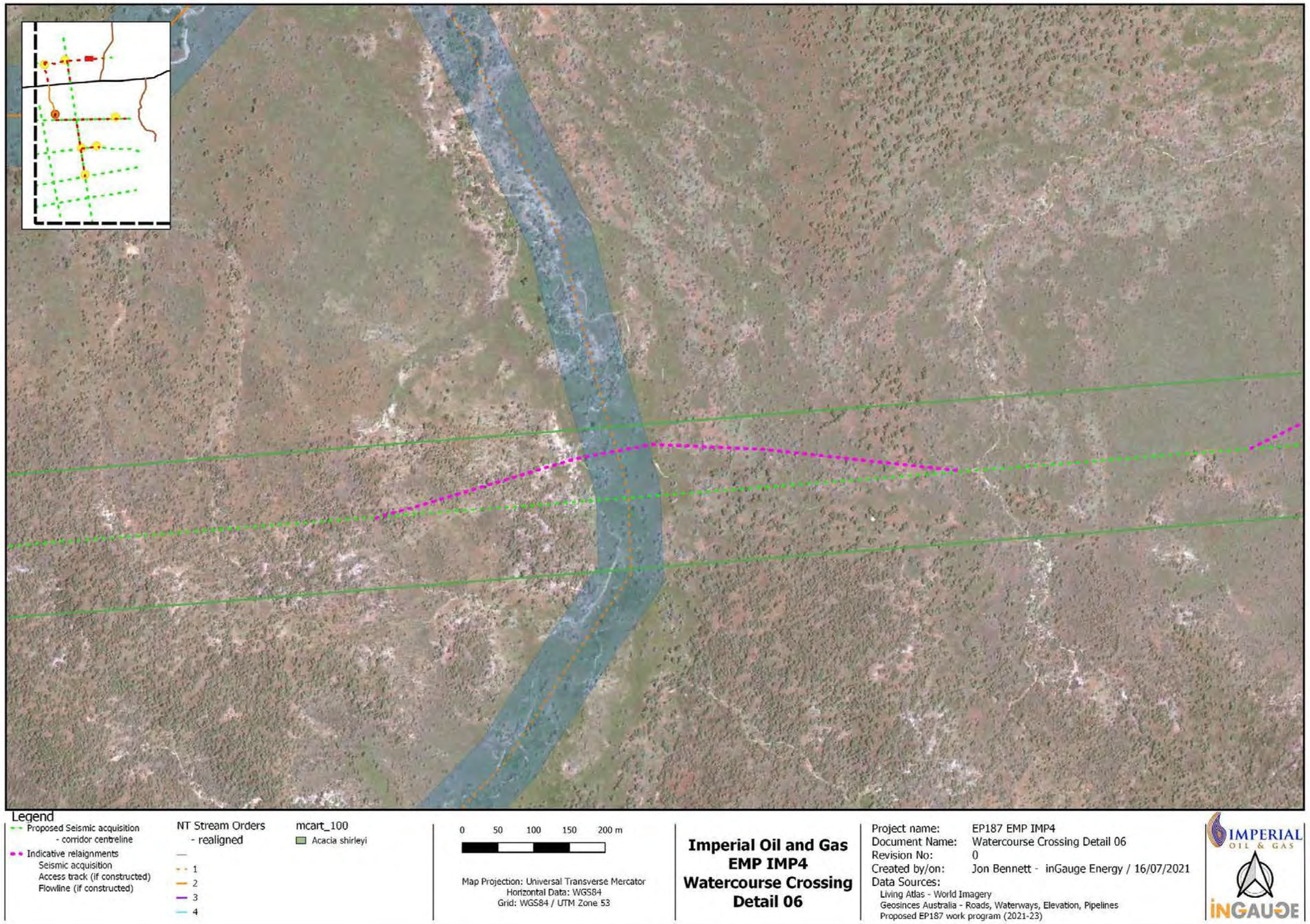


Figure 3.18: Watercourse Crossing Detail 06

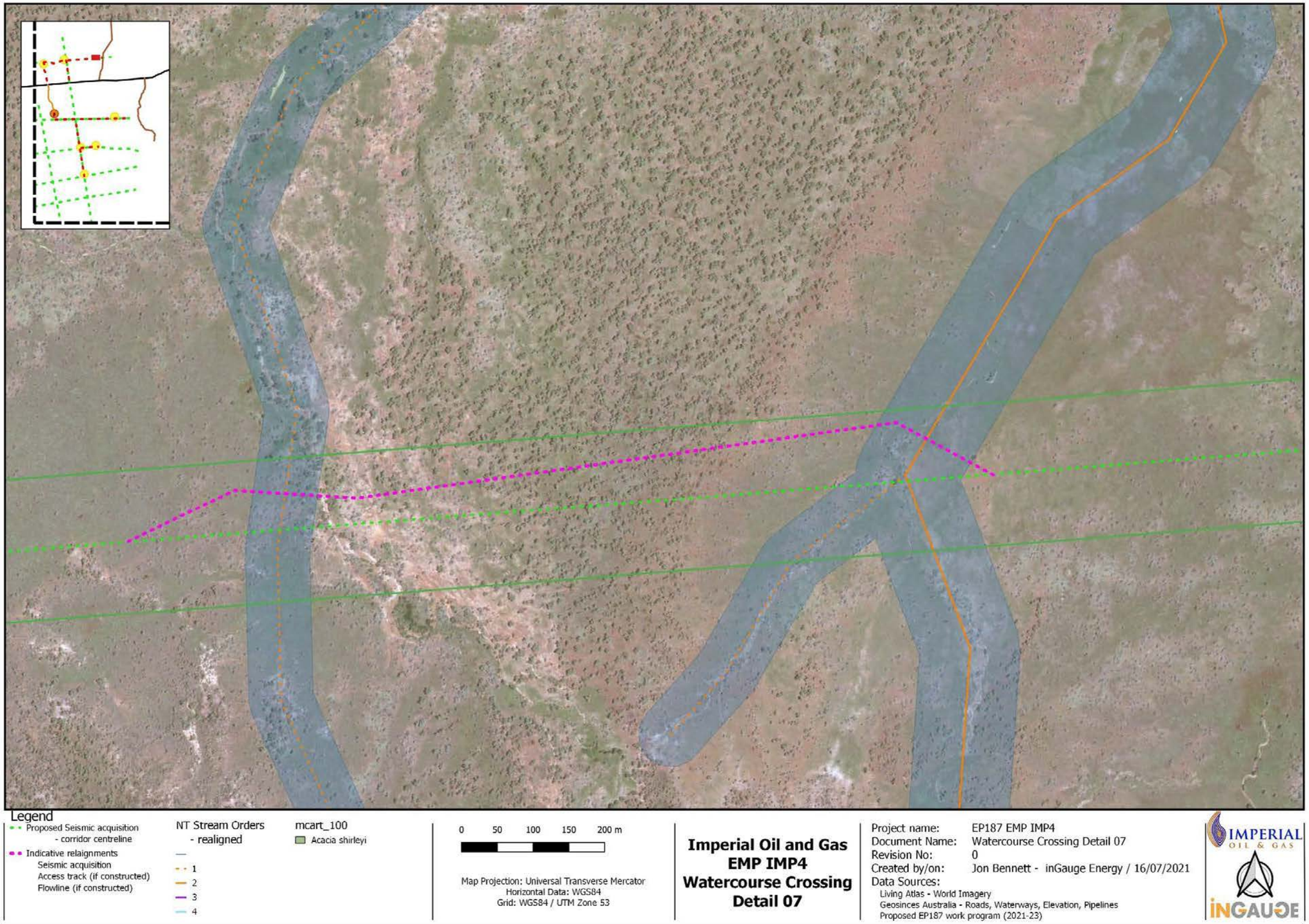


Figure 3.19: Watercourse Crossing Detail 07

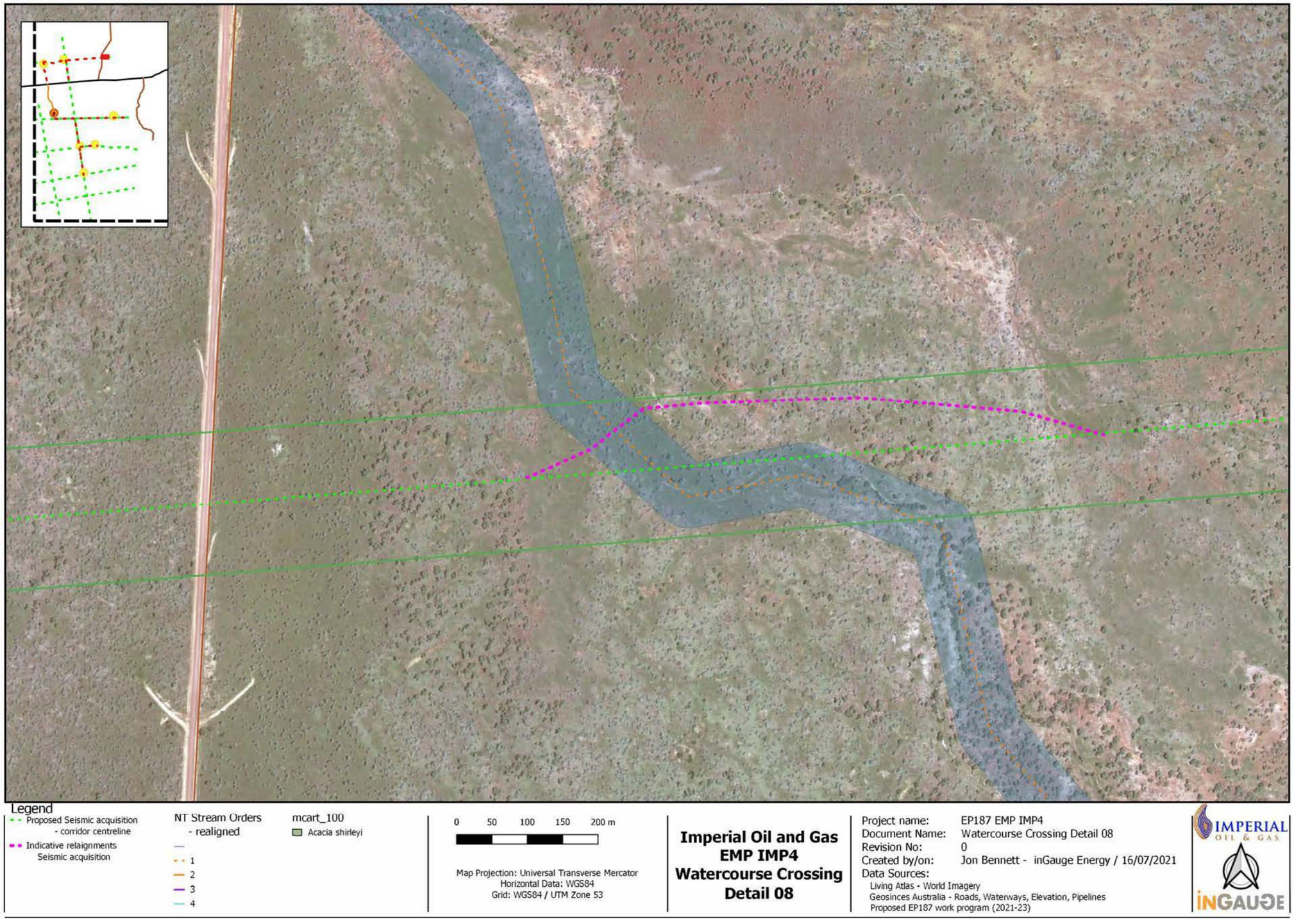


Figure 3.20: Watercourse Crossing Detail 08

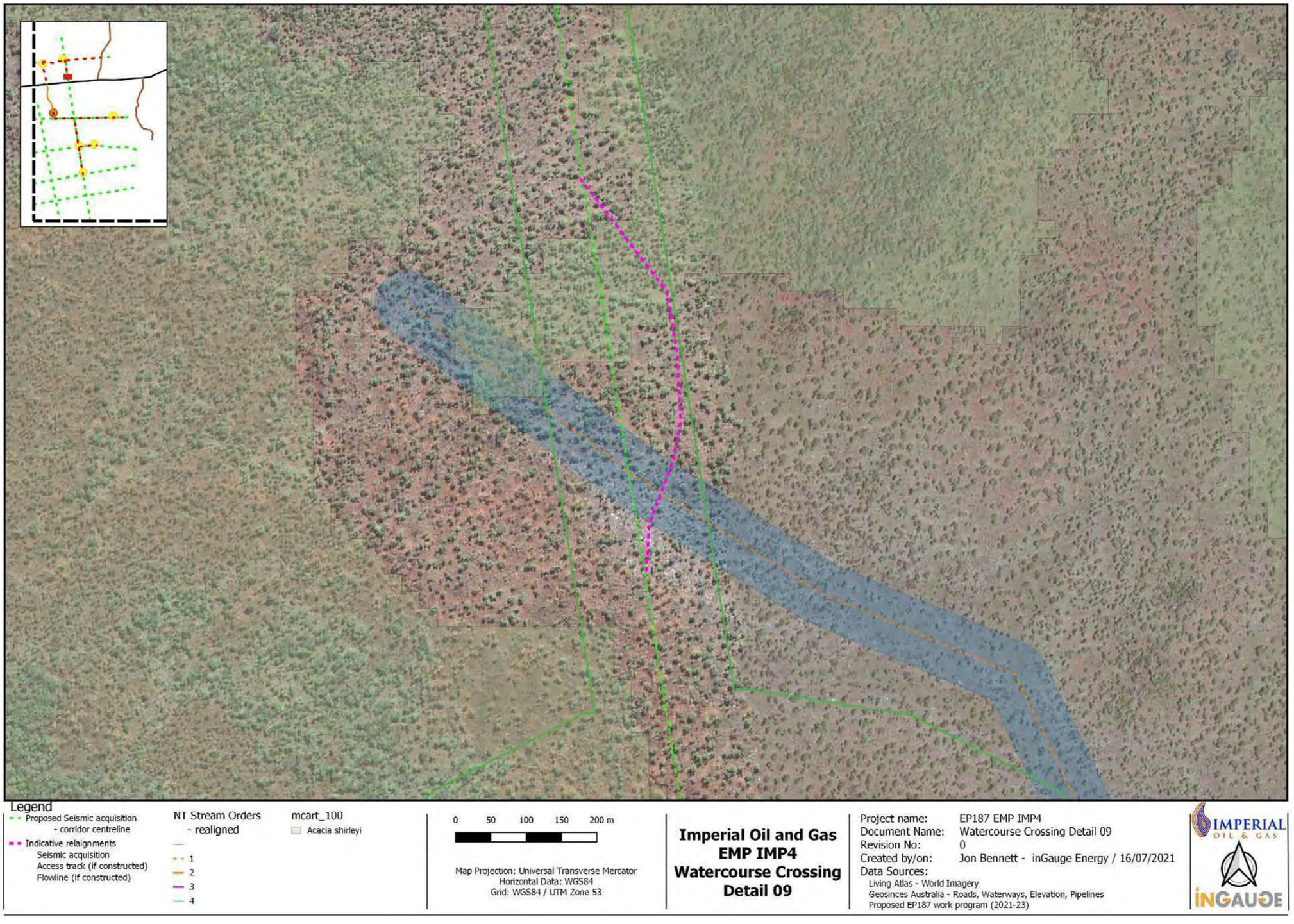


Figure 3.21: Watercourse Crossing Detail 09

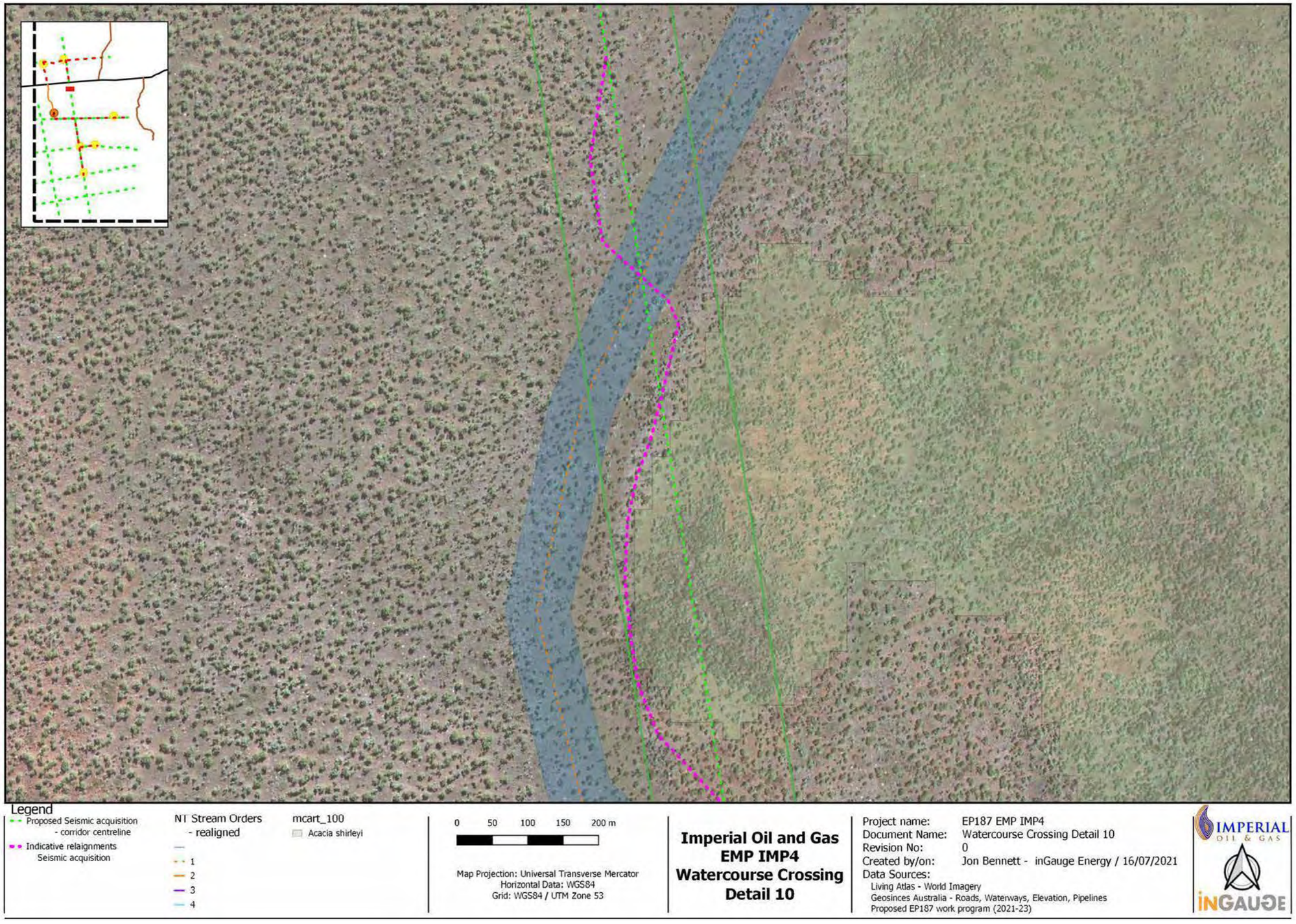


Figure 3.22: Watercourse Crossing Detail 10

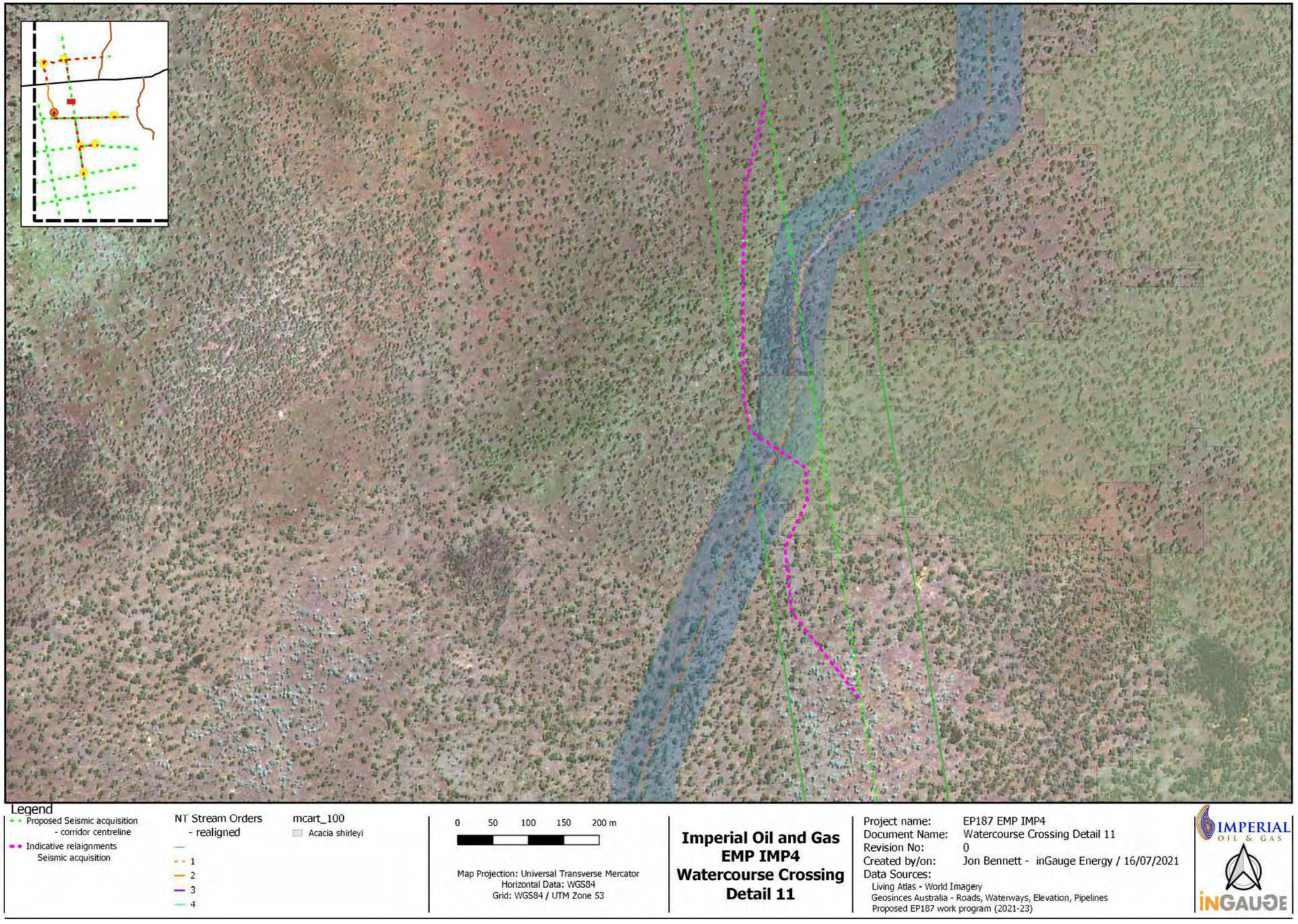


Figure 3.23: Watercourse Crossing Detail 11

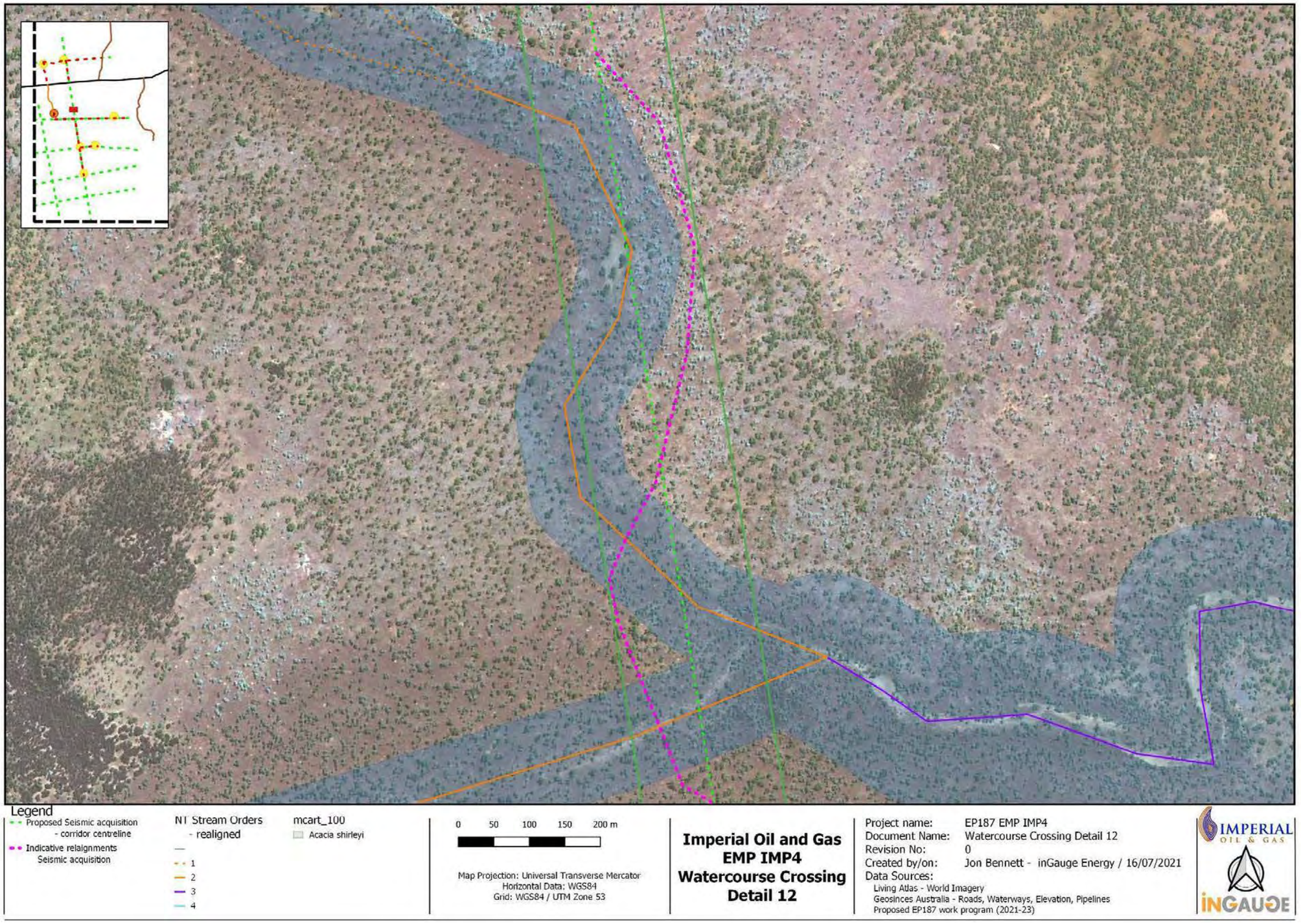


Figure 3.24: Watercourse Crossing Detail 12

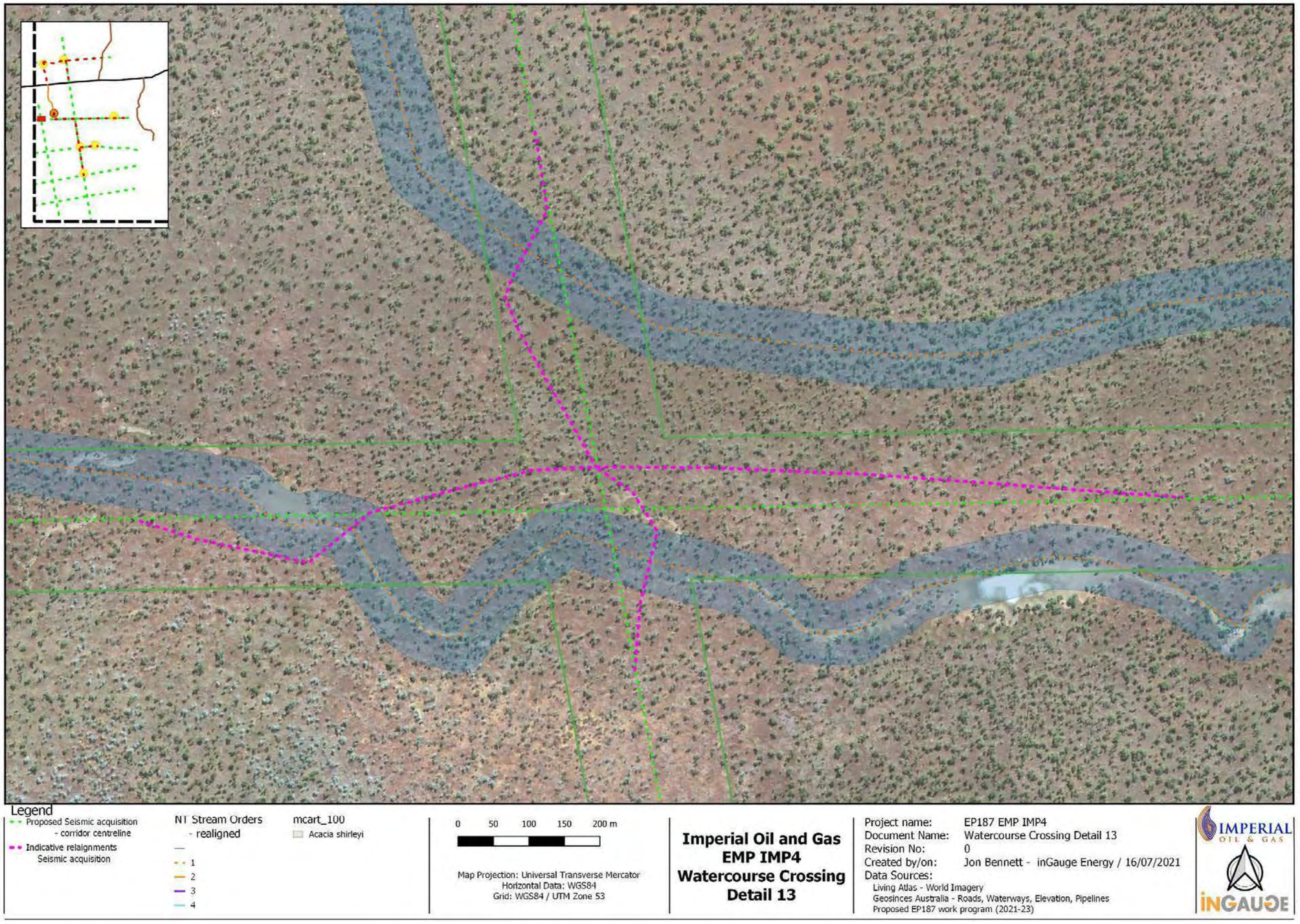


Figure 3.25: Watercourse Crossing Detail 13

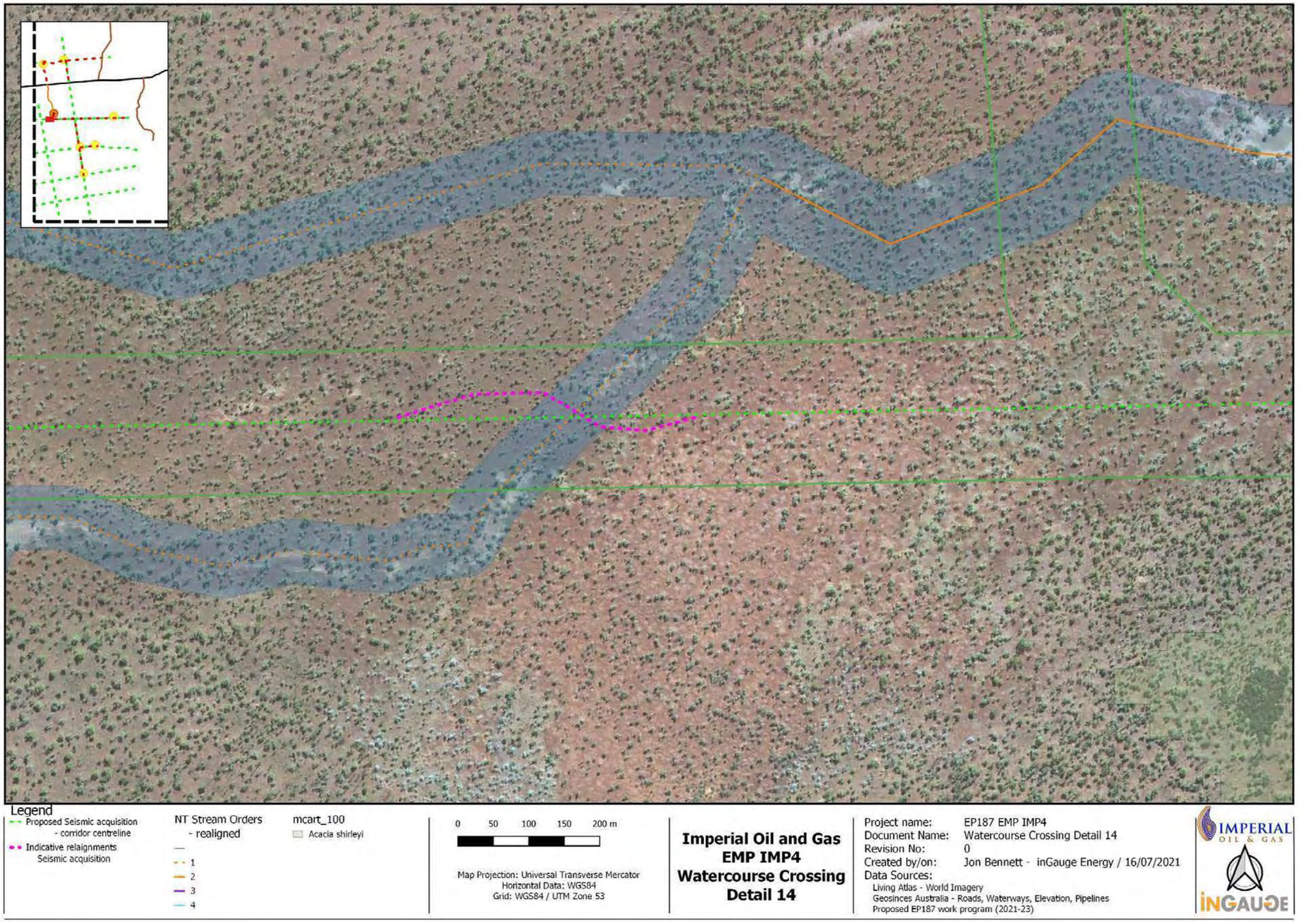


Figure 3.26: Watercourse Crossing Detail 14

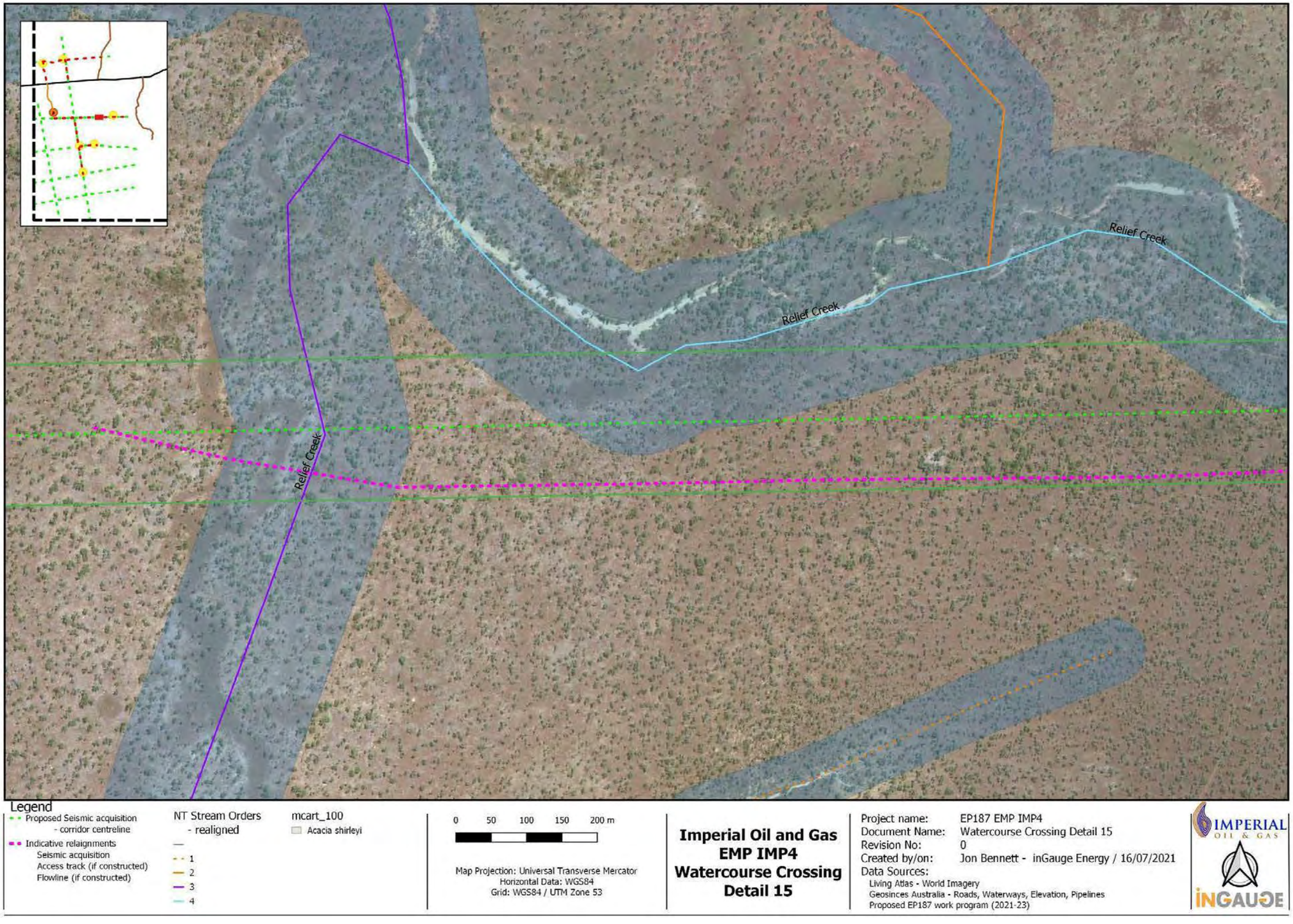


Figure 3.27: Watercourse Crossing Detail 15

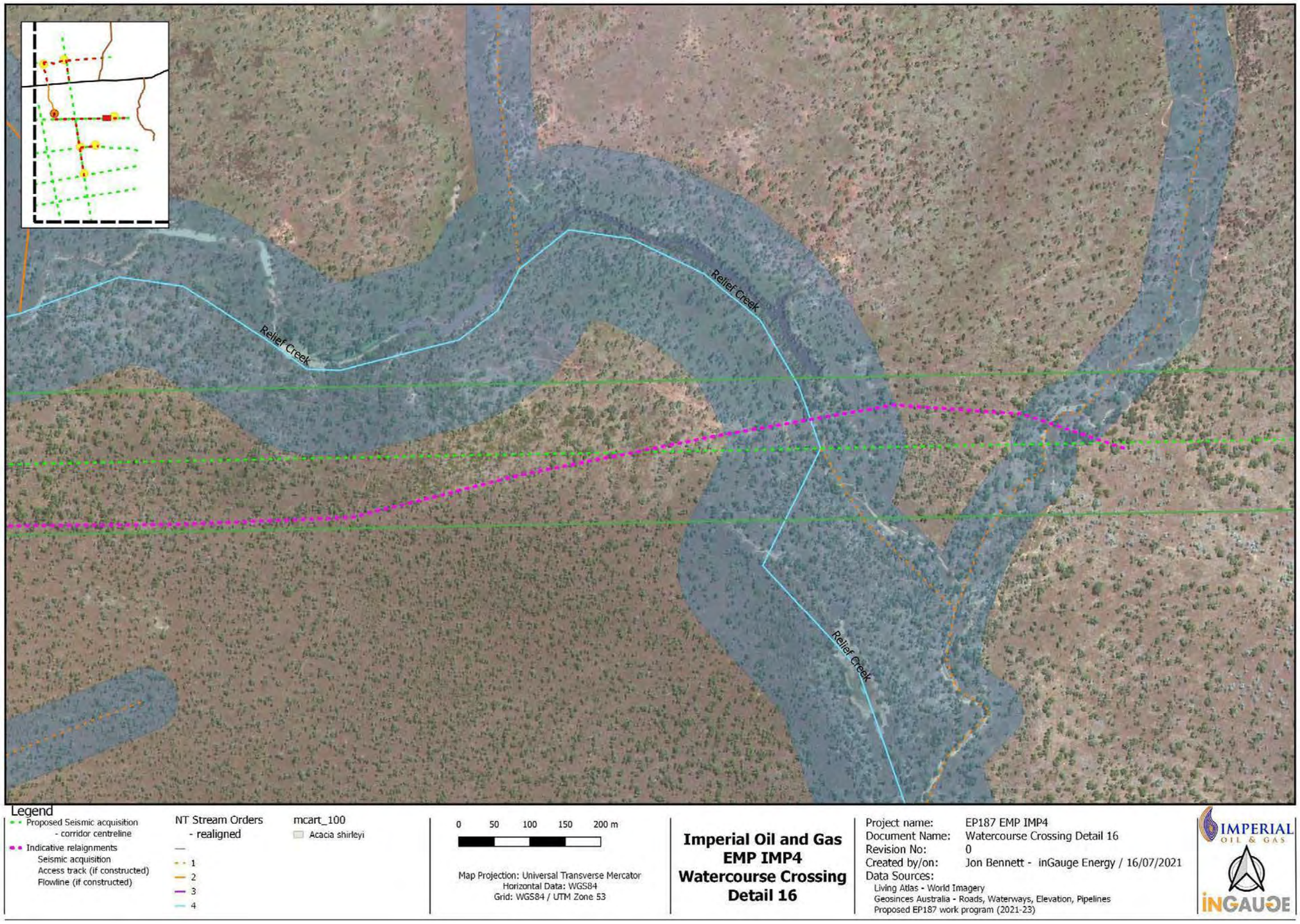


Figure 3.28: Watercourse Crossing Detail 16

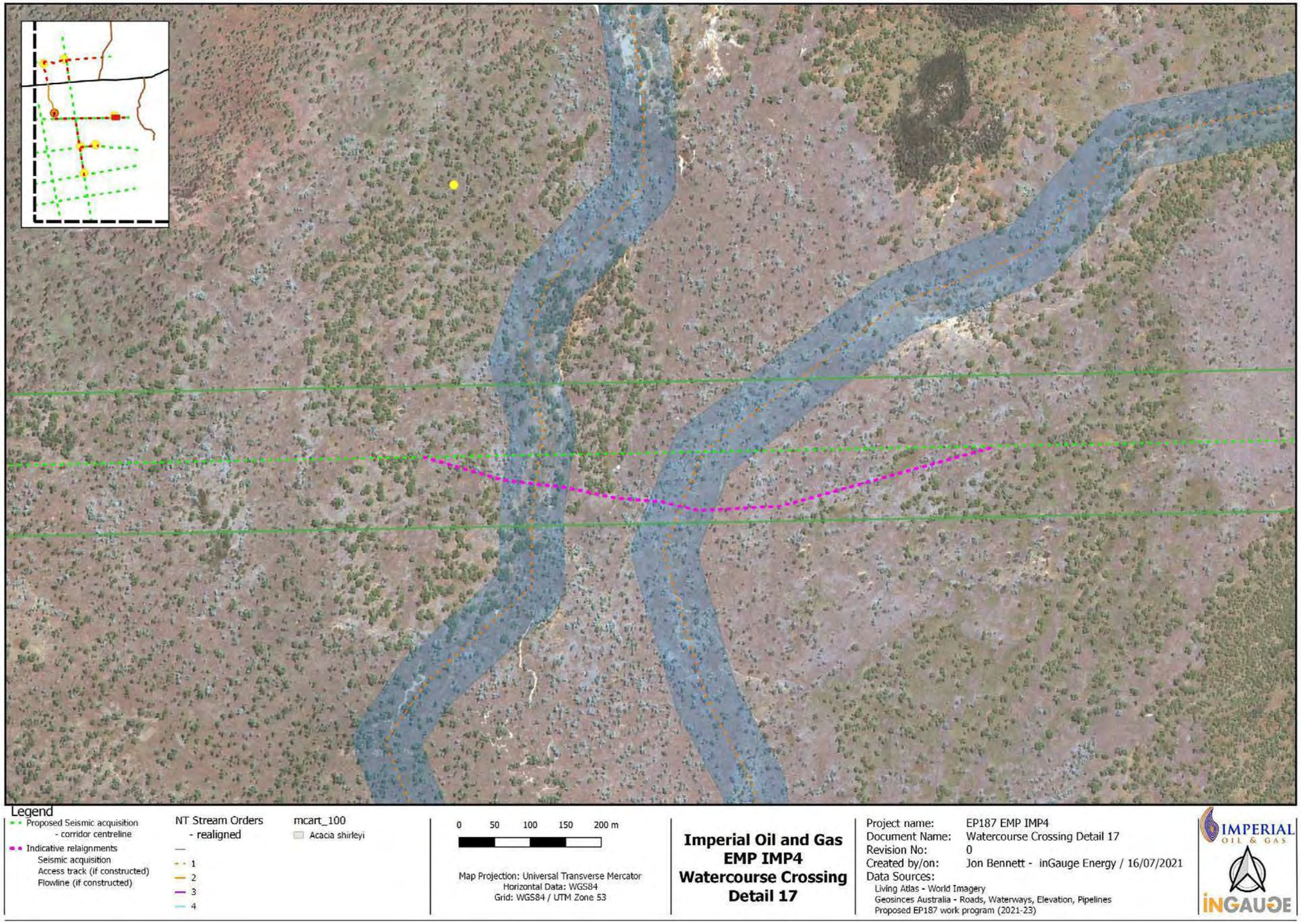


Figure 3.29: Watercourse Crossing Detail 17

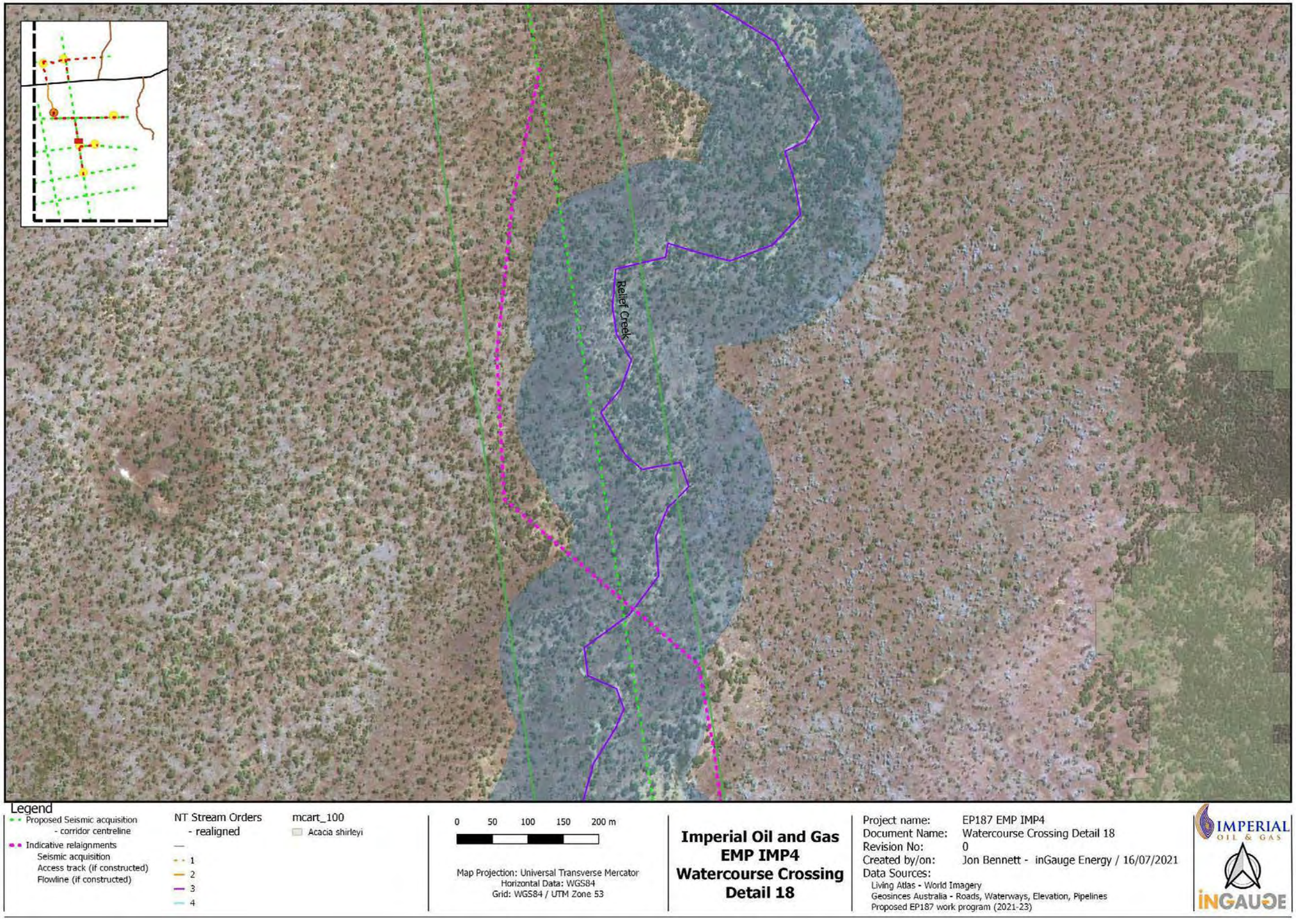


Figure 3.30: Watercourse Crossing Detail 18

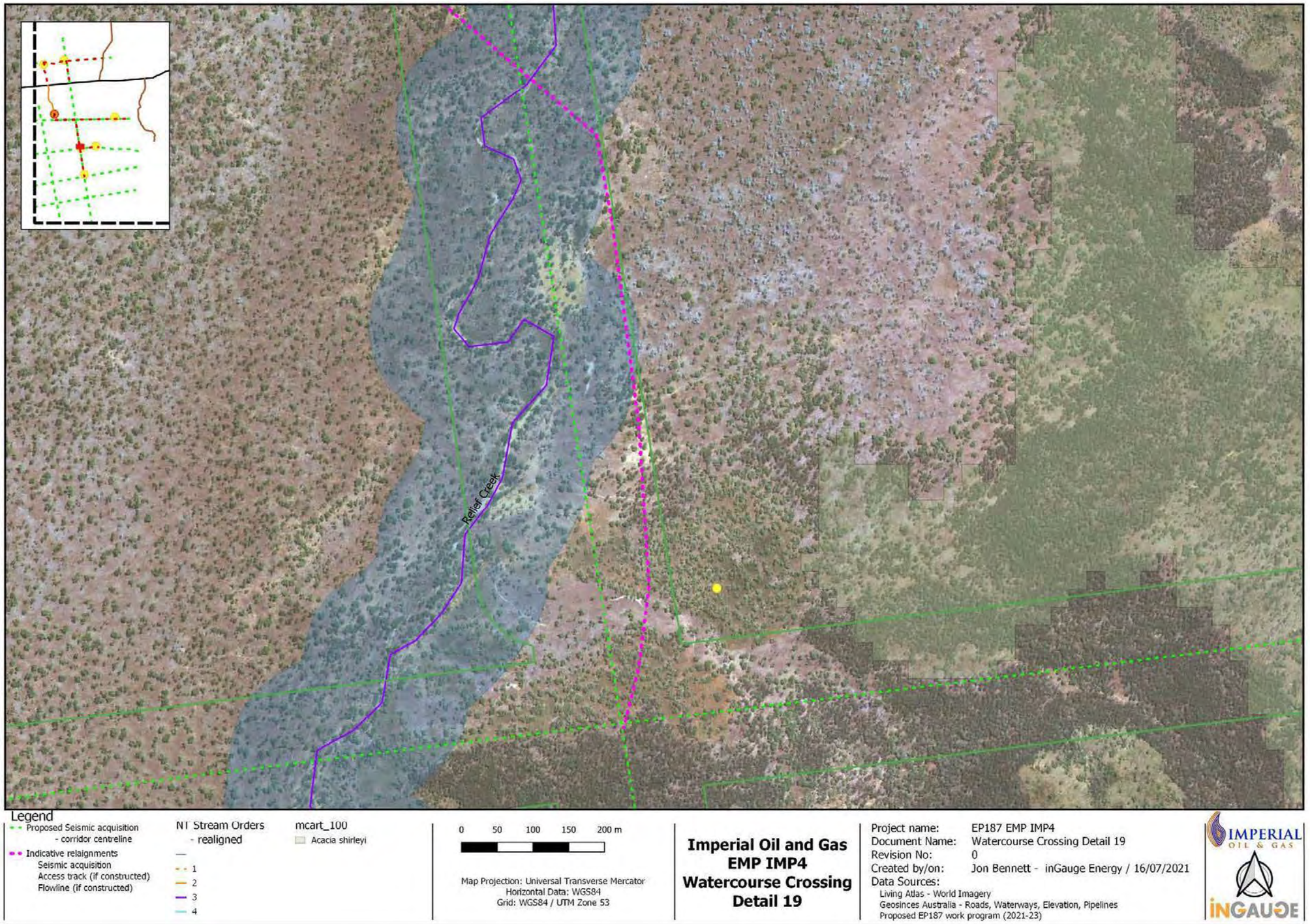


Figure 3.31: Watercourse Crossing Detail 19

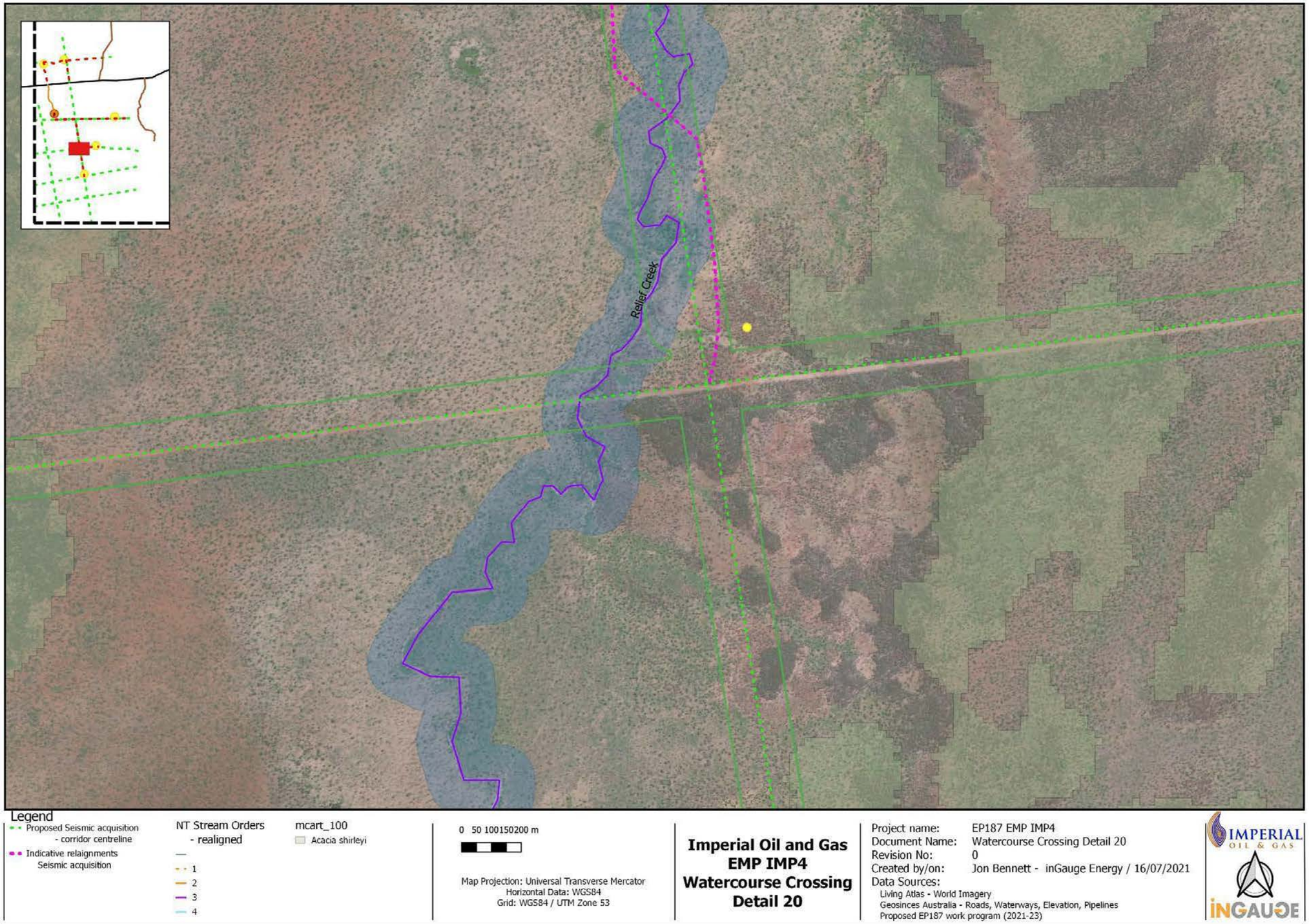
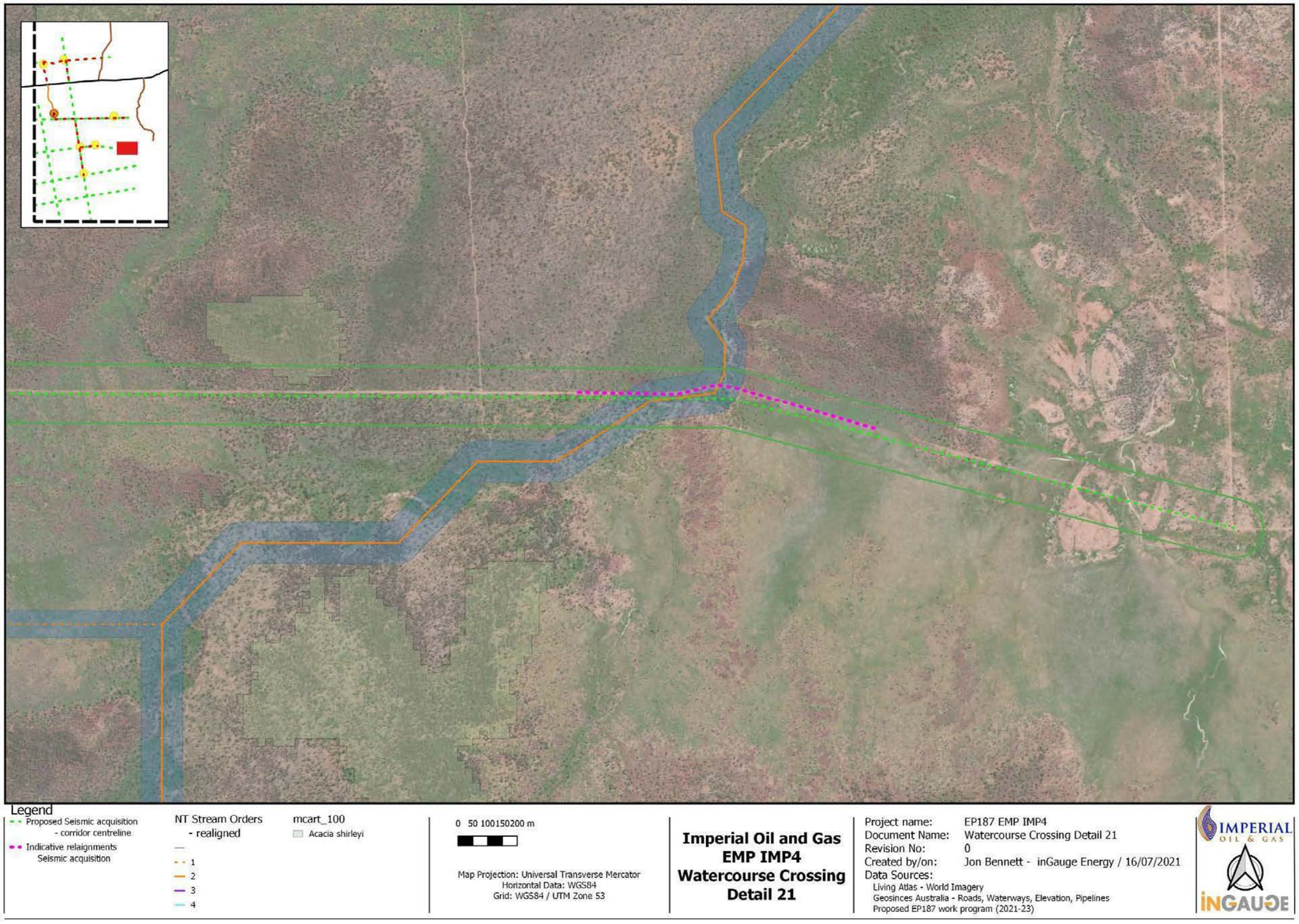


Figure 3.32: Watercourse Crossing Detail 20



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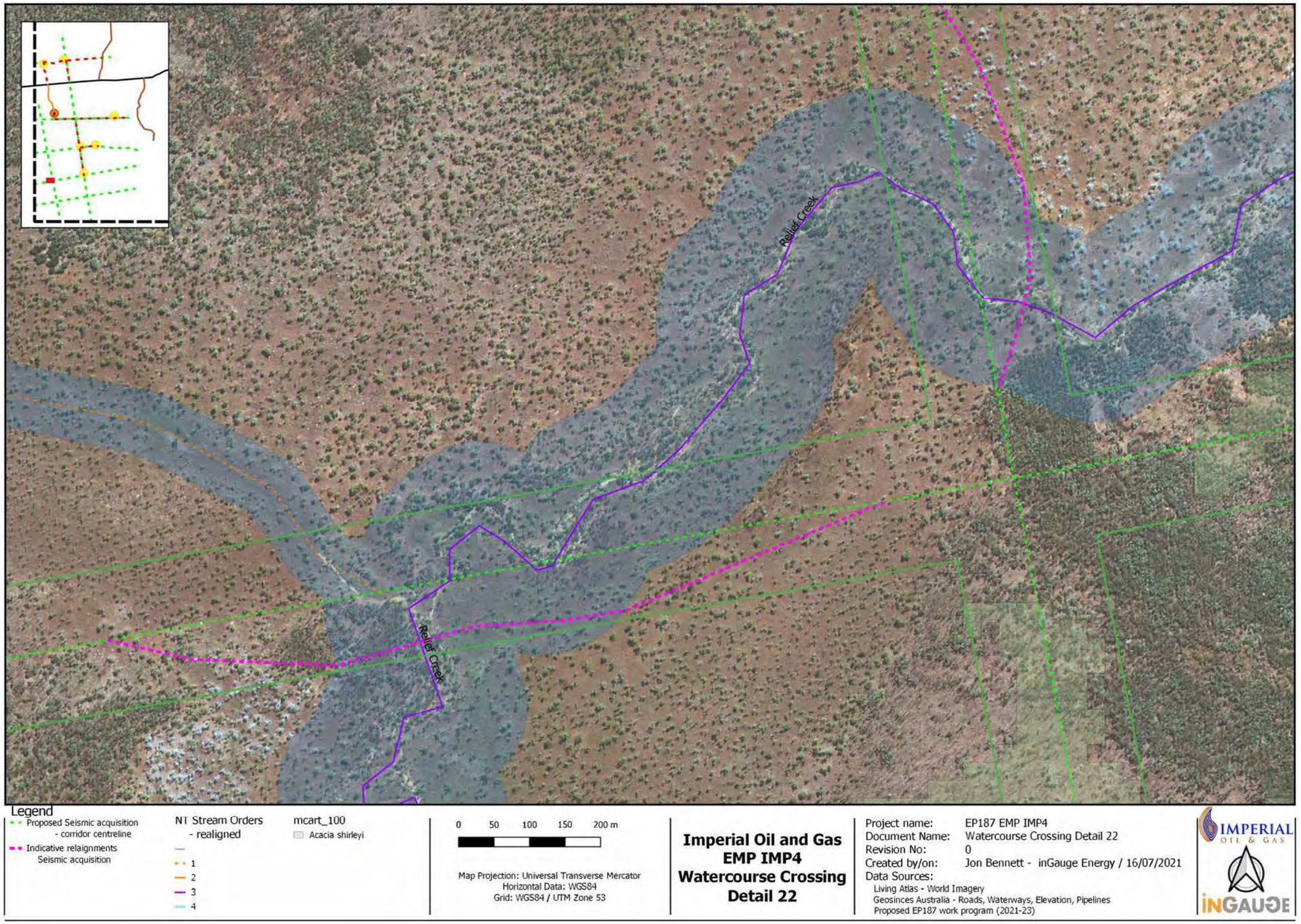

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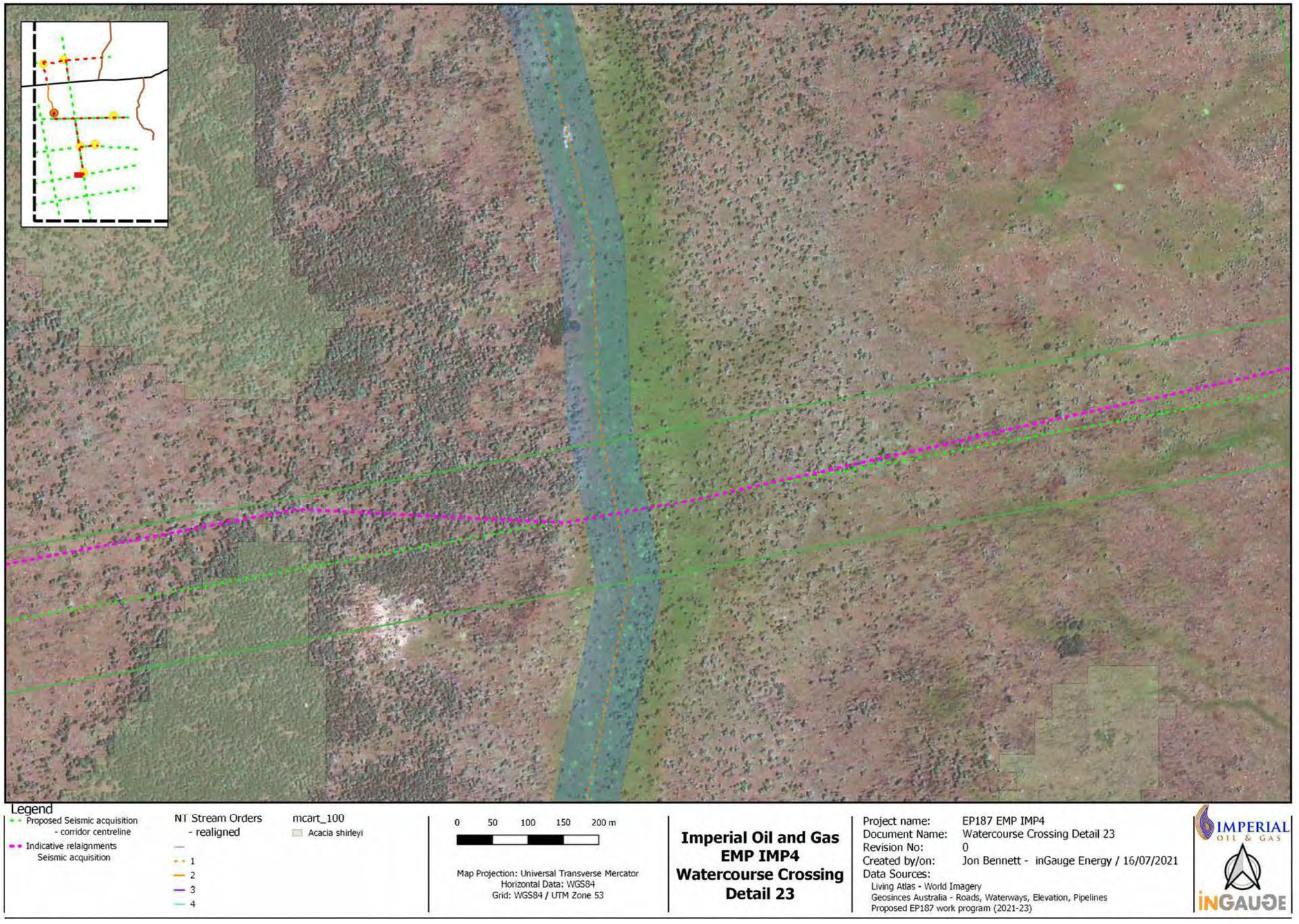

Figure 3.35: Watercourse Crossing Detail 23

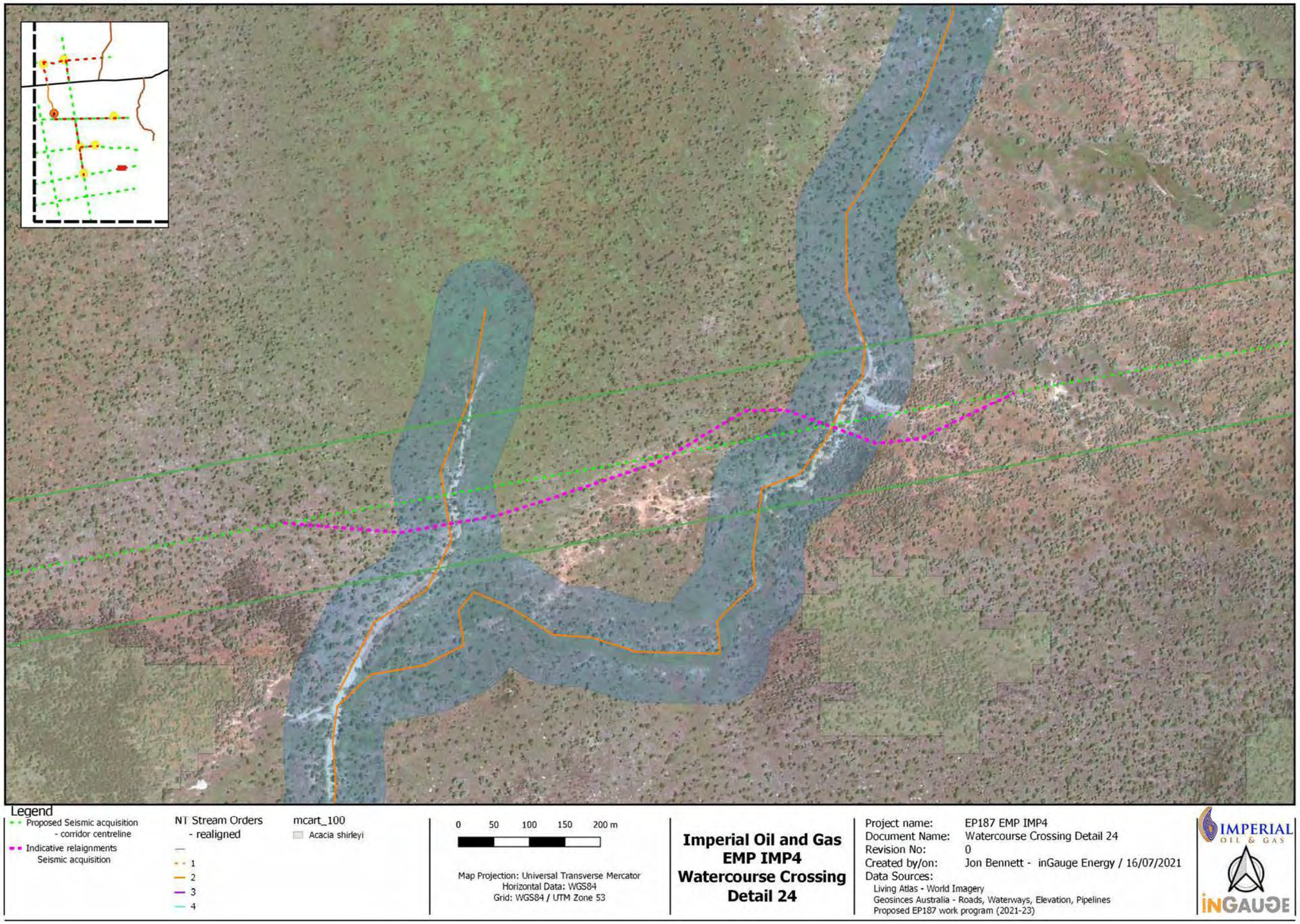

Figure 3.36: Watercourse Crossing Detail 24

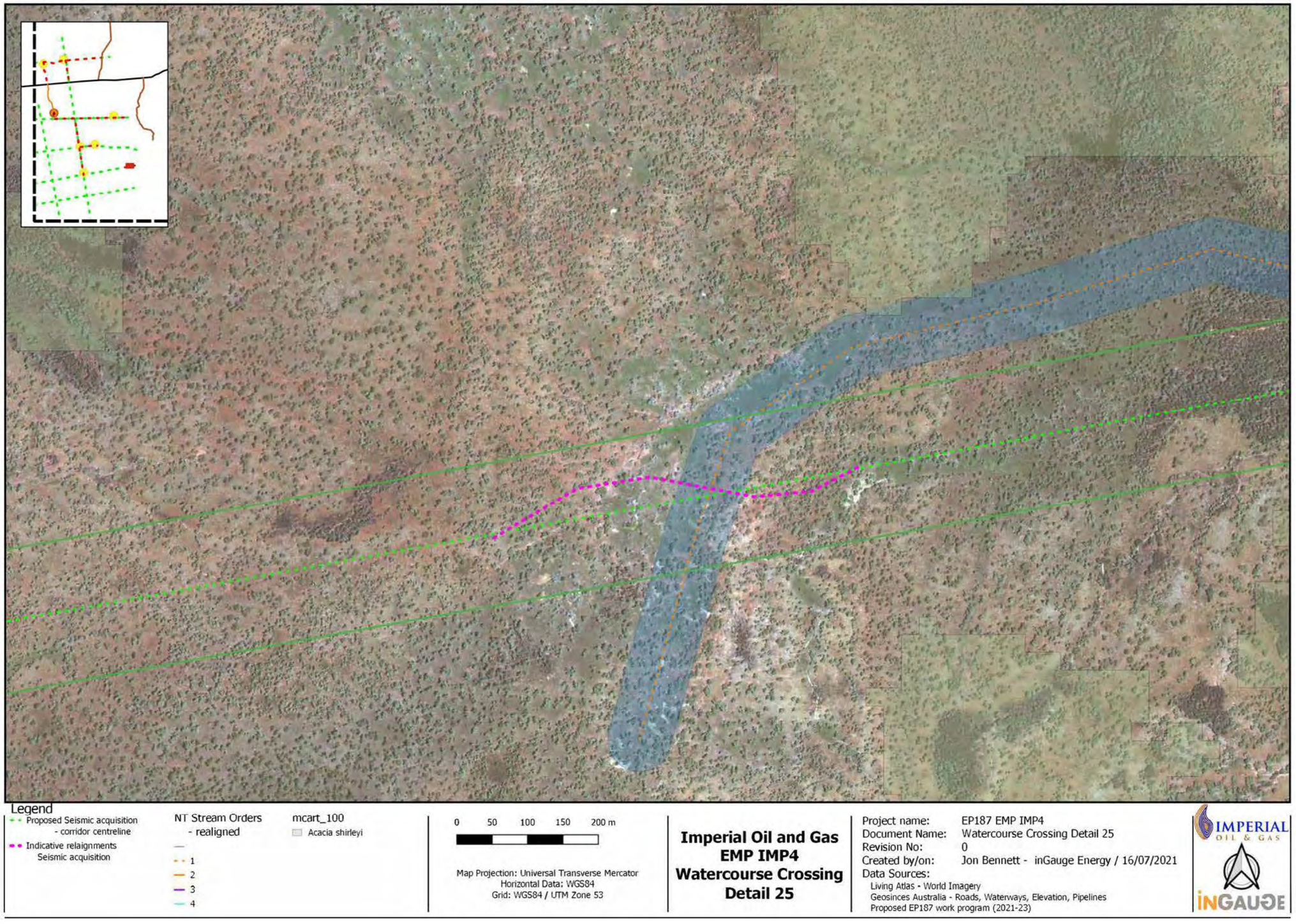

Figure 3.37: Watercourse Crossing Detail 25

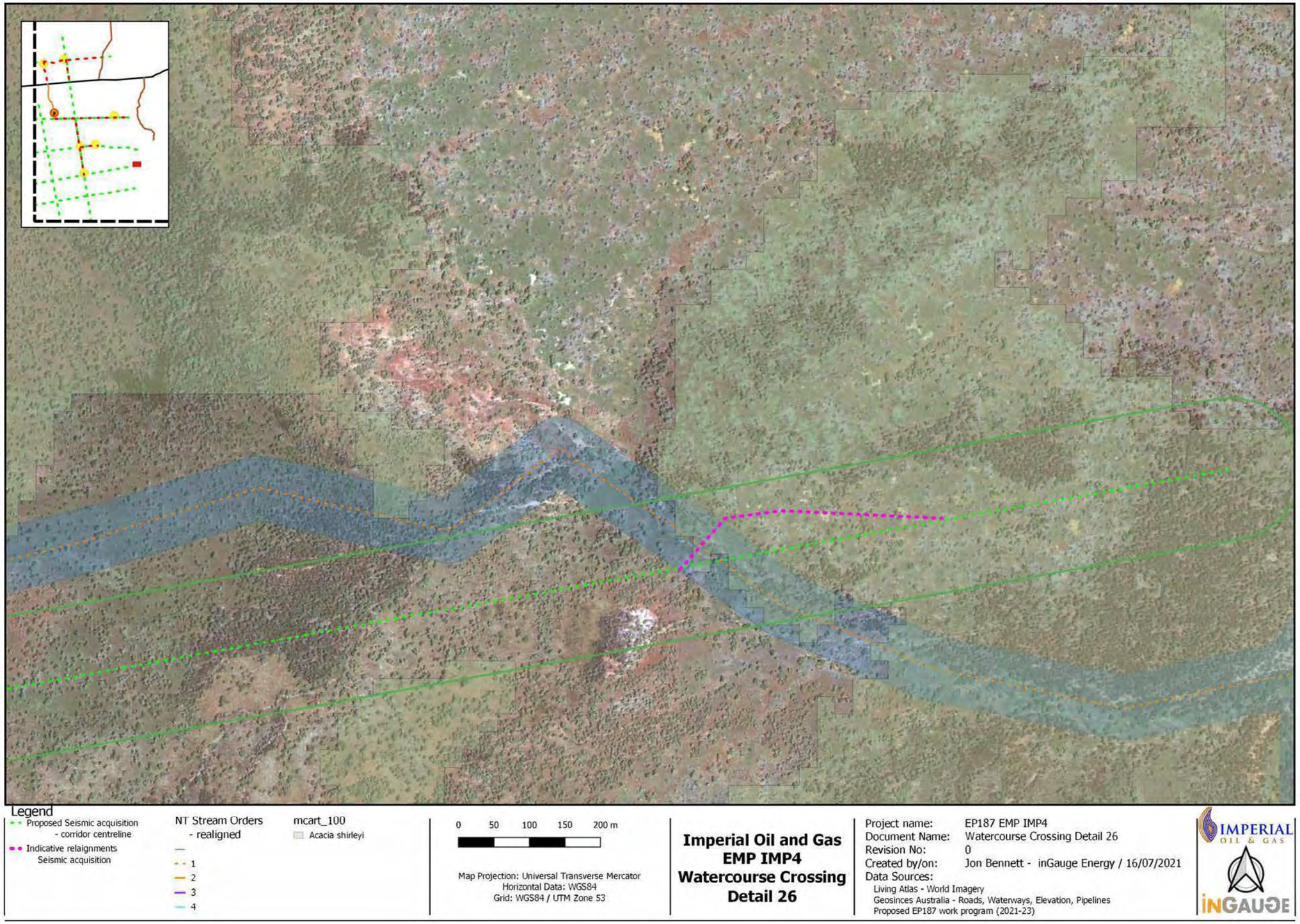

Figure 3.38: Watercourse Crossing Detail 26

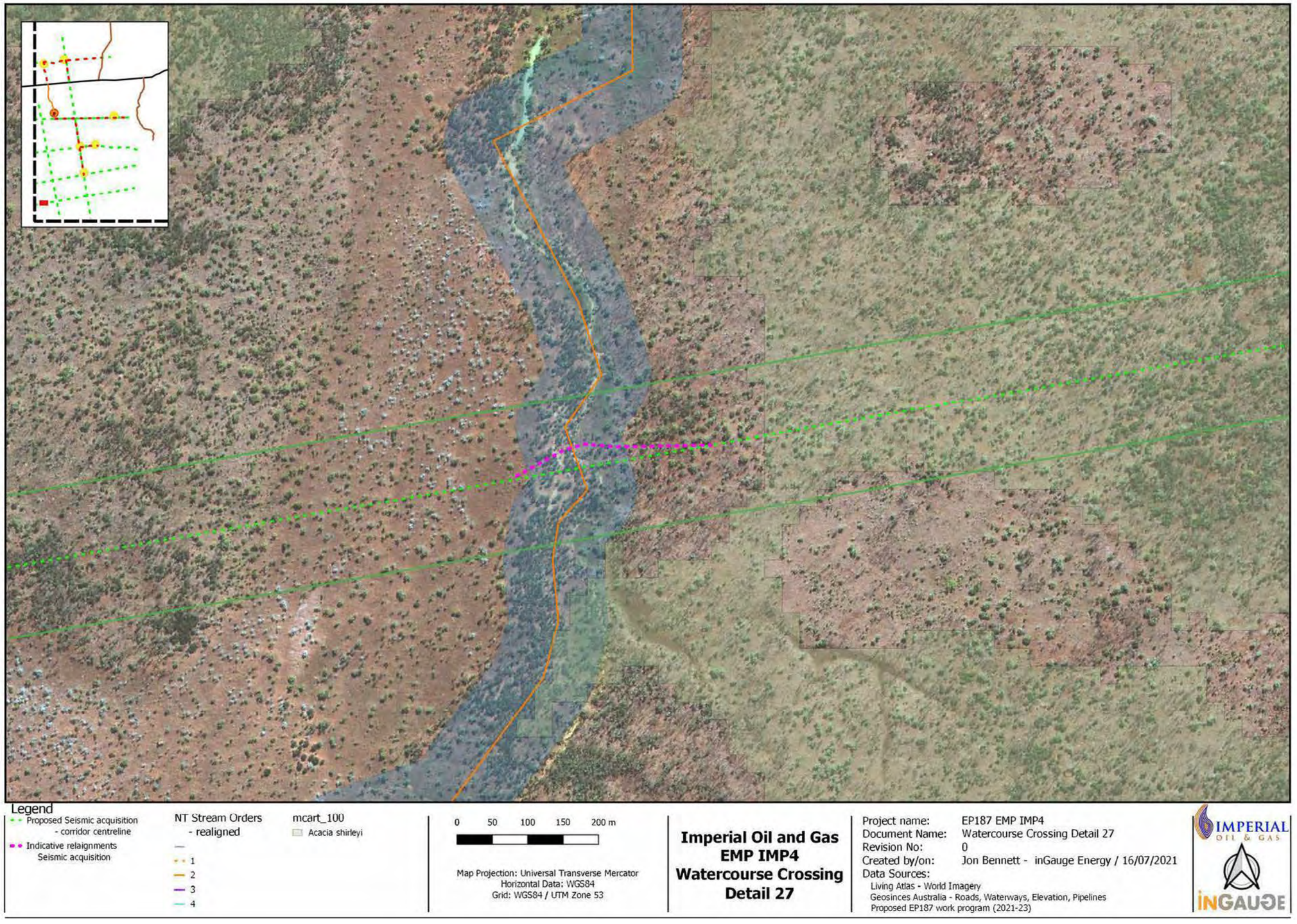

Figure 3.39: Watercourse Crossing Detail 27

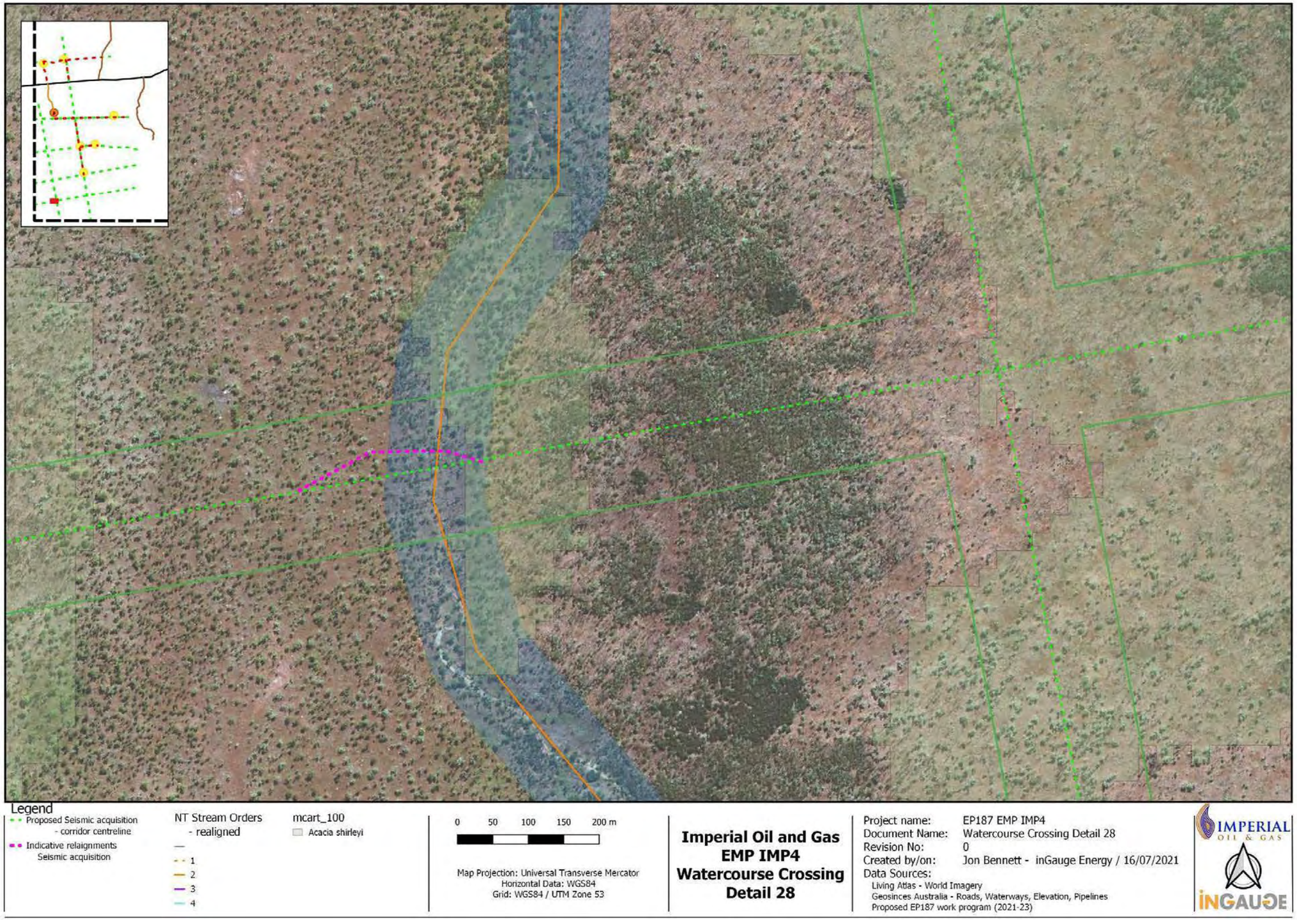

Figure 3.40: Watercourse Crossing Detail 28

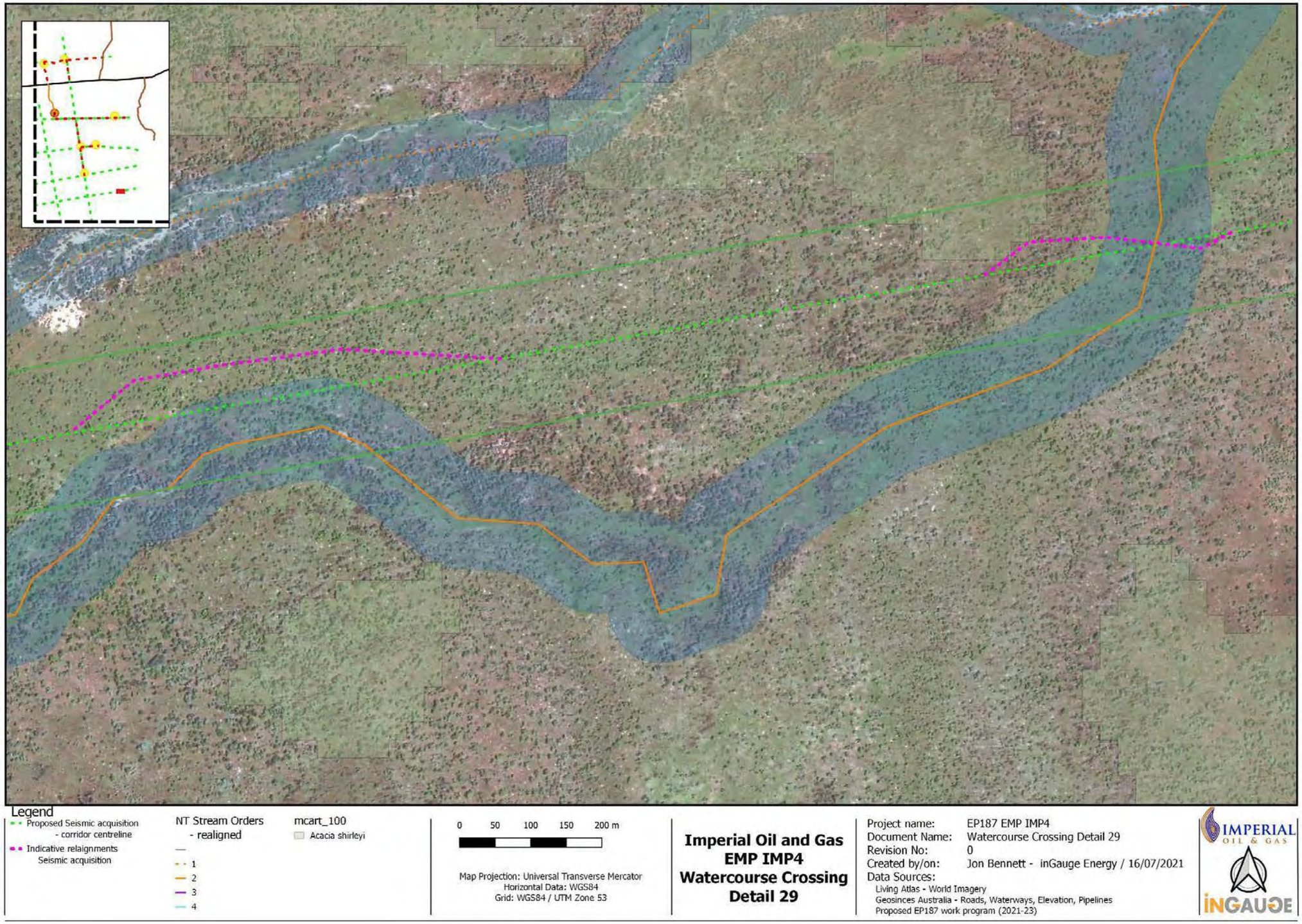

Figure 3.41: Watercourse Crossing Detail 29

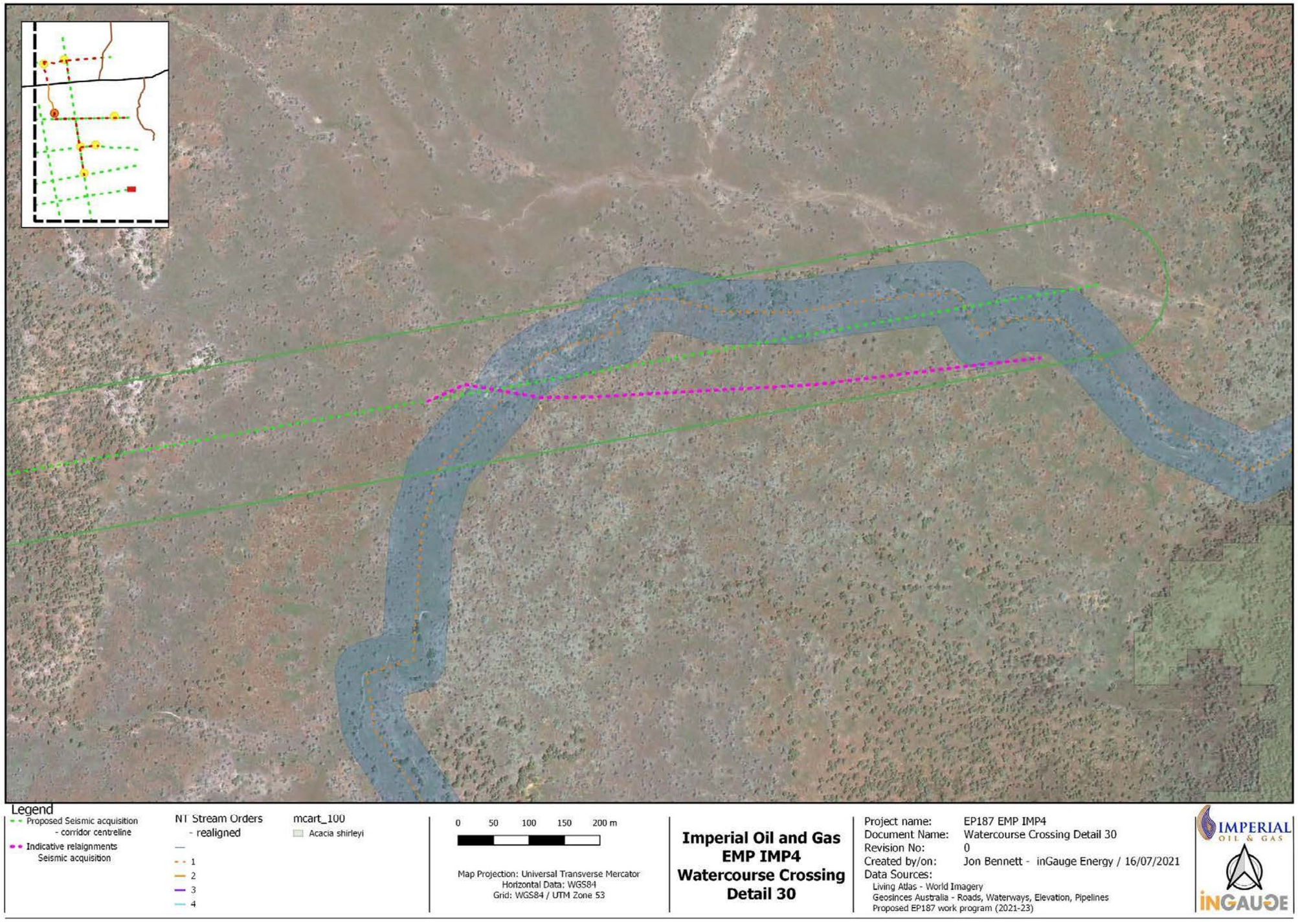

Figure 3.42: Watercourse Crossing Detail 30

3.5.3 Wellpad Site Selection

Imperial has picked preferred locations for the wellpads to be constructed under this EMP; the seismic survey results as part of this EMP could necessitate shifting these locations within the Land Type B buffer zones. Table 10 presents the selection criteria used for wellpads.

Table 10: Wellpad Site Selection Criteria

Wellpad	Below 1 in 100-year flood level	Slope	Acacia Shirleyi	Distance to closest bore	Visible from Highway	Closest Stream Order	Distance to the closest stream	Distance to closest dwelling
CARP AA	No	<2%	No	8.5	No	1	150m	14km
CARP AB	No	~3%	No	6.1km	No	1	200m	9km
CSP AA	No	~1%	No	2.2km	No	1	150m	8km
CSP AB	No	<1%	No	7.0km	No	3	3km	15k,
CSP AC	No	~2%	No	3.5km	No	3	200m	18km
CSP AD	No	<1%	No	1.1km	No	1	1km	21km

Sites have been selected and designed following Part A of the Code. Wellpad site selection and layout have been carried out to reduce the impacts on existing landscape amenity to a level that is as low as reasonably practicable (ALARP) and acceptable by utilising a hierarchy of controls, as shown in Table 11.
The closest spring to a wellpad is 22km. Therefore, there is no figure related to springs within the location of the regulated activity; rather, a figure of springs with EP187 is provided in Appendix 1.

Note: in Appendix 01.01 (Archaeological assessment), the coordinates given as the "Proposed well sites" are the centre of the area requested to be cleared; based on the intersection of seismic lines, they are not the proposed wellpad locations. Figure 3.43 to Figure 3.60 show the landscape characteristics around the wellpads.

- Figure 3.43: Carp AA – Indicative wellpad location – 1 in 100-year flood
  - Showing 1 in 100-year flood, Settlements, Dwellings and Landowner Bores
- Figure 3.44: Carp AA – Indicative wellpad location – Contour and Slope
  - Showing the Contours and Slope, Settlements, Dwellings and Landowner Bores
- Figure 3.45: Carp AA – Indicative wellpad location – GDEs, Watercourse and Acacia Shirleyi
  - Showing the GDEs, Watercourses (buffers), Stream Orders, Vegetation, Settlements, Dwellings and Landowner Bores
- Figure 3.46: Carp AB – Indicative wellpad location – 1 in 100-year flood
  - Showing 1 in 100-year flood, Settlements, Dwellings and Landowner Bores
- Figure 3.47: Carp AB – Indicative wellpad location – Contours Slope
  - Showing the Contours and Slope, Settlements, Dwellings and Landowner Bores
- Figure 3.48: Carp AB – Indicative wellpad location – GDEs, Watercourses and Acacia Shirleyi
  - Showing the GDEs, Watercourses (buffers), Stream Orders, Vegetation, Settlements, Dwellings and Landowner Bores

- Figure 3.49: CSP AA – Indicative wellpad location – 1 in 100-year flood
    - Showing 1 in 100-year flood, Settlements, Dwellings and Landowner Bores
- Figure 3.50: CSP AA – Indicative wellpad location – Contours and Slope
    - Showing the Contours and Slope, Settlements, Dwellings and Landowner Bores
- Figure 3.51: CSP AA – Indicative wellpad location – GDEs, Watercourses and Acacia Shirleyi
    - Showing the GDEs, Watercourses (buffers), Stream Orders, Vegetation, Settlements, Dwellings and Landowner Bores
- Figure 3.52: CSP AB – Indicative wellpad location – 1 in 100-year flood
    - Showing 1 in 100-year flood, Settlements, Dwellings and Landowner Bores
- Figure 3.53: CSP AB – Indicative wellpad location – Contours and Slope
    - Showing the Contours and Slope, Settlements, Dwellings and Landowner Bores
- Figure 3.54: CSP AB – Indicative wellpad location – GDEs, Watercourses and Acacia Shirleyi
    - Showing the GDEs, Watercourses (buffers), Stream Orders, Vegetation, Settlements, Dwellings and Landowner Bores
- Figure 3.55: CSP AC – Indicative wellpad location – 1 in 100-year flood
    - Showing 1 in 100-year flood, Settlements, Dwellings and Landowner Bores
- Figure 3.56: CSP AC – Indicative wellpad location – Contour in Slope
    - Showing the Contours and Slope, Settlements, Dwellings and Landowner Bores
- Figure 3.57: CSP AC – Indicative wellpad location – GDEs, Watercourses and Acacia Shirleyi
    - Showing the GDEs, Watercourses (buffers), Stream Orders, Vegetation, Settlements, Dwellings and Landowner Bores
- Figure 3.58: CSP AD – Indicative wellpad location – 1 in 100-year flood
    - Showing 1 in 100-year flood, Settlements, Dwellings and Landowner Bores
- Figure 3.59: CSP AD – Indicative wellpad location – Contour and Slope
    - Showing the Contours and Slope, Settlements, Dwellings and Landowner Bores
- Figure 3.60: CSP AD – Indicative wellpad location – GDEs, Watercourses and Acacia Shirleyi
    - Showing the GDEs, Watercourses (buffers), Stream Orders, Vegetation, Settlements, Dwellings and Landowner Bores

Table 11: Wellpad site selection hierarchy of controls

Controls and Demonstration of ALARP and Acceptability for wellpad site selection		
Hierarchy of Control	**Used?**	**Preventative Controls**
Elimination	No	The regulated activities under this EMP are not able to be carried out without constructing wellpads.
Substitution	Yes	Where possible, multiwell pads will be used to reduce the amount of clearing required for the regulated activities.
Engineering/ Design	Yes	A baseline ecological assessment has been carried out for the areas of the proposed wellpads. The results from this baseline assessment will be used to guide the location of wellpads Location of wellpads selected to minimise the risk of overland flow across a well pad, as supported by flood modelling Location of wellpads selected to avoid Acacia Shirleyi as much as practicable The wellpads constructed and drilled will be at least 1km from an existing water supply bore used for domestic or stock consumption Wellpads and well infrastructure installed on the well pad post drilling will not be visible from any major public road that exists when the well pad is constructed. Location of wellpads >1km from landowner bores Traditional Owner representatives on-site during civil construction of wellpads Wellpads have been to be as small as practicable whilst allowing for safe and efficient operation. The wellpads constructed and wells drilled under this EMP are greater than 2km apart, measured from the centre of the wellpad.
Administration	Yes	Imperial has applied for an AAPA certificate and will supply it to DEPWS when received.
Protective equipment	No	N/A
ALARP and Acceptable		Compliant with the mandatory requirements of the Code Meets legislative requirements No objections raised by stakeholders during engagement Low residual risk ranking is consistent with corporate risk acceptance standard

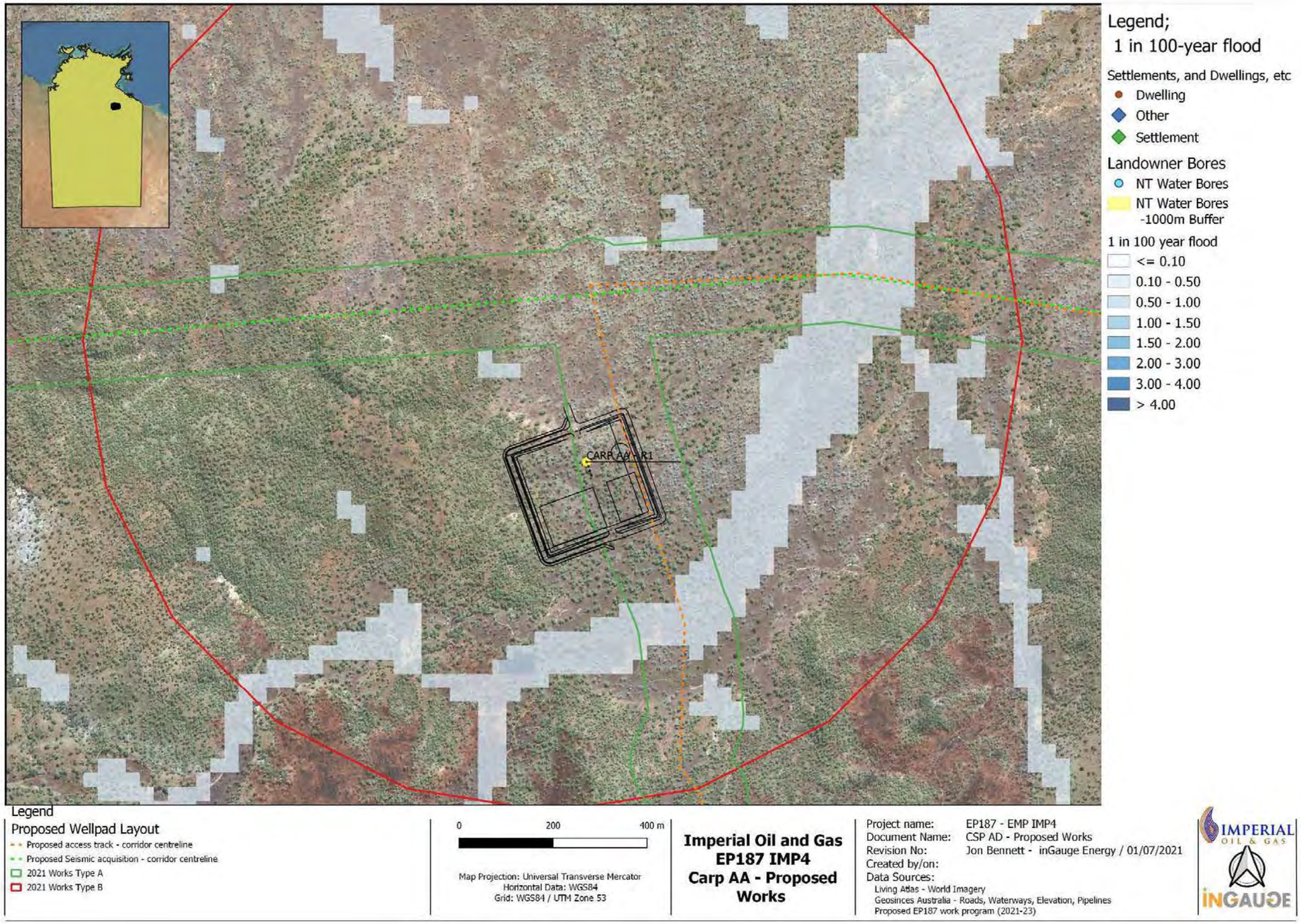

Figure 3.43: Carp AA – Indicative wellpad location – 1 in 100-year flood

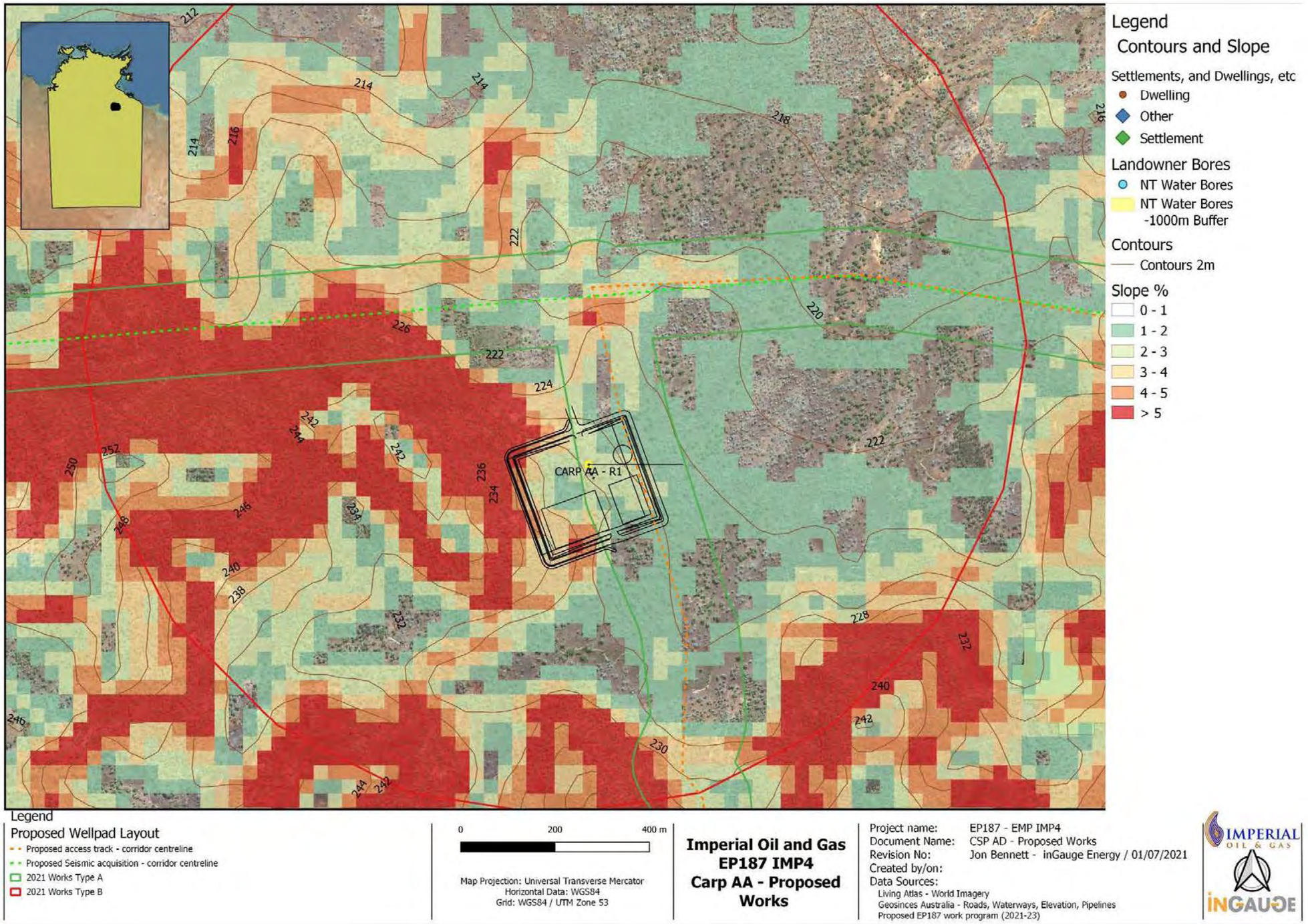

Figure 3.44: Carp AA – Indicative wellpad location – Contour and Slope

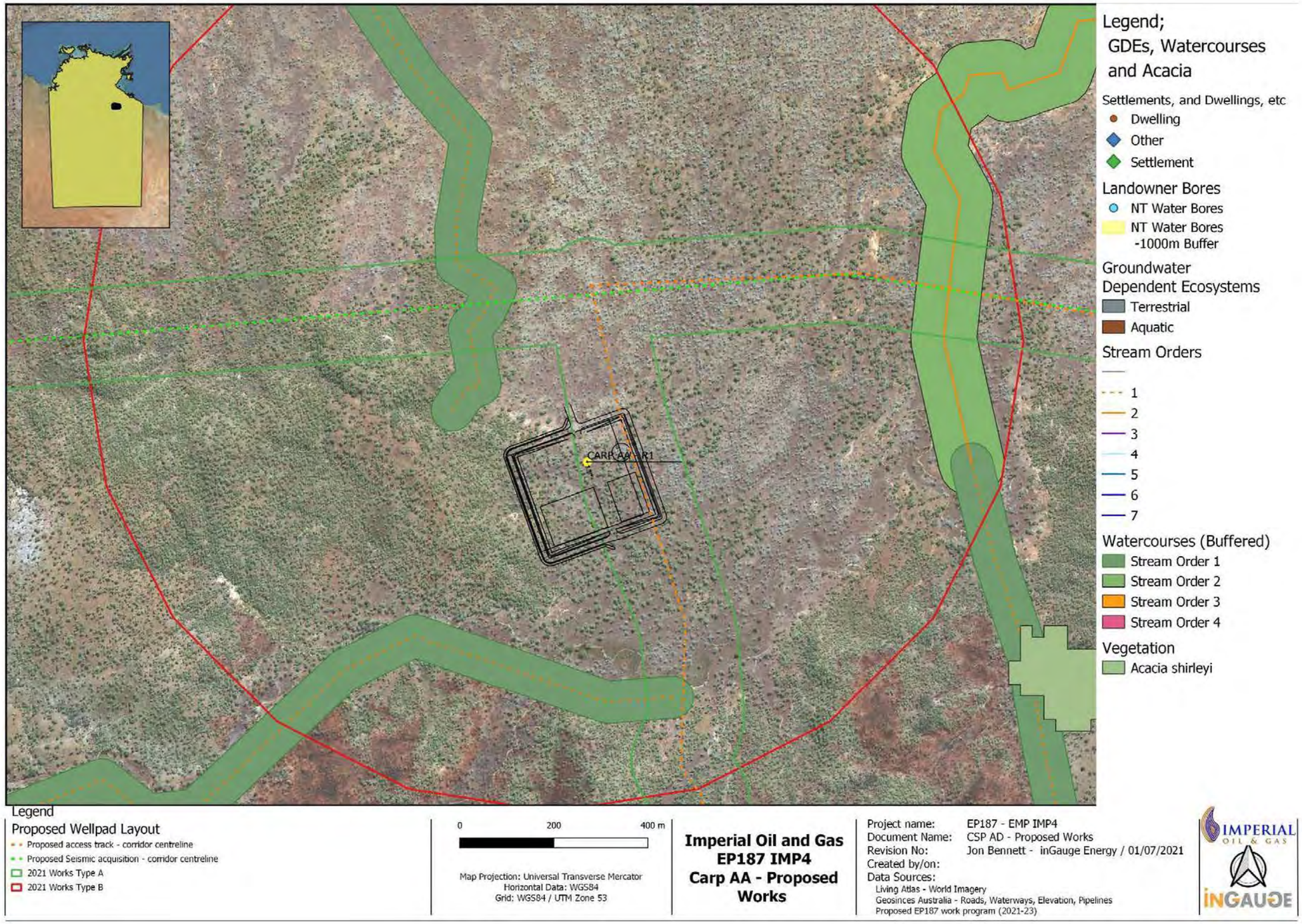

Figure 3.45: Carp AA – Indicative wellpad location – GDEs, Watercourse and Acacia Shirleyi

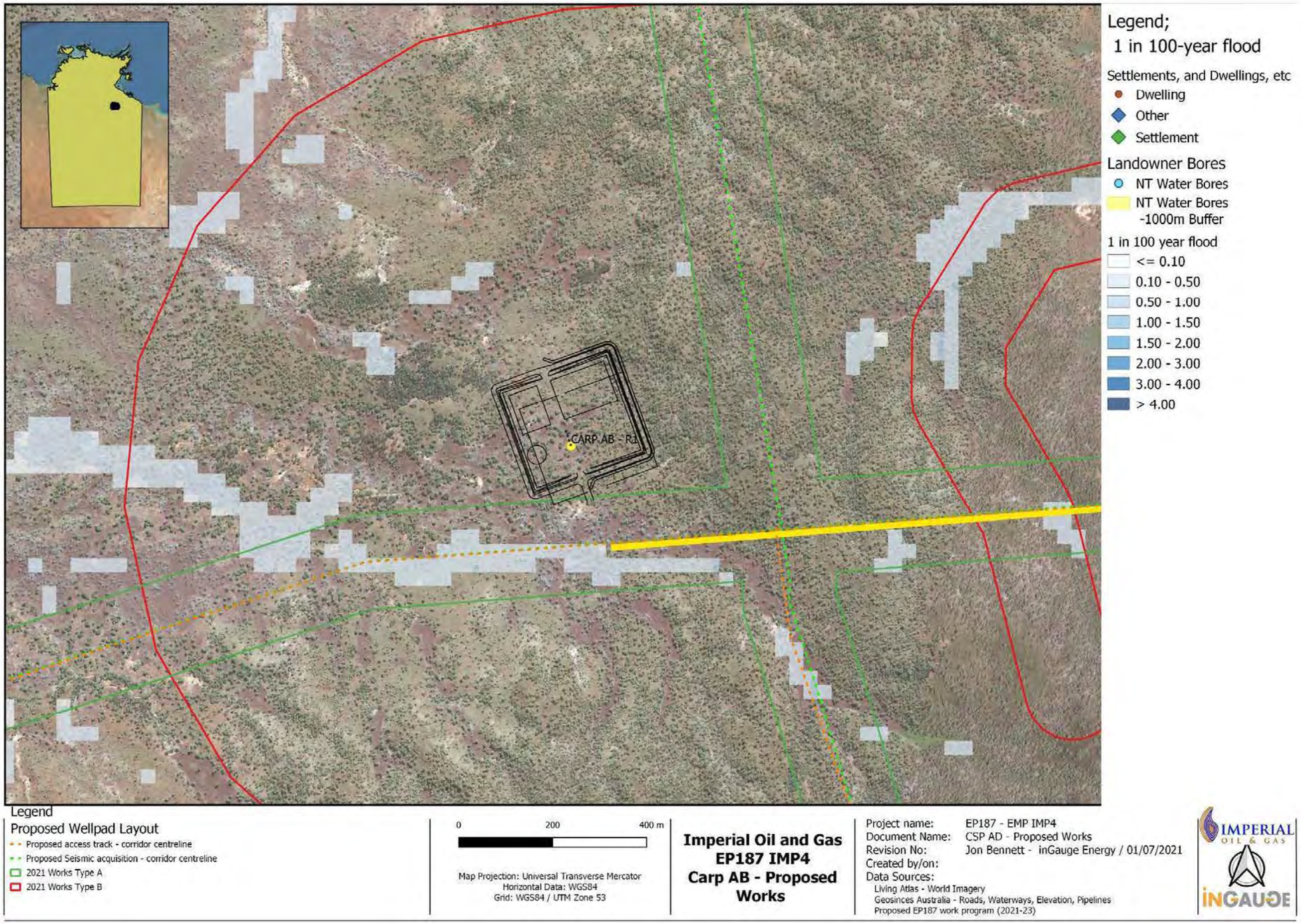

Figure 3.46: Carp AB – Indicative wellpad location – 1 in 100-year flood

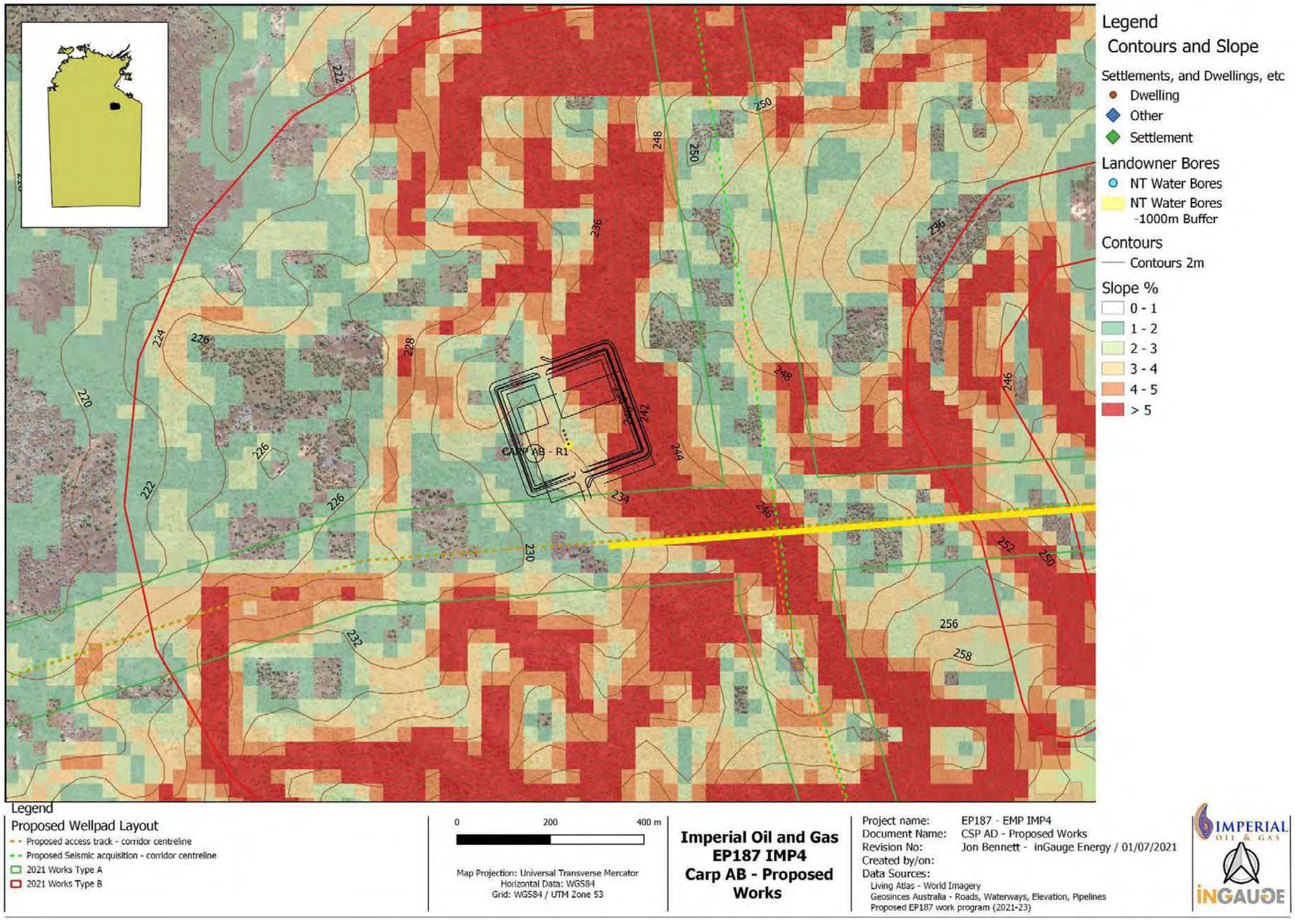

Figure 3.47: Carp AB – Indicative wellpad location – Contours Slope

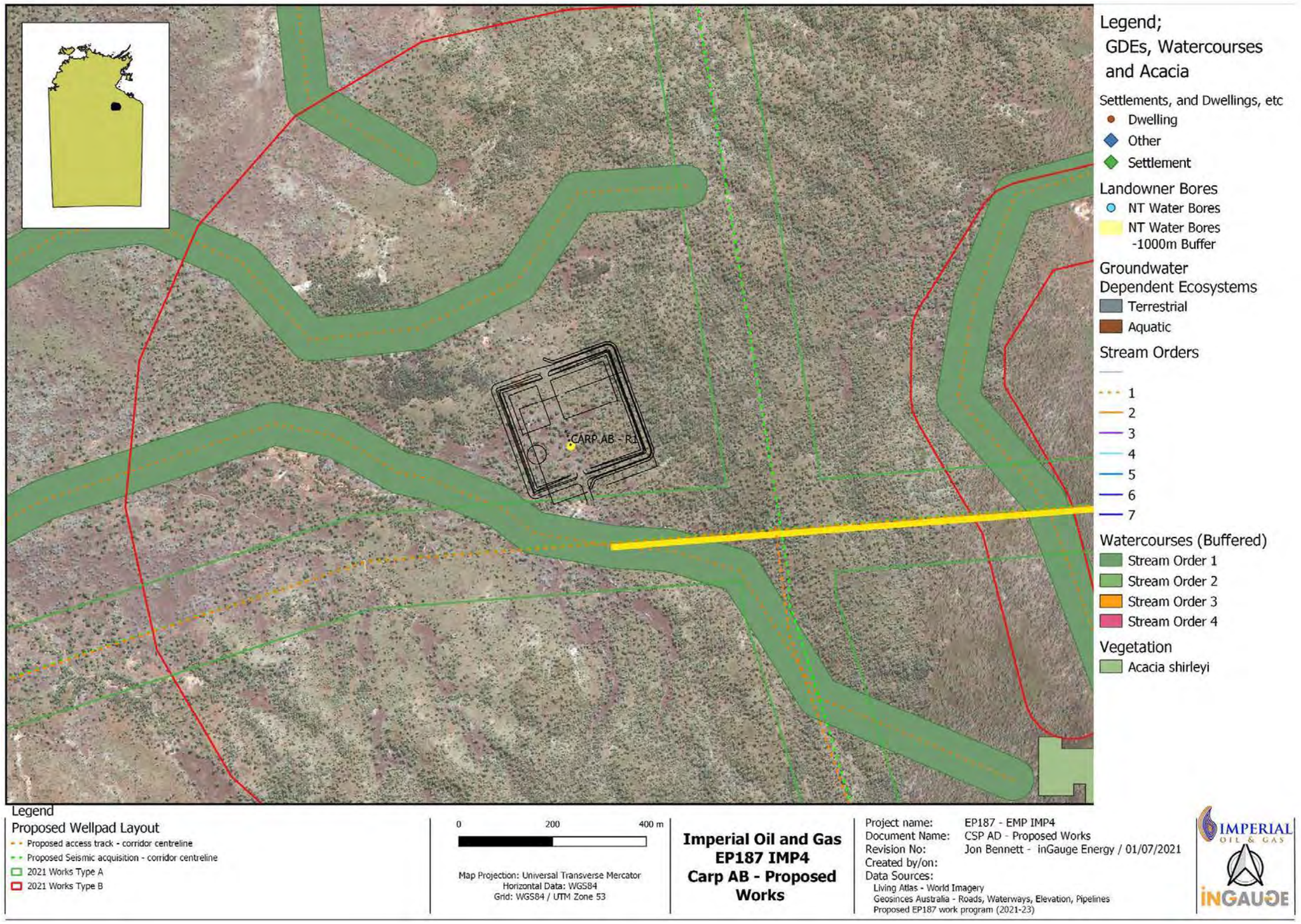

Figure 3.48: Carp AB – Indicative wellpad location – GDEs, Watercourses and Acacia Shirleyi

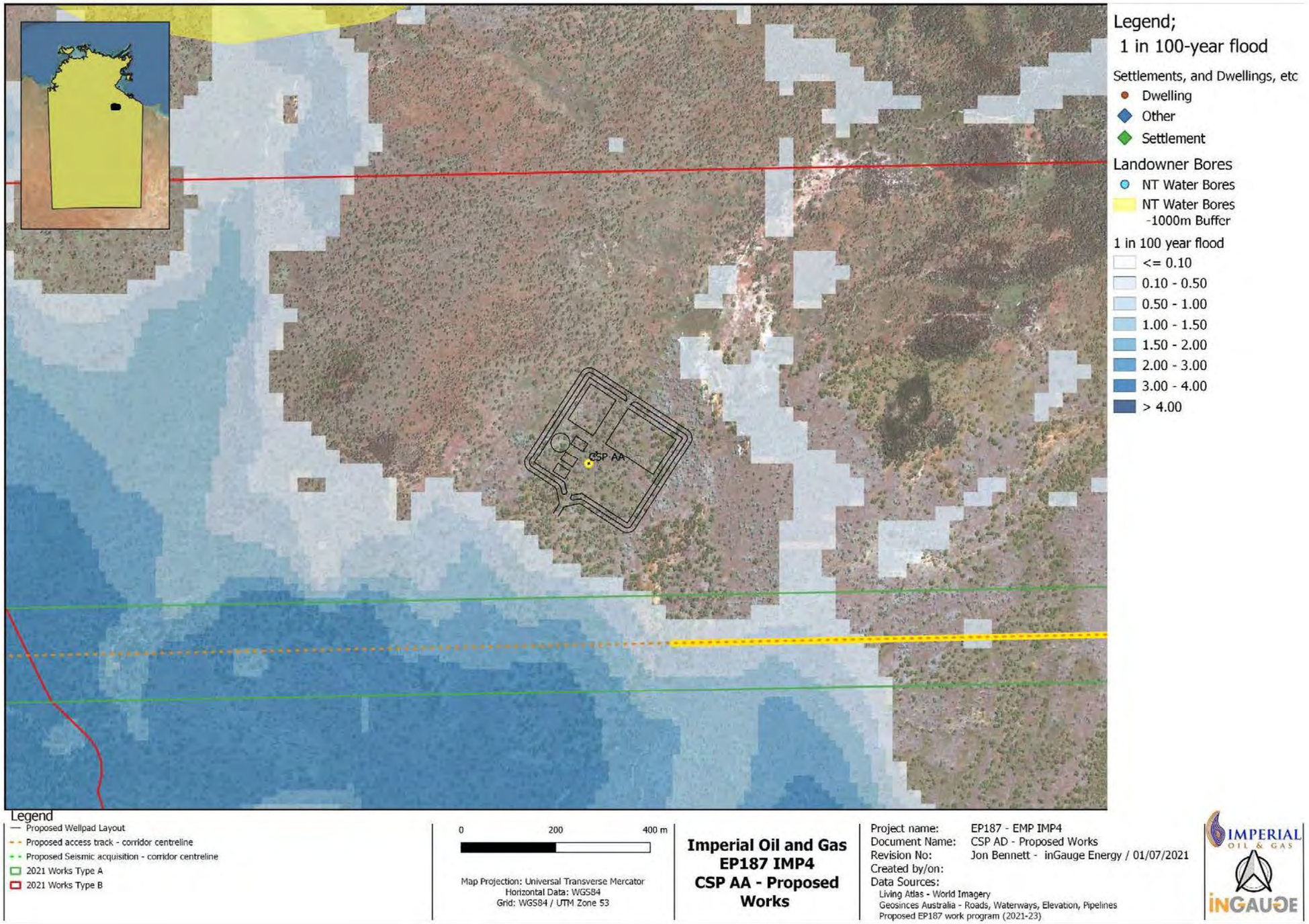

Figure 3.49: CSP AA – Indicative wellpad location – 1 in 100-year flood

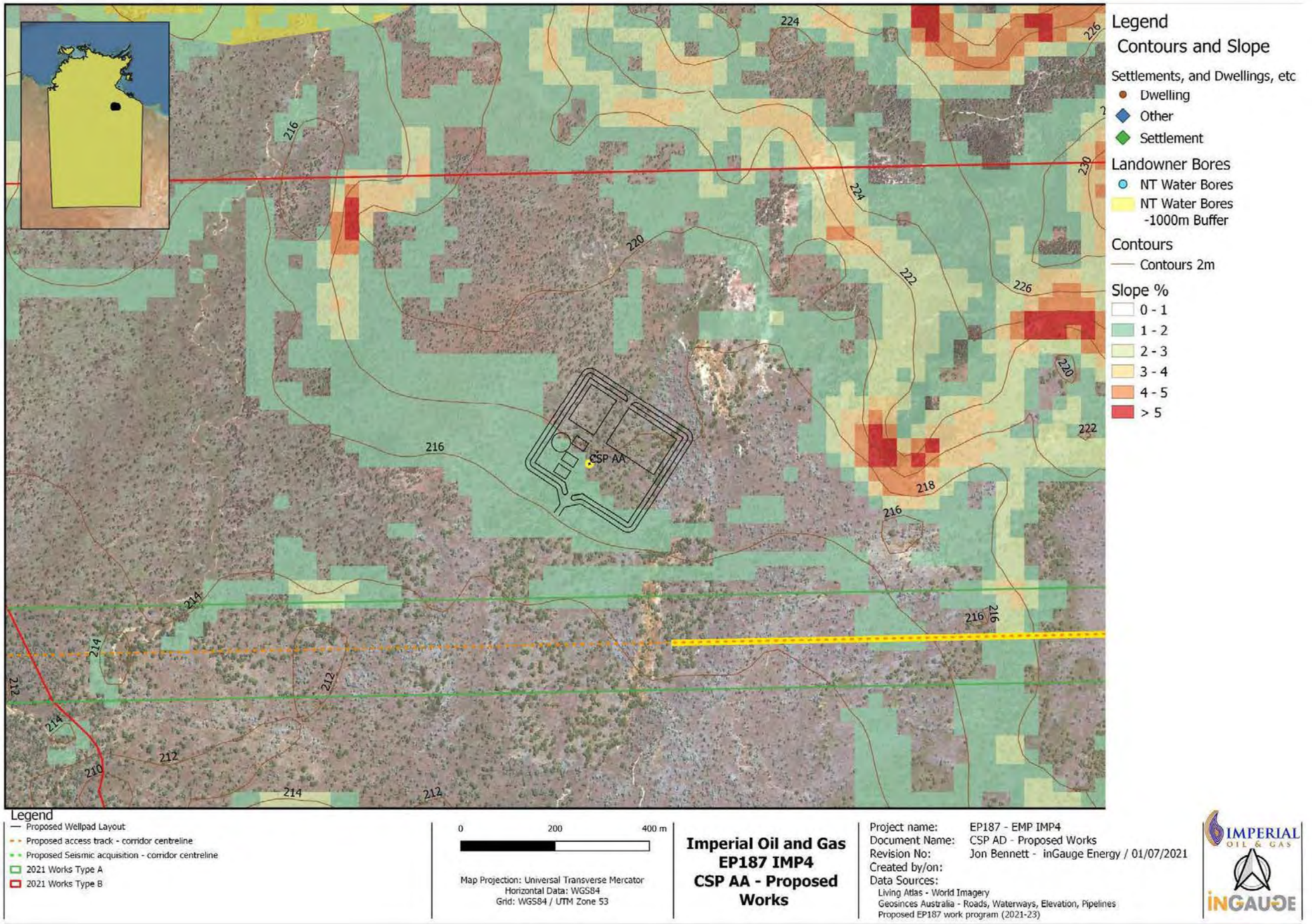

Figure 3.50: CSP AA – Indicative wellpad location – Contours and Slope

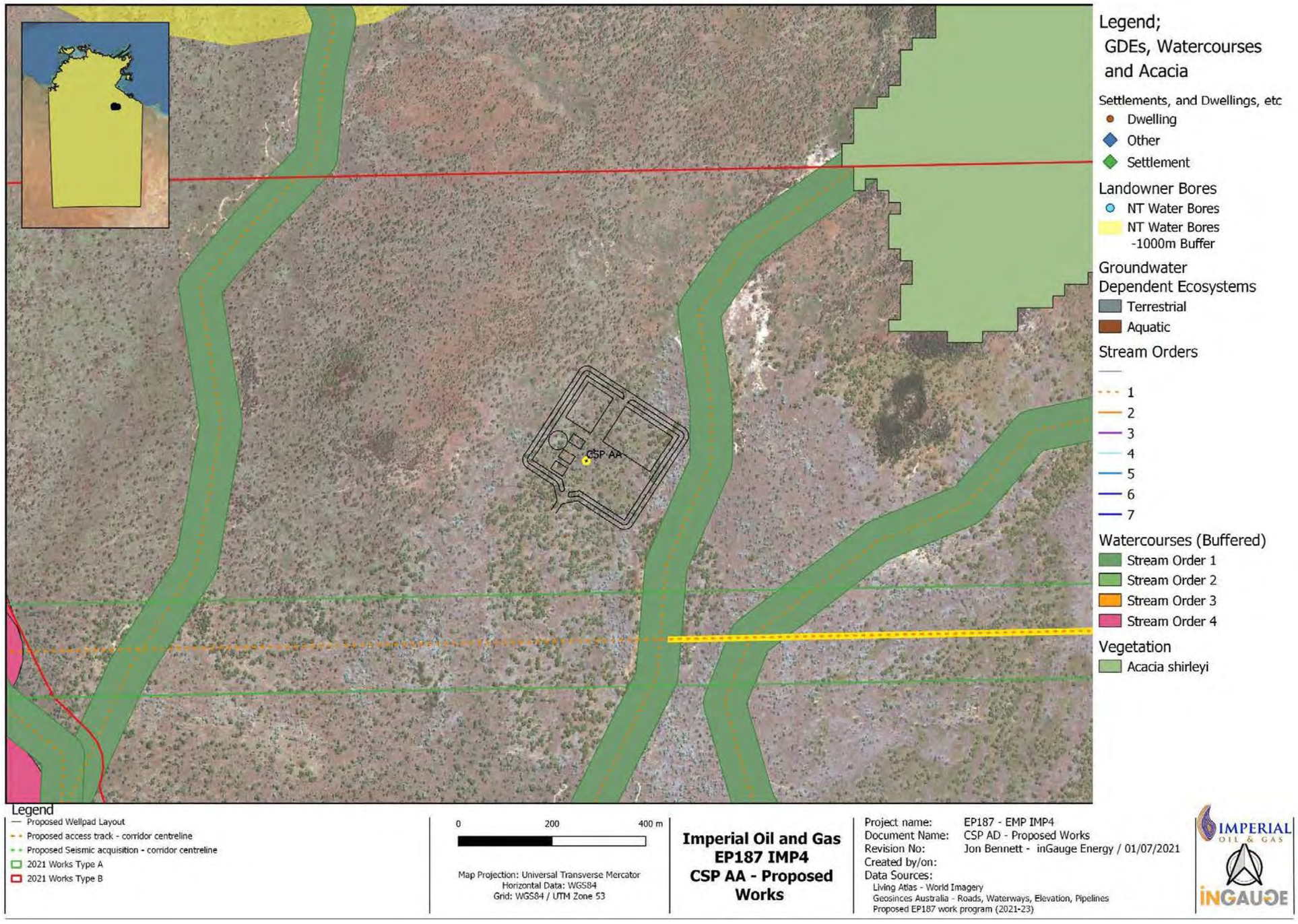

Figure 3.51: CSP AA – Indicative wellpad location – GDEs, Watercourses and Acacia Shirleyi

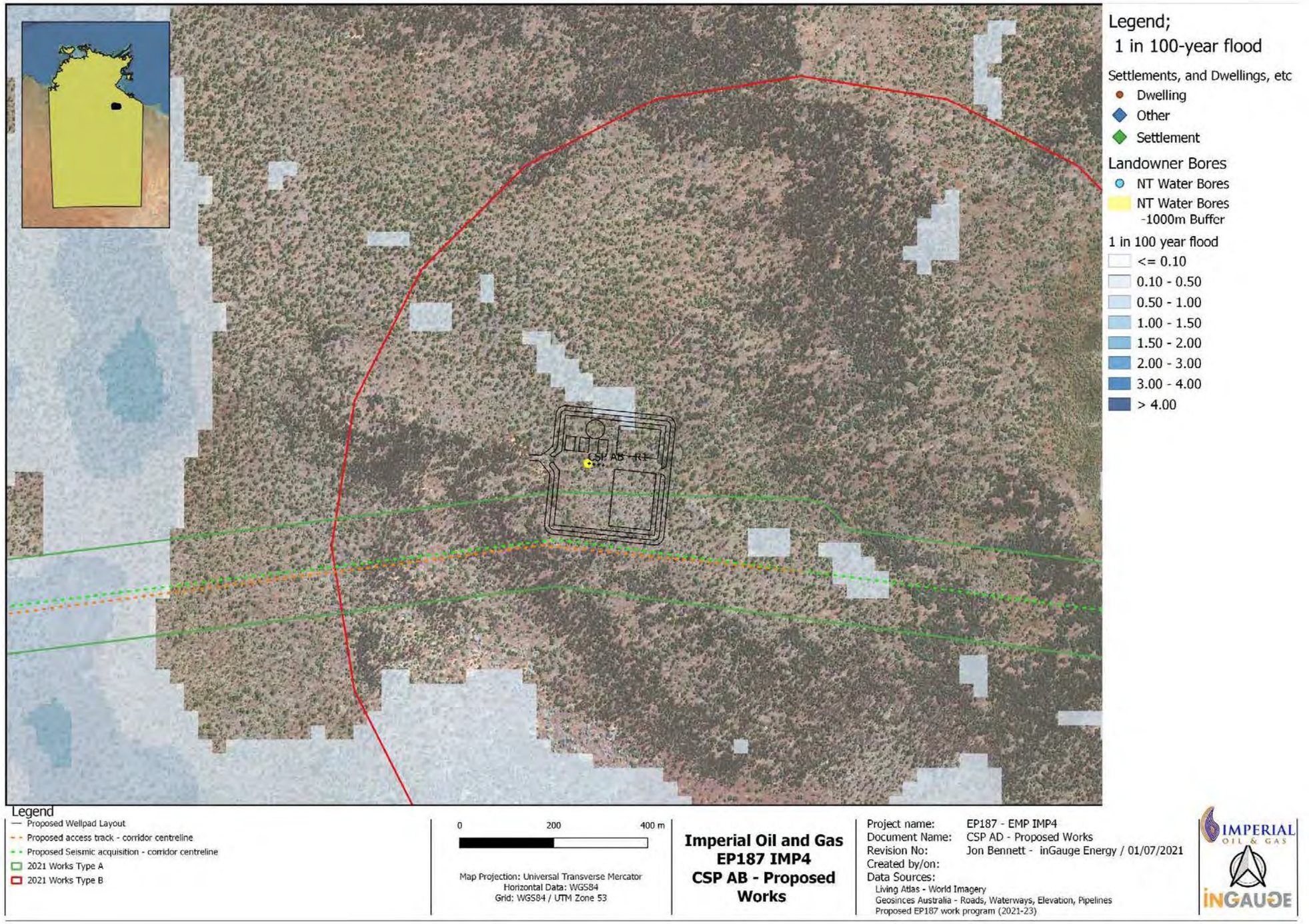

Figure 3.52: CSP AB – Indicative wellpad location – 1 in 100-year flood

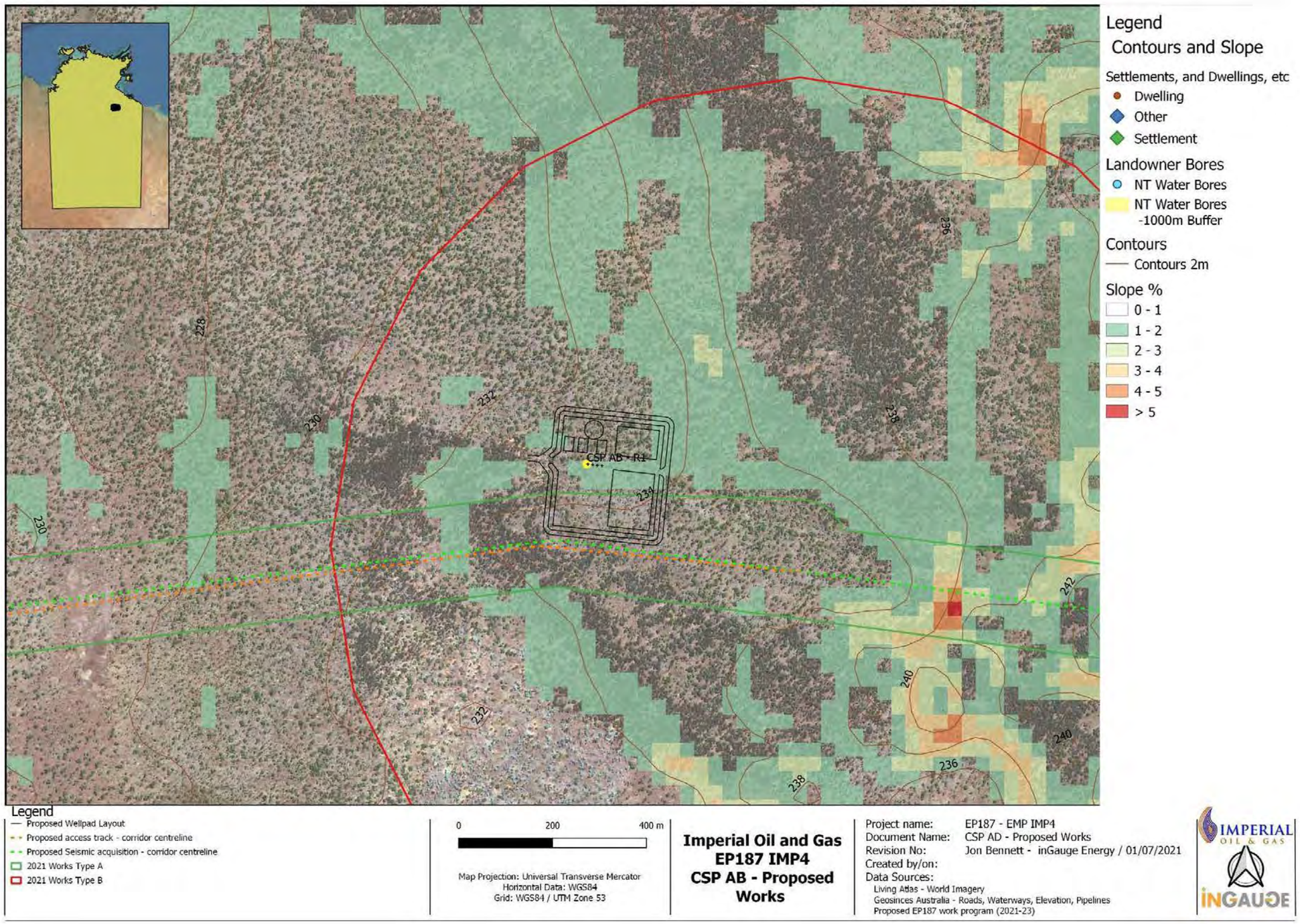

Figure 3.53: CSP AB – Indicative wellpad location – Contours and Slope

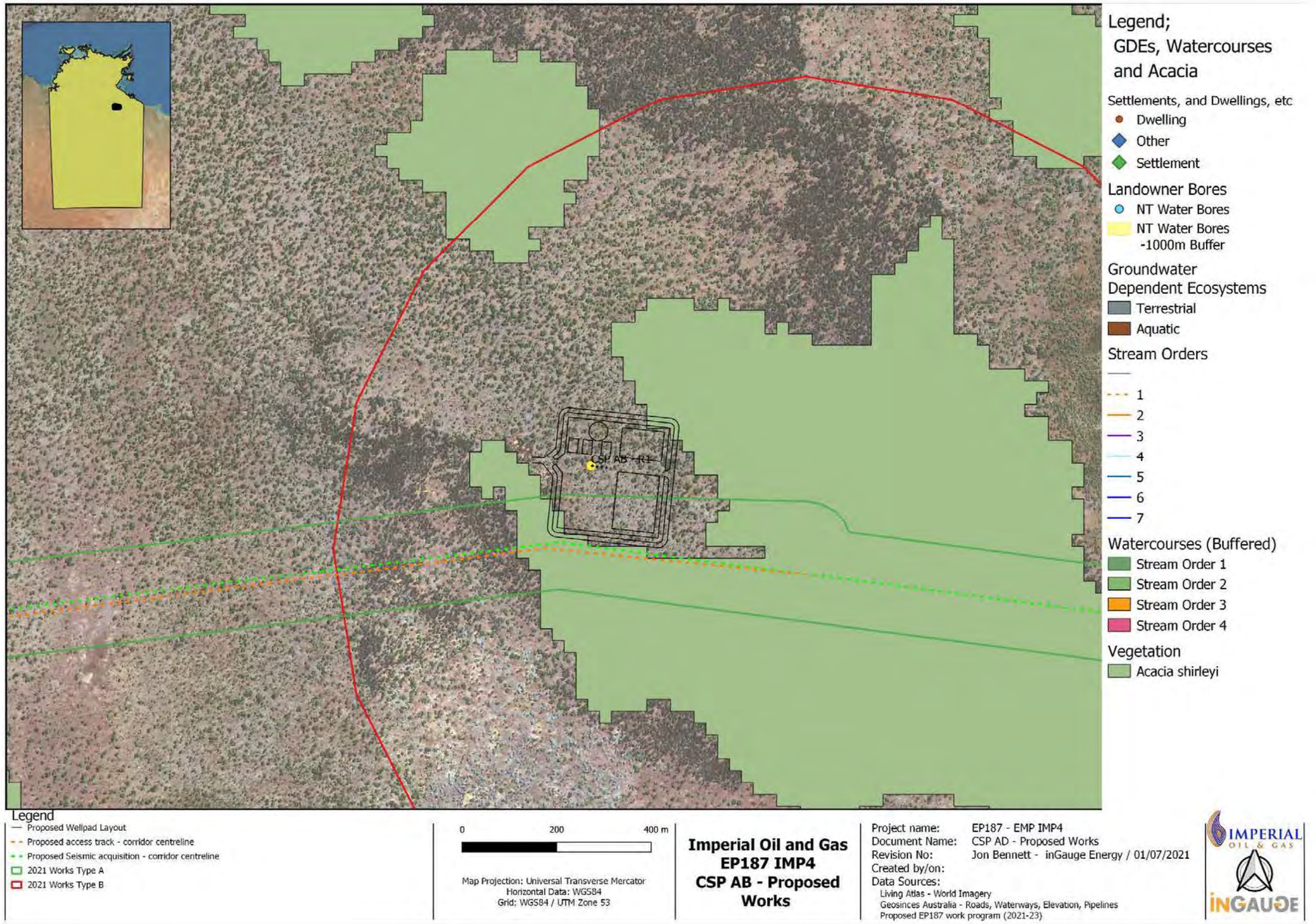

Figure 3.54: CSP AB – Indicative wellpad location – GDEs, Watercourses and Acacia Shirleyi

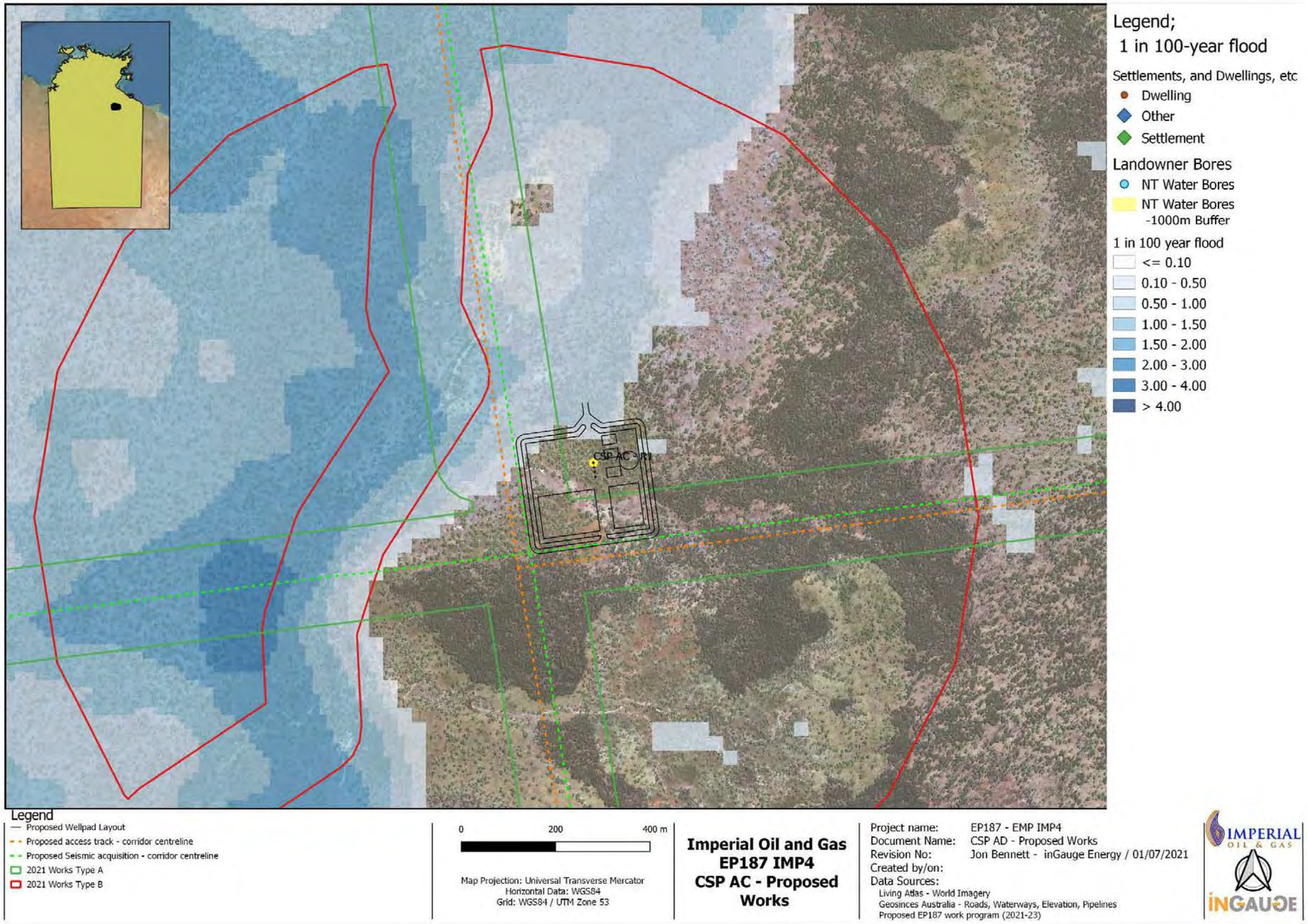

Figure 3.55: CSP AC – Indicative wellpad location – 1 in 100-year flood

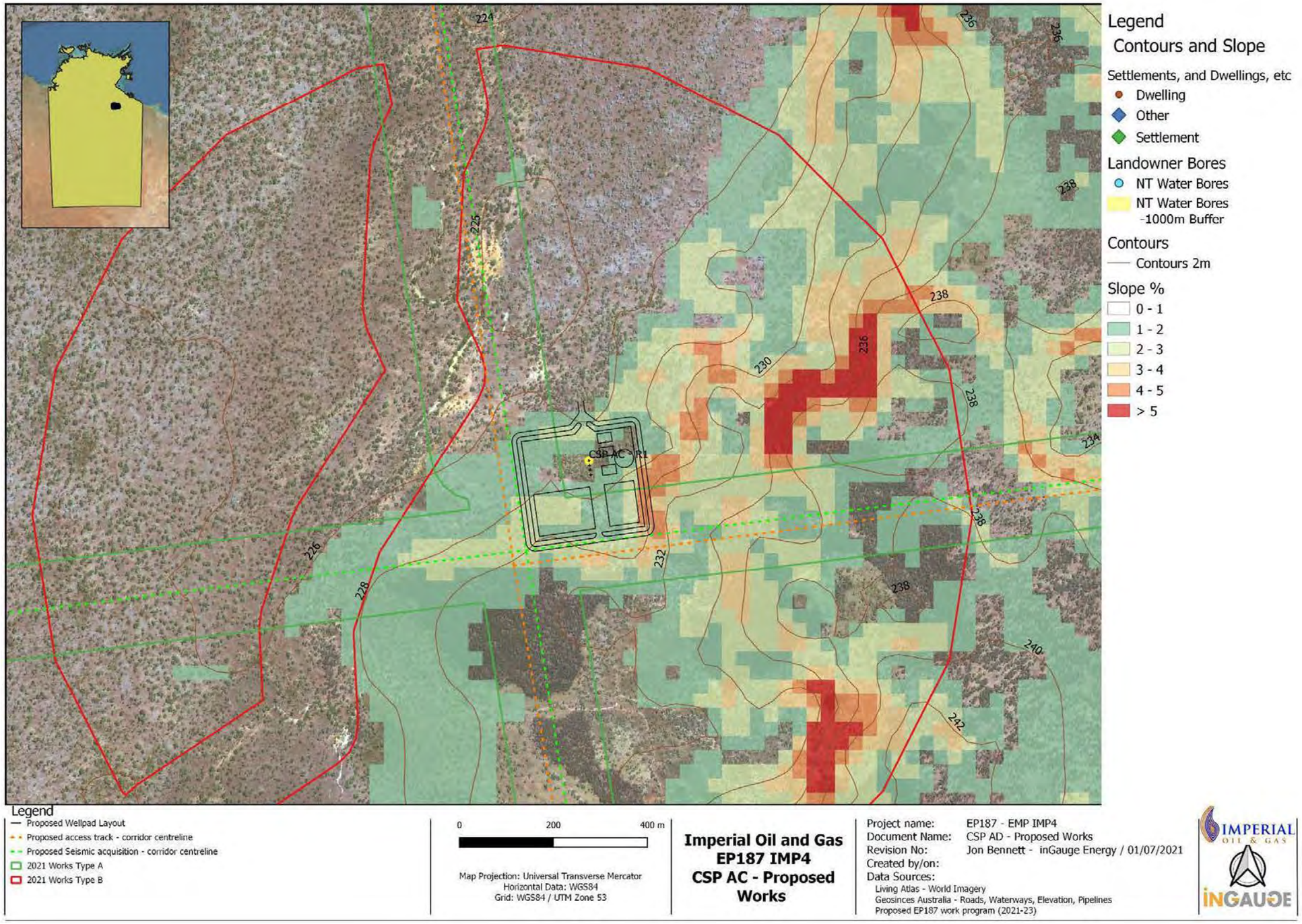

Figure 3.56: CSP AC – Indicative wellpad location – Contour in Slope

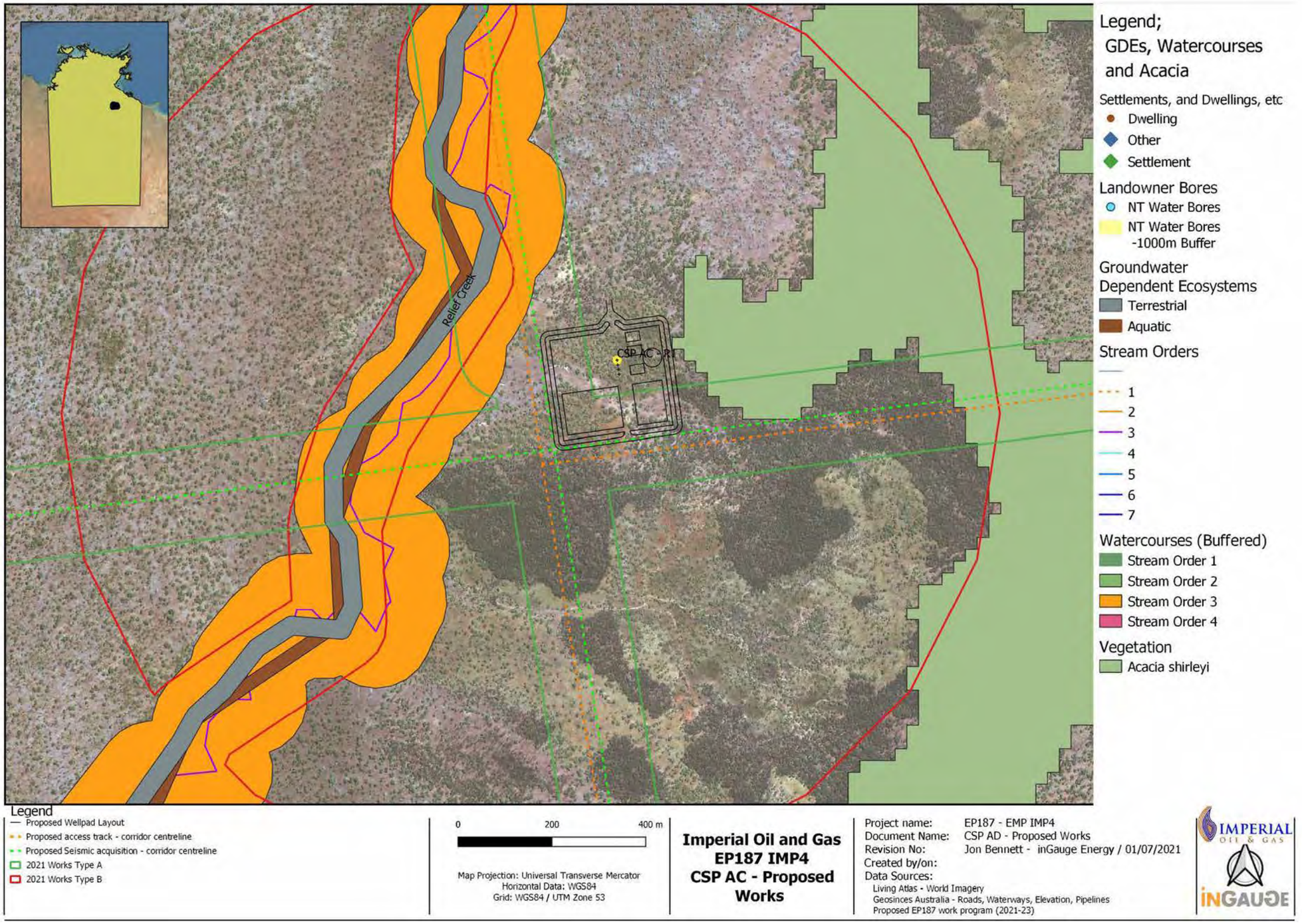

Figure 3.57: CSP AC – Indicative wellpad location – GDEs, Watercourses and Acacia Shirleyi

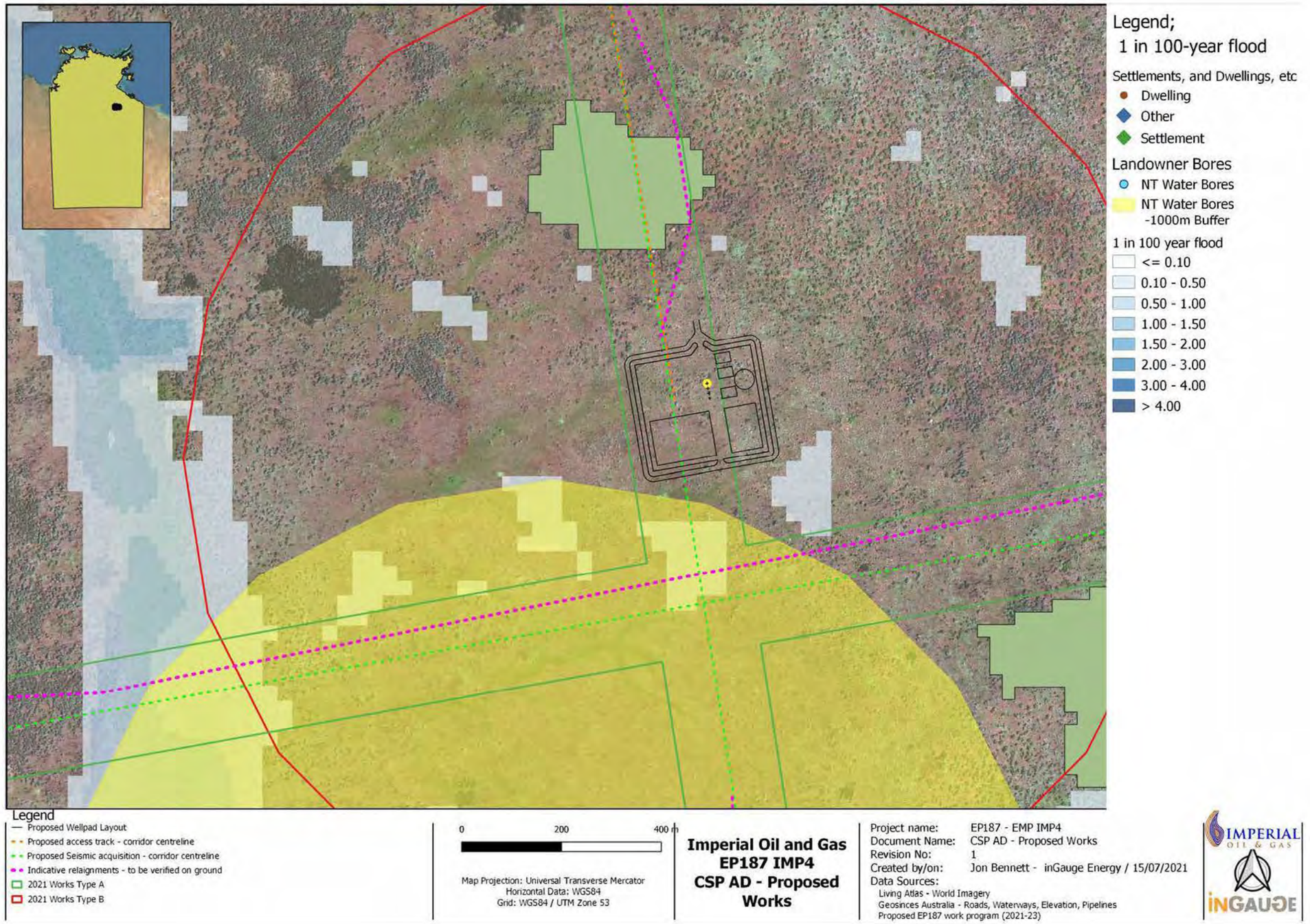

Figure 3.58: CSP AD – Indicative wellpad location – 1 in 100-year flood

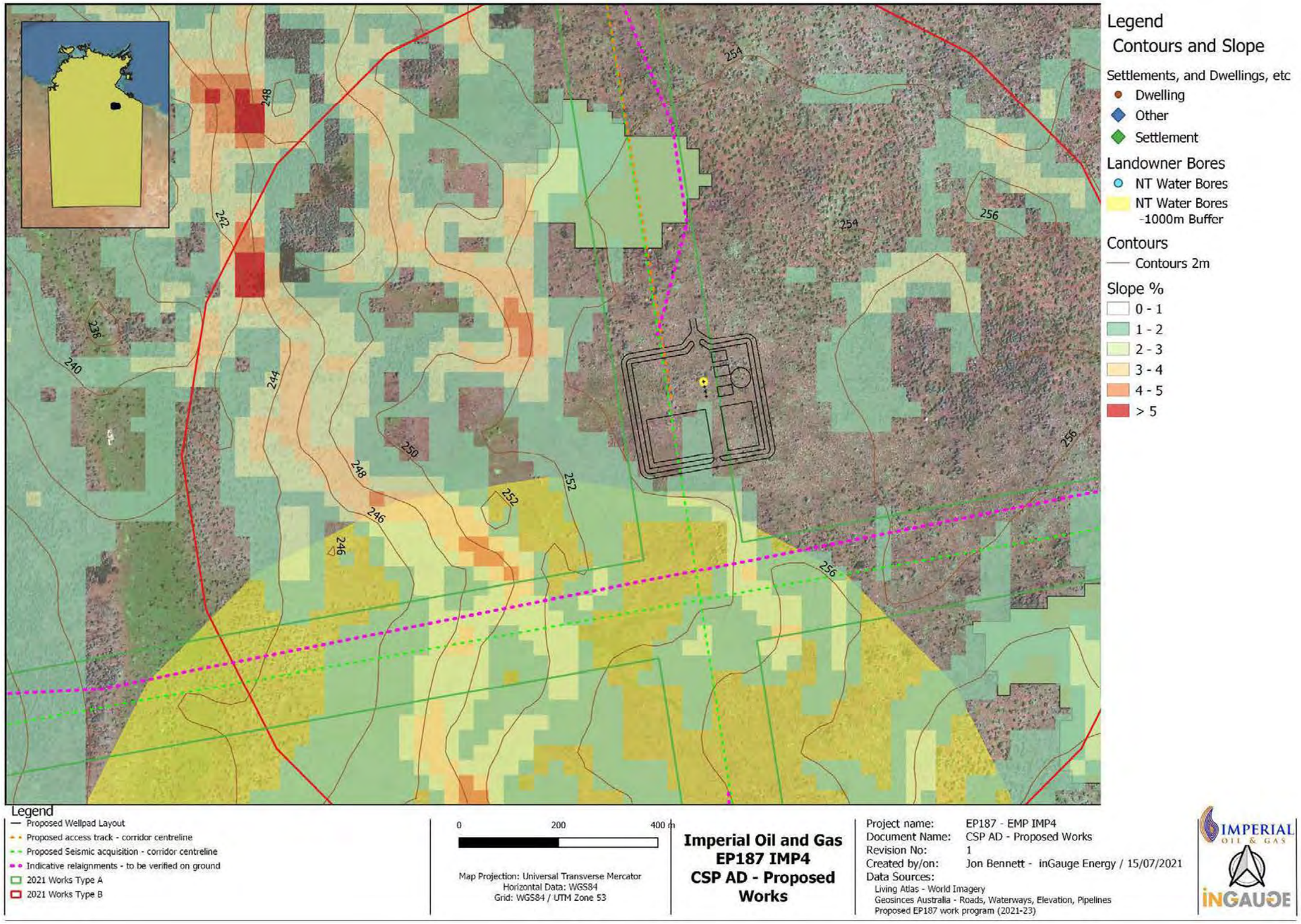

Figure 3.59: CSP AD – Indicative wellpad location – Contour and Slope

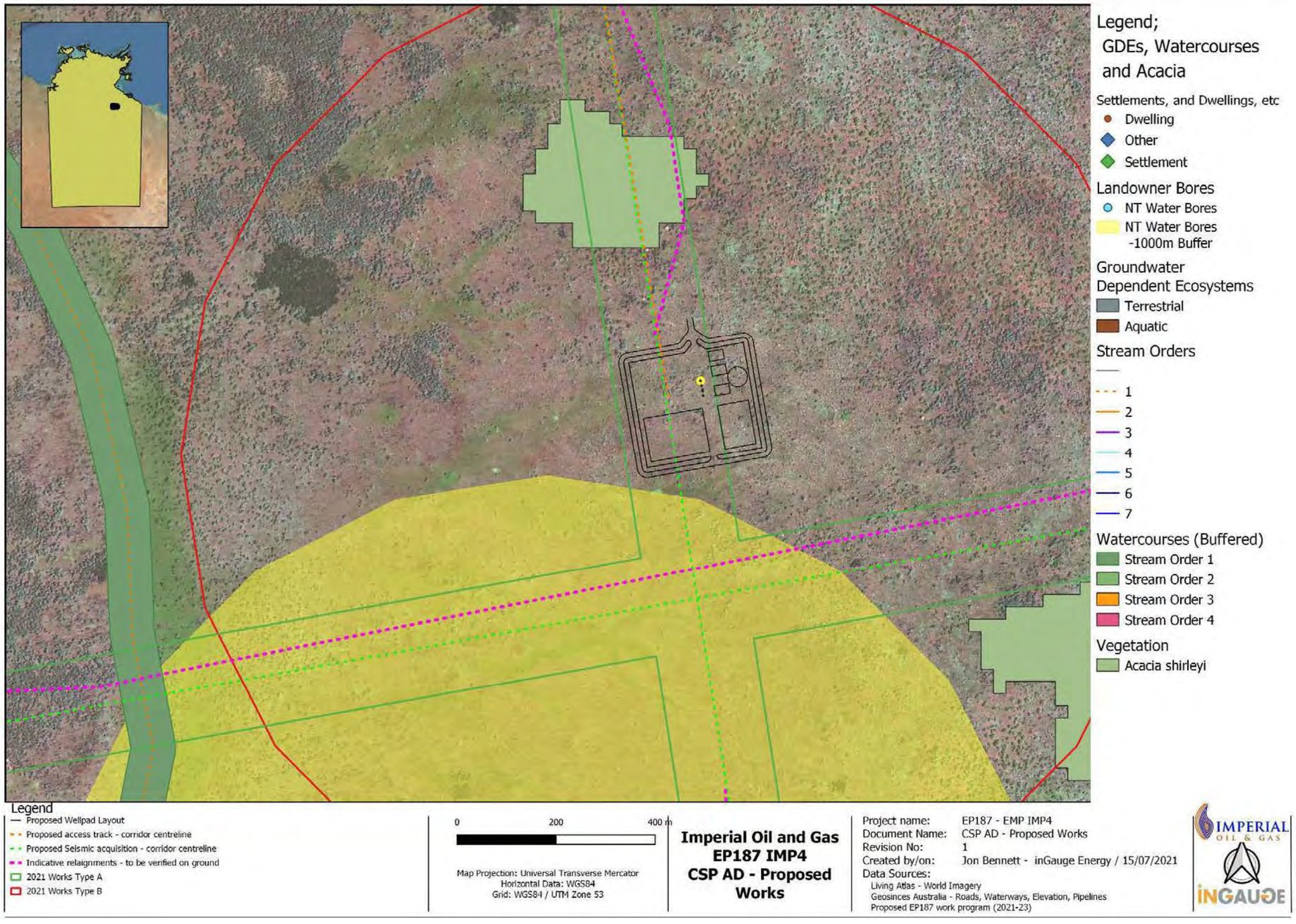

Figure 3.6o: CSP AD – Indicative wellpad location – GDEs, Watercourses and Acacia Shirleyi

3.6 Civil construction

The civil construction activities to be carried out under the is EMP are;

- Wellpad construction
- Access track construction
- Intersection construction

The activities under this EMP will be carried out by clearing the minimal areas practical and minimising the disturbance by;

- Deviating seismic lines around mature trees to the greatest extent possible
- Co-locating access tracks on seismic line disturbance
- Co-locating flowlines with access tracks
- Using multiwell pads where practicable

A breakdown of these new disturbance areas is shown in Table 12.

Table 12: Land Clearing for this program

Description	Area to be cleared under this EMP
Seismic Lines	58 Ha
Wellpad (6 of)	56 Ha
Access tracks/Fire Trails See notes T12.1 and T12.2	12 Ha
Gravel Pits	6 Ha
Flowlines	34 Ha
Total	166 Ha

Note T12.1: As access tracks will be predominately constructed on seismic lines, most of the length will require widening by 2m rather than clearing a full 6m.

Note T12.2: The area for access tracks includes widening sections for intersections and turn out drains.

Imperial will provide geospatial files of the extent of clearing to DEPWS after construction activities are completed.

Note that the wellpad cleared areas in this table do not account for the reduction in the cleared area if the Flowlines are installed between wellpads. The areas are stated as the larger number for both the wellpad and flowlines to ensure neither is understated, but in reality, where the flowlines are built, the wellpad area will reduce by approximately 1.6 Ha per linked wellpad, and conversely, where the full wellpads are built the flowline to that wellpad will not be built reducing the flowline cleared area.

3.6.1 Wellpad Construction

Wellpads will be constructed with a sufficient area to provide a safe and efficient workplace for drilling and other wellpad regulated activities.

The construction of wellpads will include:

- Clearing and levelling of the wellpad work area
- Construction of up to 2 lined pits per wellpad for the storage of freshwater, drilling fluids and drilling cuttings
- Construction of water production and monitoring bores
- Installation of drilling cellar and conductor
- Installation of closed-topped tanks for the storage of Frac Flowback Fluid and Produced Water
- Installation of open-topped tanks for the treatment of Frac Flowback Fluid and Produced Water
- Fencing of the wellpad to prevent livestock, wildlife and personnel entry
    - Fencing will be undertaken to fit the scope and purpose of the surrounding landholder's requirements. As such, a livestock proof fence will be put around the wellpad
- Clearing of firebreaks
- Installation of erosion and sediment control devices, including gravel capping where required

The wellpads will be signposted to identify;

- The well name and number
- Any major hazards
- Details of the interest holder
- The name of the person in charge

The proposed EP187 wellpad layout is shown in Figure 3.61 including the indicative placement of pits, tanks, erosion and sediment controls, and fire protection. Individual locations will be modified to suit site slope and vegetation. Figure 3.62 shows the multiwell wellpad footprint layout when cut and fill is required.

Where Wastewater Gathering Flowline is installed up to the wellpad as part of the civil works, the wellpad cleared area will be significantly reduced by eliminating the area required for tanks. It is likely that both the open and closed top tank area would not be required reducing the cleared area by approximately 16,000 square metres (1.6 hectares); however, calculations based on the distance to the nearest facility, pump capacity, line size, the size of hydraulic fracture stages planned and the scheduling of other work that utilise the gathering system may require that some reduced volume of the open or closed top tank may still be required.

The decision regarding the installation of a wastewater flowline gathering system, the reduction of on-site tank volume, and the associated reduction in the cleared area required for tanks will be made prior to mobilising the civil equipment for the pad, and after the hydraulic frac design and the location of all wells to be drilled in that campaign are confirmed. Individual locations will then be modified to suit the reduced land clearing requirement.

The proposed layout for a cut and fill wellpad for use on a sloped site is shown in Figure 3.62.

The proposed EP187 wellpad pit profiles are shown in Figure 3.63.

Further detail of the methodology to be used for wellpad construction, including levelling a wellpad on a sloped site, and wellpad size reduction where Wastewater Gathering flowlines are used, can be found in Appendix 02.

3.6.2 Multiwell pads

Multiwell pads can significantly reduce the amount of clearing required if they allow drilling to the several desired targets from one location. As the wellheads are generally only 10m apart, the wellpad footprint for up to a four well multiwell pad is no larger than a single wellpad.

If the drilling, HF and EPT operations on different wells on the same wellpad are accrued out over multiple years, the wastewater can be disposed of between wells so that extra tanks and pits are not needed.

If the activities on different wells on the same pad are carried out in quick succession, larger pits and tanks will likely be required. Imperial will continue to re-assess the schedule as it works through the program and size pits and tanks accordingly. As a significant proportion of drilling fluid is recycled during drilling operations, there is not a linear increase of drilling waste produced in relation to the number of wells on a pad.

The design requirements and operability of multi-well pad operations across all seasons are not materially different from a single well pad, especially as the drilling consumables are delivered to the wellpad as the drilling program progresses. No extra lay down or storage infrastructure is required for a multiwell pad.

The proposed EP187 multi-wellpad layout is shown in Figure 3.61 below, including the indicative placement of pits, tanks, erosion and sediment controls, and fire protection. Individual locations will be modified to suit site slope and vegetation.

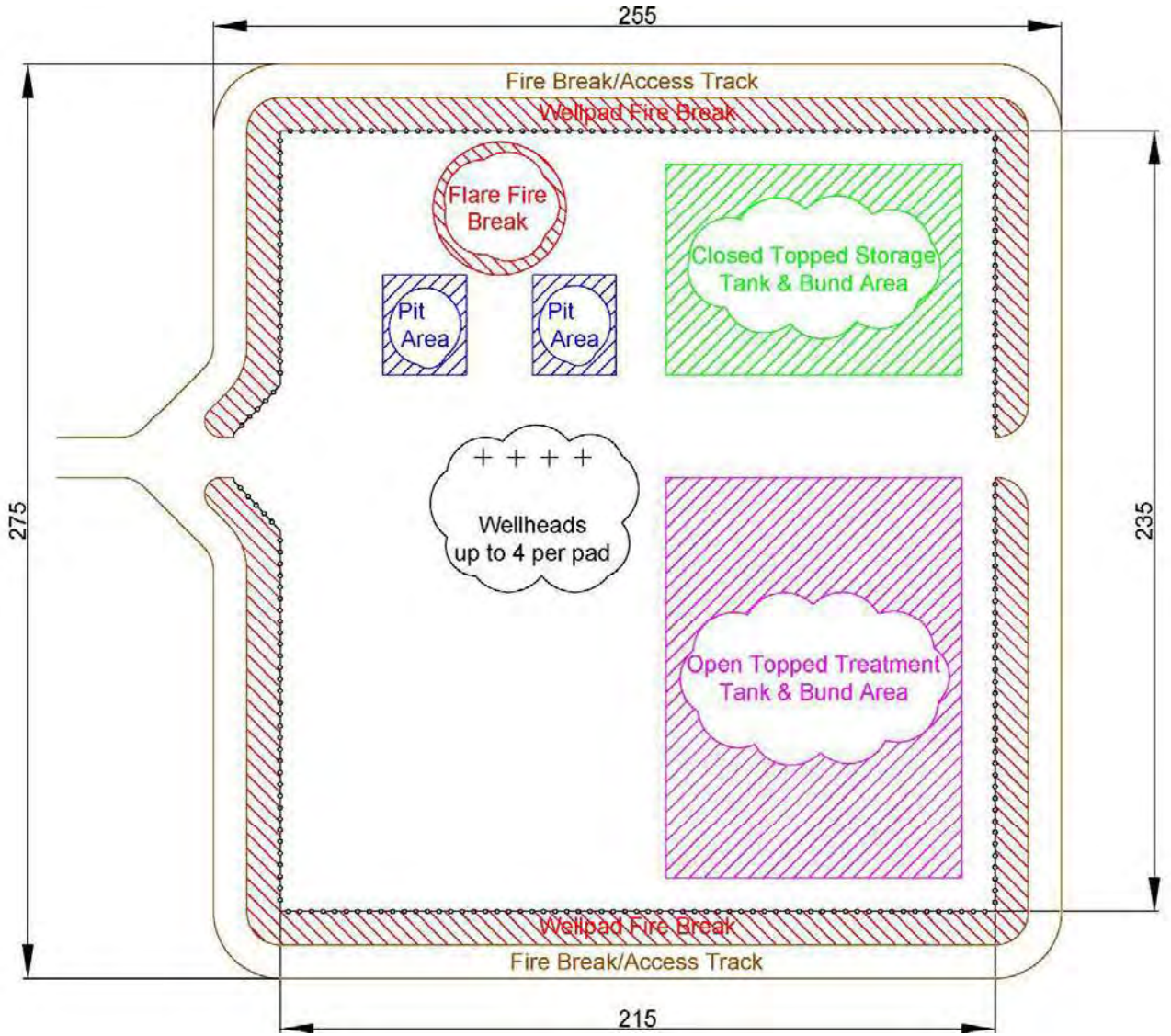

Figure 3.61: EP187 Multiwell Wellpad footprint with indicative tanks layout, where cut and fill is not required

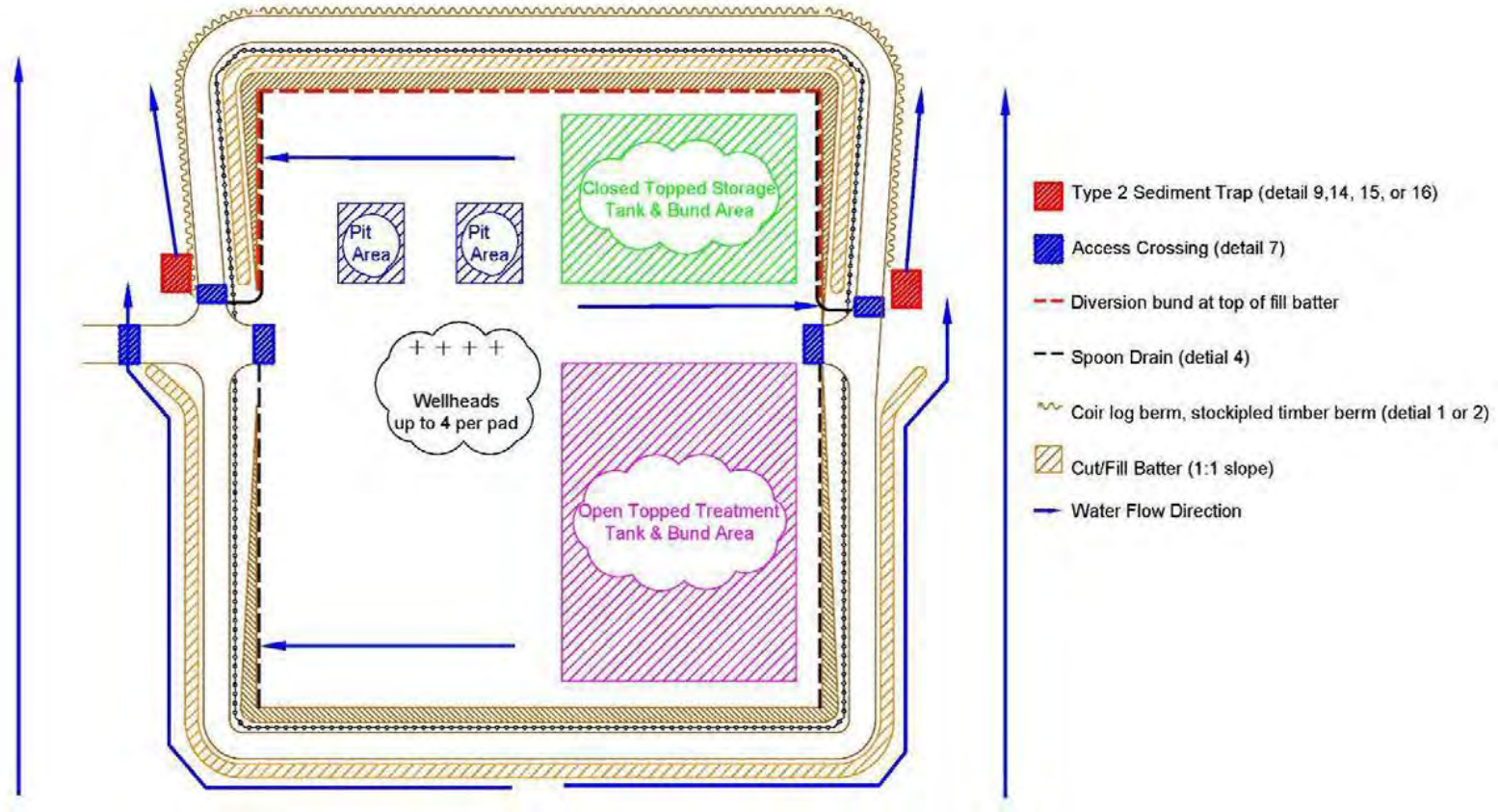

Figure 3.62:EP187 Multiwell Wellpad footprint with indicative tanks layout, where cut and fill is required

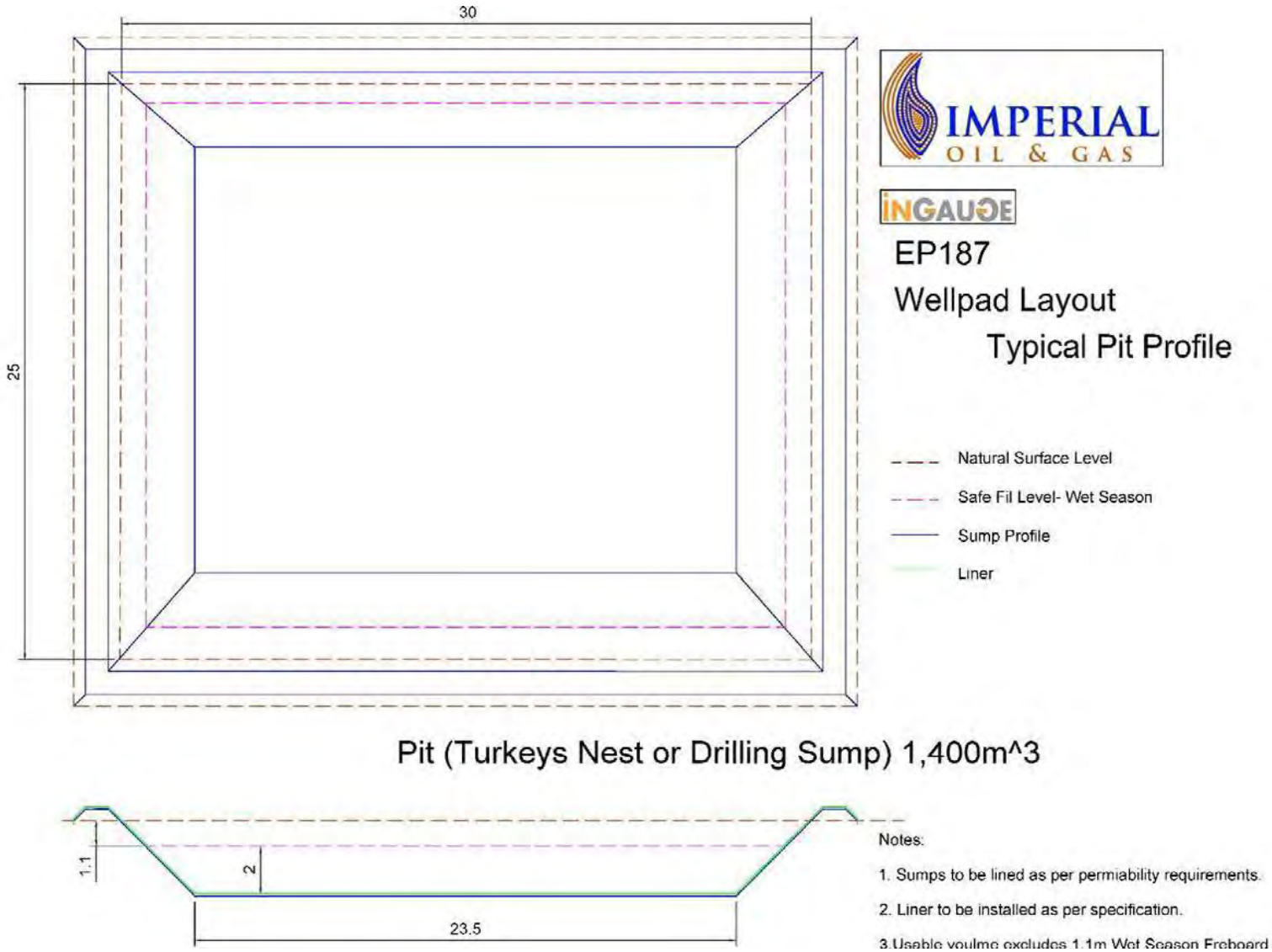

Figure 3.63: EP187 Wellpad Layout – typical pit profiles

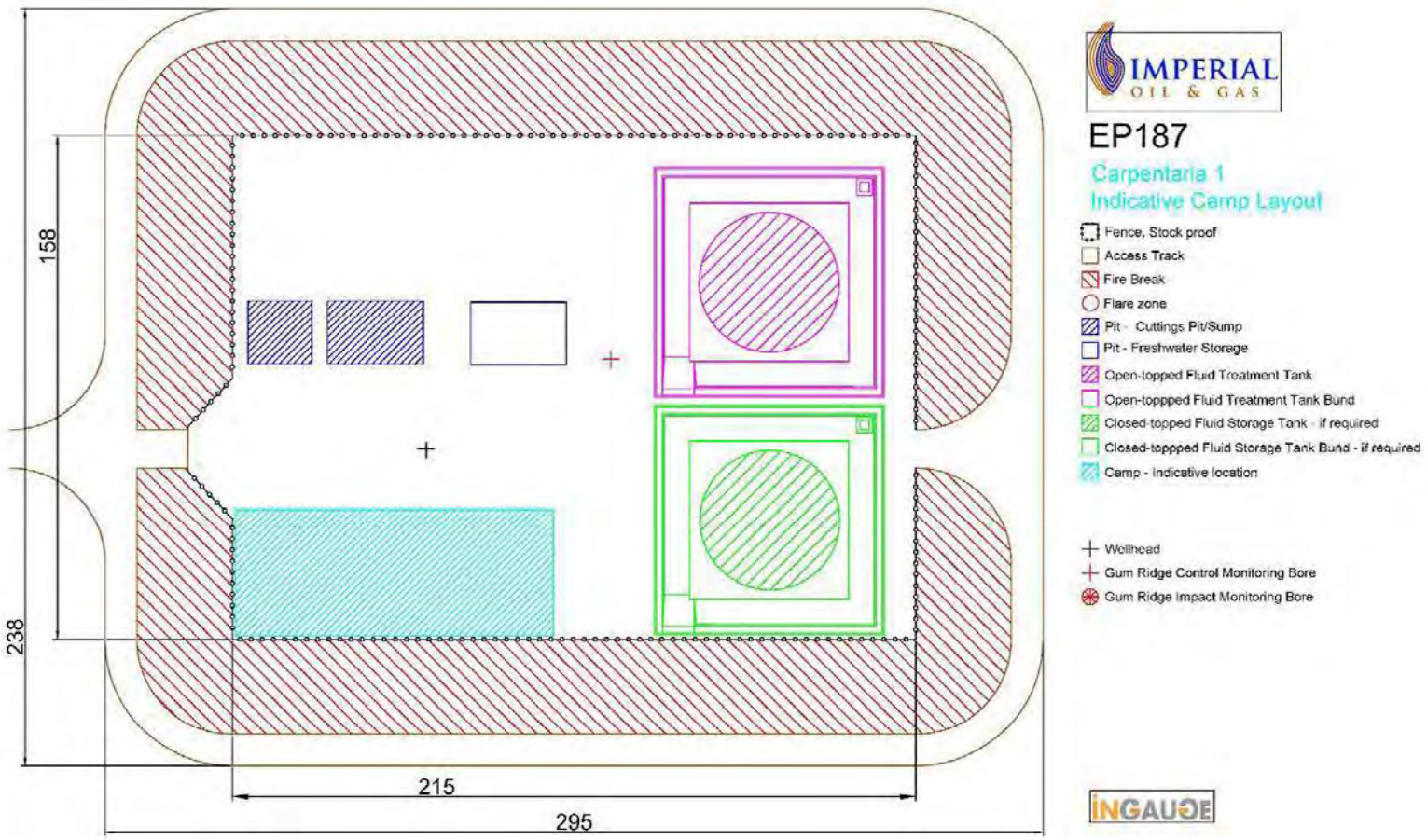

Figure 3.64: Carpentaria 1 – Indicative Camp Layout

3.6.3 Highway Intersection Construction

The activities under This EMP require the construction of an intersection onto the Carpentaria Highway. Imperial has applied and will gain permits and approval for constructing this intersection and the associated Traffic Management Plan from DPIL before the intersection construction works are carried out. Appendix 13 references the potential construction of up to three intersections; only Intersection 3 will be constructed under this EMP. Intersection 1 was included for future planning analysis, as Carpentaria AA and Carpentaria AB will be accessed via Intersection 3. Intersection 2 will not be constructed as access will be via the existing Carpentaria 1 intersection. Imperial will notify DEPWS when this approval is granted. All works will be conducted with the appropriate permits in place.

3.7 Groundwater Monitoring Program

Imperial will install a Control Monitoring Bore (CMB) and Impact Monitoring Bore (IMB) on each wellpad in line with the Preliminary Guideline: Groundwater Monitoring Bores for Exploration Petroleum Wells in the Beetaloo Sub-basin.

The location of these monitoring bores relative to the well is described in Section 3.10.4.

Licenced water bore drillers will drill these monitoring bores.

Imperial has Bore Works permits in place for the installation of these bores.

The monitoring program for the bores is covered in Table 27: Monitoring Plan.

3.8 Seismic

Imperial is carrying out a 166km 2D seismic survey under this EMP.

The 2D seismic survey aims to produce detailed images of the various formations and their location beneath the earth's surface.

The proposed seismic survey method uses vibrator trucks to produce sound waves. These sound waves are reflected off underground rock formations, and the waves that reflect to the surface are captured by recording sensors (geophones).

The returning reflections are recorded in a digital format and sent to a seismic data processing centre to produce a 'cross-section' of the earth's crust layers. Analysing the waves' time to return provides valuable information about rock types and possible gases or fluids in rock formations.

The 2D seismic lines are laid out in a grid pattern to help construct a better understanding of the operating area's geology.

Further detail of the methodology to be used for the seismic survey can be found in Appendix 02.

3.9 Wastewater Flowline

Imperial may install a Wastewater Gathering Network, utilising low-pressure (less than 1,500kPag) Polyethelene (PE) flowlines.

Depending on the order and timing of the appraisal program, it may not be beneficial to install the gathering network, e.g., if two wellpads are drilled relatively close together in a relatively short time, Imperial will likely construct flowlines between them. If, however, wellpads are drilled in a more dispersed pattern across the project, it may not be the lowest impact approach to install flowlines, so they may not be constructed. The current wellpad design in the EMP allows room for wastewater storage and treatment on each wellpad; where wastewater flowlines are built, the wellpad footprint will be reduced accordingly.

If used, these will be constructed as required to provide the ability to safely and efficiently transfer high volumes of fluids between wellpads and other facilities.

Fluids transferred in the Gathering Network may include:

- Groundwater
- Drilling fluids
- Flowback Fluid and Produced Water
- Wastewater
- But will not include liquid or gaseous hydrocarbons or concentrated chemicals

Flowlines will be constructed, operated, maintained and abandoned in line with the "Code of Practice for Upstream PE Gathering Lines in the CSG Industry and Companion Papers" published 10 November 2018 (hereafter referred to as the PEGN Code).

If a flowline is required to cross the Carpentaria 1 Highway Road, approvals with TCSD will be sought before works commence.

The motivation for Imperial to install and operate the Wastewater Gathering Network is to;

- Reduce the land clearing requirements for storage tanks at each well site
- Provide the capability for recycling and reuse of fluids between well sites
- Optimise in-field Flowback Fluid, Produced Water and Wastewater treatment to a centralised location
- Reduce trucking requirements
- Reducing the amount of groundwater water take
- Reduce the amount of wastewater for final disposal
- Operate the well site to minimise the potential for contaminant releases to the environment and any potential impacts of such releases.

Imperial will bury any flowlines outside of wellpad fences to protect them from fire, flood, and damage from livestock and human activity; this is in line with industry best practice. Flowlines will follow the disturbance footprint of access tracks or other pre-disturbed areas to reduce the amount of land clearing required and allow efficient construction, operation and maintenance.

Imperial will detect any leaks as per section 7.1.1 of Appendix 07, Spill Management Plan. Should a level 2 spill, or greater, occur during the wet season, Imperial will undertake the following measures to ascertain if any impacts have occurred. If the leak is in a watercourse, Imperial will sample 100m upstream, at leak point, 100m, 200m, 500m, 1,000m downstream. If the leak is not in a watercourse, but rather on soil; Imperial will sample at leak point and 100m away from the leak point, including inlet and outlet of the leak area as well as any surfacing puddles related to the leak at 100m and 200m from the leak point. Any Wastewater Flowline Leak will be reported to DEPWS.

A volume of 859,000 litres is the theoretical worst-case scenario if a flowline leak happens, being the entire volume of the system. However, this scenario is implausible as the whole flowline network would not generally drain to a single point in the system. Regardless, the leak would have been detected before the whole system drains. The longest likely timeframe to find a leak using the leak detection system will vary, subject to the size of the leak. It may take up to 24 hours for small leaks, as the leak may only be detected the following day if the system is shut down. Larger leaks will only happen when the system is operating and under pressure will be picked up within 2 hours as the system will be monitored during pumping periods.

Further detail of spill management can be found in Appendix 07, Spill Management Plan.

Further detail of the methodology used to construct and operate the wastewater flowlines can be found in Appendix 02.

3.10.1 Well information

The wells to be drilled under this EMP are exploration-appraisal wells on the western flank of EP187, in the Beetaloo Sub-Basin as determined in 2020 by the NTGS. They surround Carpentaria 1, which was drilled in 2020 under the Drilling EMP.

Table 13 presents the general well information, and Figure 3.65 illustrates the Stratigraphy, casing and cement configuration of Carpentaria 1, both of which are indicative of the proposed wells.

The shallowest target formation, the Velkerri – Amungee – C Shale formation top, was intersected at 1095mRT on Carpentaria 1. The formations and depths intercepted during the Carpentaria 1 drilling program are shown in Figure 3.65 and Table 14.

Among the various formations intersected during the drilling of Carpentaria 1, the Gum Ridge Aquifer (shallowest) was encountered from 50 to 115mRT, and the deepest aquifer being the Bukalara Sandstone, was encountered from 115m to 244mRT. Therefore, a minimum offset of 851m is present between the deepest aquifer base and the top of the well's shallowest primary target (Velkerri - Amungee C Shale formation). This separation distance complies with the minimum offset of 600m between the top target zone and base aquifer as mandated by the Code. All encountered aquifers will be isolated behind the cemented casing.

The wells to be drilled under this EMP will be targeting the same formations as intercepted during the drilling of Carpentaria 1 to increase the understanding of the resource potential in EP187. Some of the proposed wells will be drilled with a vertical pilot to provide more information on formations below the target formation; others will not have a vertical pilot drilled below the target formation. The wells drilled with the vertical pilot will be plugged back to the kick-off point before the lateral section is drilled. The wells with and without the vertical pilot will all have aquifers isolated behind cemented casing before drilling into hydrocarbon-bearing zones.

An example of a vertical pilot is shown in **Figure *3.65***

An example of a horizontal well drilled with a vertical pilot is shown in Figure 3.66.

An example of a horizontal well drilled without a vertical pilot is shown in Figure 3.67.

For further information on drilling practices, please refer to appendix 02.

Table 13: General Well Information

General Well Information			
Permit Area:	EP 187		
Basin:	Beetaloo Sub-Basin, the Beetaloo Sub-basin as determined in 2020 by NTGS		
Well Name	Carpentaria 1		
Well Type:	Exploration		
Primary Target	Velkerri - Amungee Shale Sequence		
Predicted Hydrocarbon	Dry Gas		
Carpentaria 1 (MGA94, Zone 53)	Easting Northing Elevation	513112 8143174 195 mGL	
Exploration Wellpad locations Imperial utilises buffers to allow fine-tuning of infrastructure locations to reduce on-ground impacts; wellpads have a 1000m movement buffer from the coordinates shown below to enable movement. The final location will comply with the recommended width for riparian buffers described in the Land Clearing Guidelines (DEPWS, 2020). Imperial will undertake a further archaeological assessment if a wellpad is proposed to be moved outside of the areas cleared by the current archaeological assessment.,			
Carp AA Well Location (MGA94, Zone 53)	Easting Northing	510819 8153792	
Carp AB Well Location (MGA94, Zone 53)	Easting Northing	515187 8154337	
	This location may move along a line between the two points listed below and will be situated as per the recommended width for riparian buffers described in the NT Land Clearing guidelines (DEPWS, 2020)		
	Line End Easting Northing	Western 515557 8154239	Eastern 523183 8154852
CSP AA Well Location (MGA94, Zone 53)	Easting Northing	525930 8142354	
	This location may move along a line between the two points listed below and will be situated as per the recommended width for riparian buffers described in the NT Land Clearing guidelines (DEPWS, 2020)		
	Line End Easting Northing	Western 5221171 8136399	Eastern 528948 8142267
CSP AB Well Location (MGA94, Zone 53)	Easting Northing	521897 8136472	
CSP AC Well Location (MGA94, Zone 53)	Easting Northing	518361 8136149	
CSP AD Well Location (MGA94, Zone 53)	Easting Northing	519321 8130769	

Table 14: Formation depths at Carpentaria 1

Formation depths at Carpentaria 1	mRT
Alluvium etc	0
Gum Ridge Formation	50
Bukalara Sandstone	115
Kyalla Shale	244
Moroak Sandstone	307
Velkerri - Wyworrie Member	589
Velkerri - Amungee Member	1024
Velkerri - Amungee - C Shale	1095
Velkerri - Amungee - Intra B / C	1155
Velkerri - Amungee - B Shale	1323
Velkerri - Amungee - Intra A / B	1379
Velkerri - Amungee - A Shale	1493
Velkerri - Amungee - Kalala Member	1551
Bessie Creek Sandstone	1832

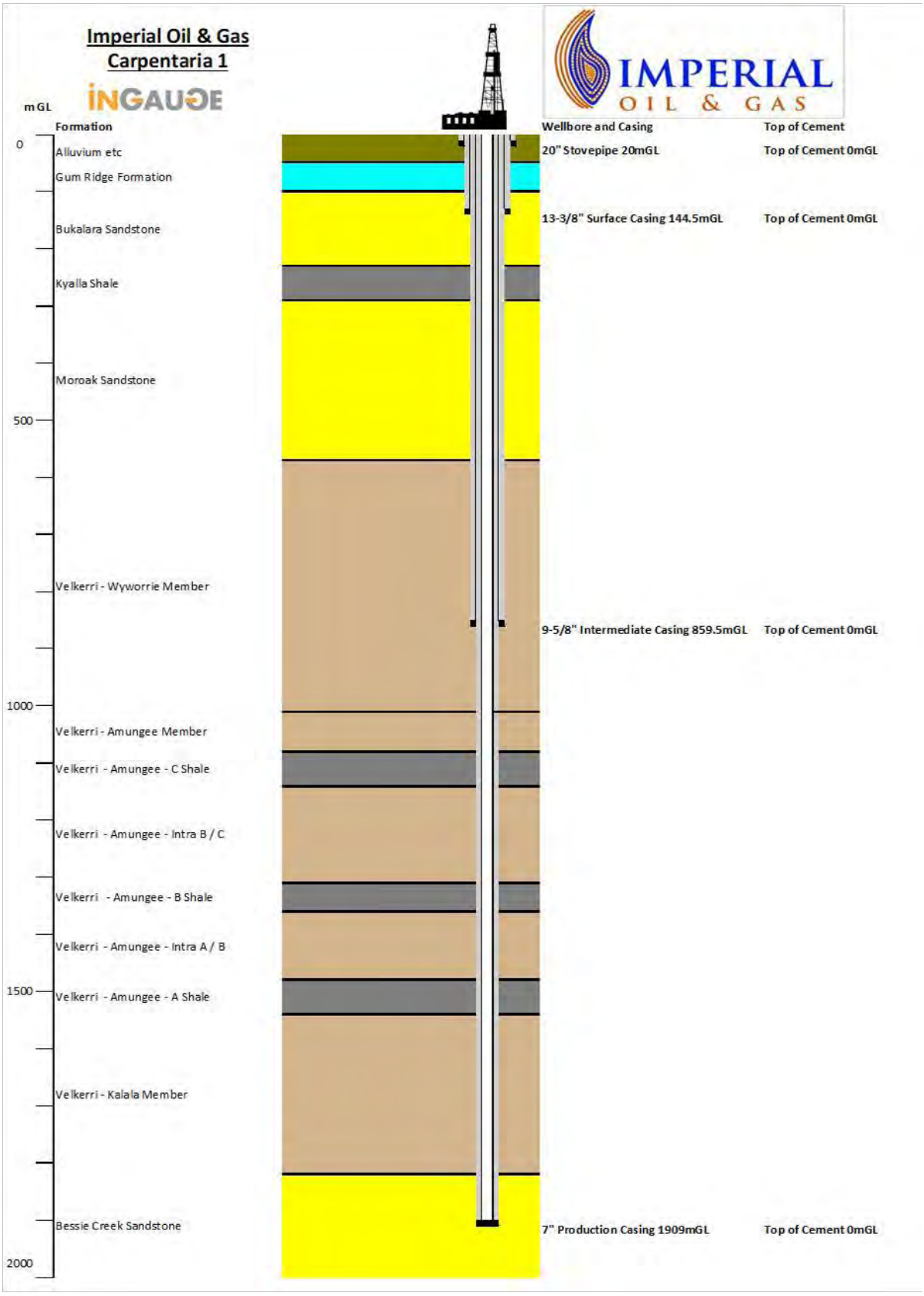

Figure 3.65: Carpentaria 1- Stratigraphy, Casing and Cement

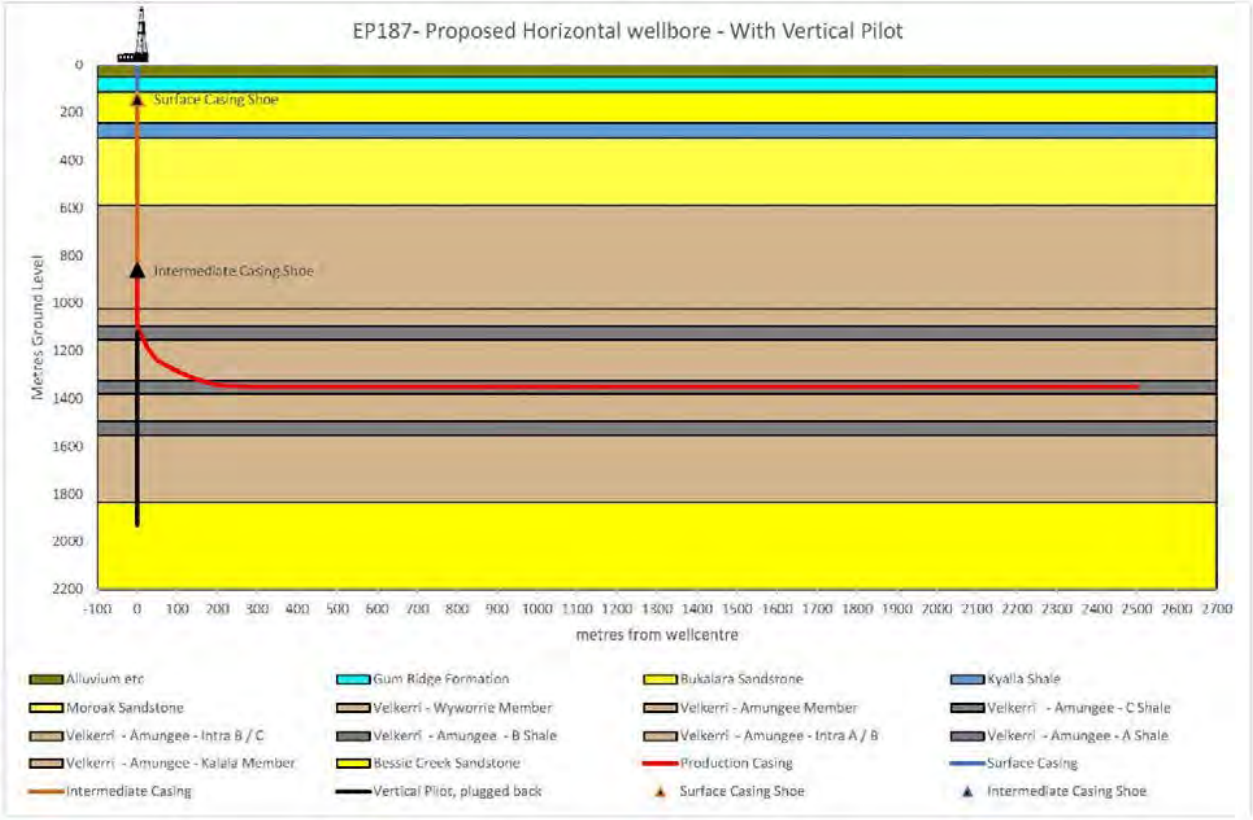

Figure 3.66: Proposed Lateral wellbore - with vertical pilot

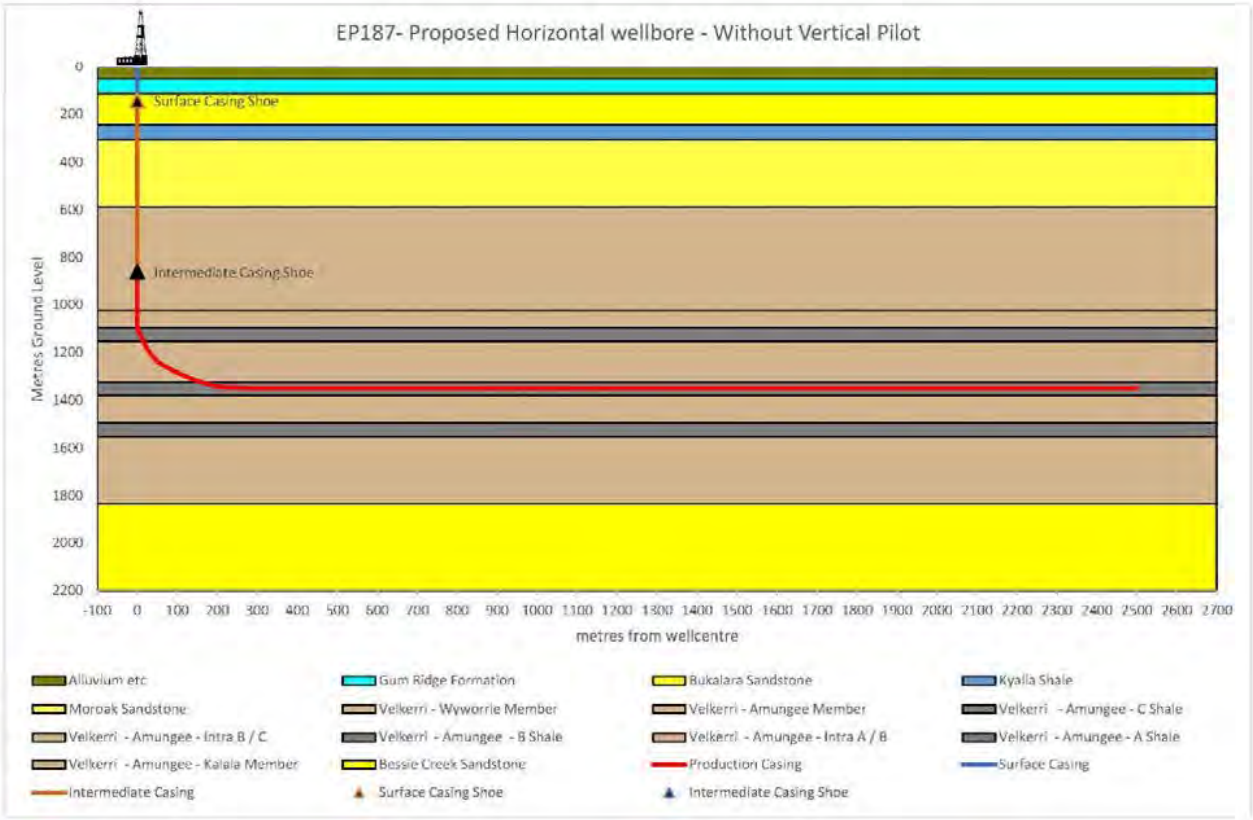

Figure 3.67: Proposed Lateral wellbore - without vertical pilot

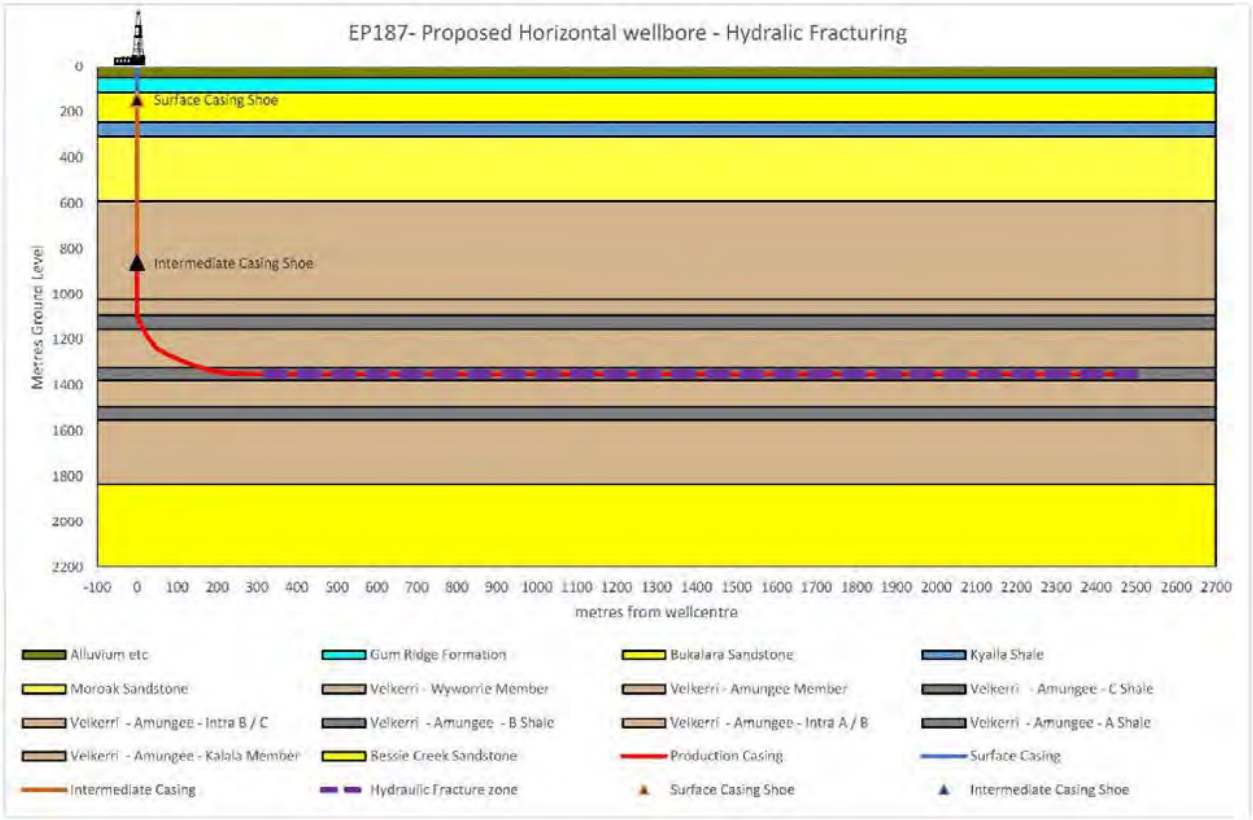

Figure 3.68: Proposed Lateral wellbore - Hydraulically fractured

3.10.2 Well Operations Management Plan

Parallel to the EMP, Imperial is compiling a Well Operations Management Plan (WOMP) to cover the Drilling, Hydraulic Fracture (HF), and Extended Production Test (EPT) activities to be carried out under this EMP. The WOMP will be submitted to DITT for approval before those activities are carried out.

The WOMP covers requirements for section B of the Code. Section B requirements of the Code will be covered under the WOMP rather than the EMP to avoid ambiguity between the EMP and WOMP. One exception to this is Aquifer protection. The EMP will address separation distances between aquifers on-site and the target formation and monitoring to be carried out for aquifer protection.

Imperial will provide DEPWS notification when DITT approves the revised WOMP.

3.10.3 Well Integrity Management

Well integrity management requirements are covered in the WOMP. The WOMP will be revised and approved by DITT before the regulated activities under this EMP are carried out. Imperial will provide DEPWS notification when DITT approves the revised WOMP.

3.10.4 Aquifer Protection

Casing setting depth will be selected to protect resources, including aquifers, according to section B.4.3.2 of the Code.

All aquifers encountered during drilling operations will be isolated from each other and the surface and any hydrocarbon-bearing zones by appropriate well barriers, following section B.4.3 of the Code.

Primary cementing design and validation will be carried out following the WOMP and B.4.7 of the Code.

Monitoring of barriers and casing conditions must be carried out following the interest holder's well operations management plan and per B.4.1 of the Code.

If an aquifer is discovered during drilling that was not identified prior to drilling, Imperial will notify the Minister in compliance with regulation 23 of the PER. This notification will identify whether or not the aquifer's environmental values have been adequately addressed under the EMP and whether or not the EMP requires revision under regulation 17 of the PER.

Imperial will drill a Control Monitoring Bore, and an Impact Monitoring Bore for the Gum ridge formation on each wellpad drilled under this EMP. The logs from these monitoring bores will be utilised to build an accurate understanding of what aquifers and potential geohazards exist at the site and their depth from the surface. The control monitoring bore (CMB) location on each wellpad will be approximately 100 metres up-gradient from the petroleum well. The impact monitoring bore (IMB) location will be approximately 20 metres down-gradient from the well in compliance with the Code. Groundwater quality reporting from the impact monitoring bore (IMB) to DEPWS will comply with the Code.

Furthermore, the Bukalara Sandstone aquifer will be monitored at RN041679 using the same parameters and frequency as the Gum Ridge. Refer to Table 27 for monitoring details. This

monitoring demonstrates further that the Carpentaria-1 petroleum well has isolated and protected the Gum Ridge and Bukalara Sandstone aquifers and confirms that no impact to groundwater is occurring as a result of the regulated activities.

Imperial will supply DEPWS with local baseline data for water quality indicators as part of the EMP activities in line with Table 7 of the Code and the required analyte testing from the Preliminary Guideline: Groundwater Monitoring Bores for Exploration Petroleum Wells in the Beetaloo Sub-basin before HF of any wellbore. This baseline will be established by a minimum of eight samples from the Control Monitoring Bore (CMB) and Impact Monitoring Bore (IMB) at each new well pad on EP187 before undertaking hydraulic fracturing of the well.

Imperial has an accurate understanding of what aquifers exist at the well site, their depth from the surface, and their relationships to each other and other hydro-stratigraphic units and uses this knowledge during the well design phase.

3.10.5 Well Design and Well Barriers

Well Design and Well Barrier requirements are covered in the WOMP. Imperial's WOMP will be compiled and reviewed and approved by DITT before the regulated activities under this EMP are carried out. Imperial will provide DEPWS notification when DITT approves the revised WOMP.

3.10.6 High-Pressure High-Temperature well design

No high-pressure, high temperature offset wells were found during the offset well review; the Carpentaria 1 well is not a high-pressure, high temperature well as defined in the Code of practice.

3.10.7 Working with Hydrogen Sulphide (H_2S)

There was no evidence of Hydrogen Sulphide in the offset wells reviewed or during the drilling of Carpentaria 1.

3.10.8 Casing and Tubing

Casing and tubing requirements are covered in the WOMP. The WOMP will be compiled by Imperial and reviewed and approved by DITT before the regulated activities under this EMP are carried out. Imperial will provide DEPWS notification when DITT approves the WOMP.

3.10.9 Primary Cementing

Cementing requirements are covered in the WOMP. The WOMP will be compiled by Imperial and reviewed and approved by DITT before the regulated activities under this EMP are carried out. Imperial will provide DEPWS notification when DITT approves the WOMP.

3.10.10 Wellheads

Wellhead requirements are covered in the WOMP. The WOMP will be compiled by Imperial and reviewed and approved by DITT before the regulated activities under this EMP are carried out. Imperial will provide DEPWS notification when DITT approves the WOMP.

3.10.11 Well Control

Well Control requirements are covered in the WOMP. The WOMP will be compiled by Imperial and reviewed and approved by DITT before the regulated activities under this EMP are carried out. Imperial will provide DEPWS notification when DITT approves the WOMP.

3.10.12 Drilling Fluids

Drilling fluid requirements are covered in the WOMP. The WOMP will be compiled by Imperial and reviewed and approved by DITT before the regulated activities under this EMP are carried out. Imperial will provide DEPWS notification when DITT approves the WOMP.

The management of drilling fluids for the regulated activities under this EMP is covered in the Wastewater Management Plan and the Spill management Plan. See appendices 06 and 07.

Drilling fluids composition will be selected to ensure low toxicity and to be water-based. No non-aqueous fluids or containing benzene, toluene, ethylbenzene, or xylene (BTEX) will be used while drilling.

Imperial will utilise checklists during construction, site operations and periods where the wellpad is not operational to monitor and ensure compliance.

3.10.13 Air and Gas Drilling Fluids

Air and Gas drilling fluids are not planned to be used under this EMP.

3.10.14 Well Evaluation, Logging, Testing and Coring

Well Evaluation, Logging, Open Hole Testing and Coring requirements are covered in the WOMP. The WOMP will be compiled by Imperial and reviewed and approved by DITT before the regulated activities under this EMP are carried out. Imperial will provide DEPWS notification when DITT approves the WOMP.

3.10.15 Multiple wells on a single well site

Imperial may use multiwell pads under this EMP if it allows the reaching of proposed targets.

Where multiwell pads are used, extra precautions are required to avoid collision of wellbores; further information on collision avoidance is available in Appendix 02.

If the targets on a multiwell pad are in the same direction, the wellbores are drilled in a way to gain separation before entering the target formation, before running parallel, at a separation distance of >350m.

As the wellbores are only perforated and Hydraulically Fractured in the target formation, at least 350m of separation exists between the wellbores being Hydraulically Fractured. A plan view of this is shown in Figure 3.69.

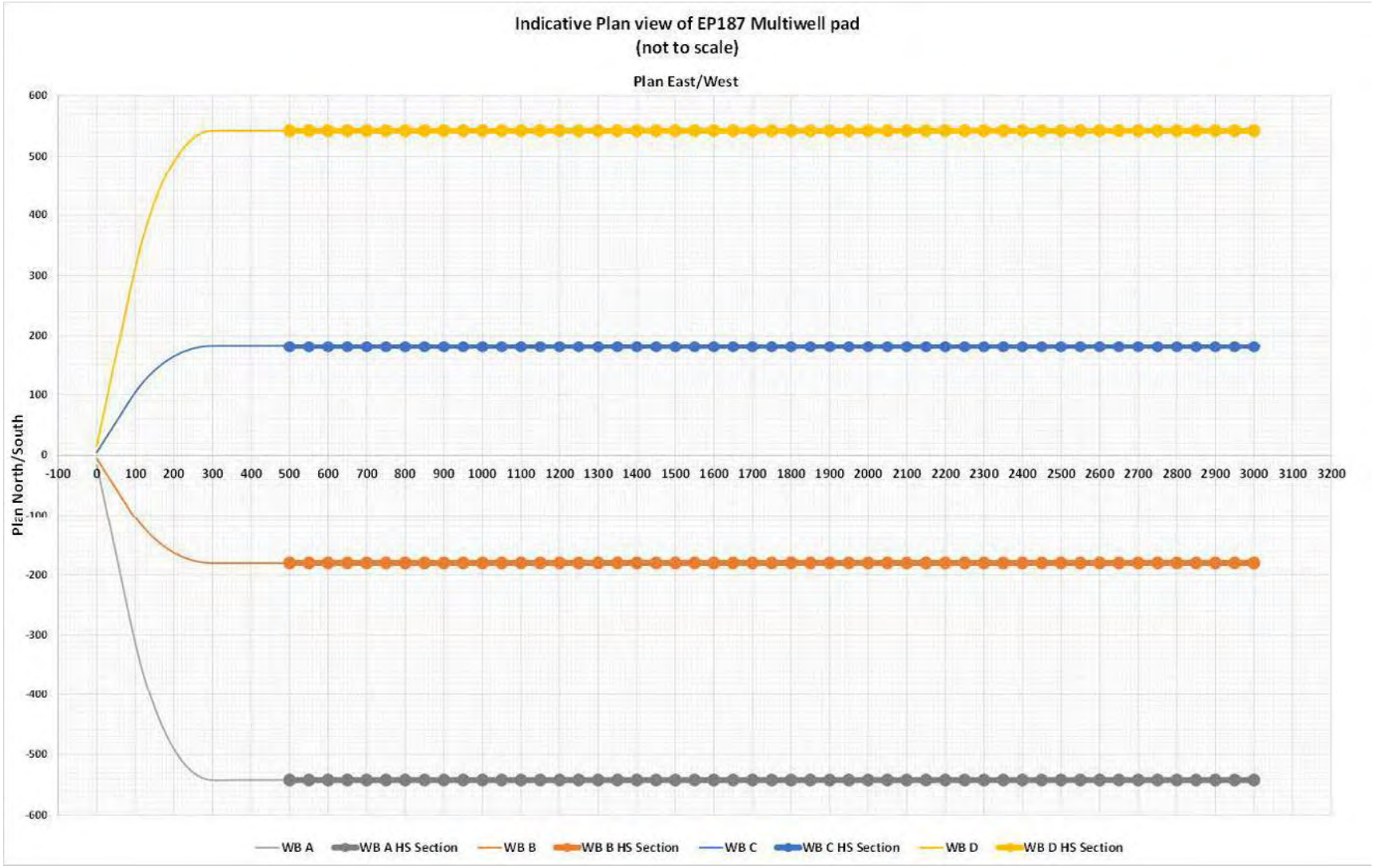

Figure 3.69: Indicative plan view of EP187 Multiwell pad

3.11 Hydraulic Fracture

Wells drilled under this EMP will be Hydraulicly Fractured to increase the shale formation's available surface contact area; this enhances the volume of hydrocarbons that migrate into the wellbore and flow to the surface.

The process of hydraulic fracturing follows these sequential stages:

1. Well integrity verification
2. Stimulation activities.

3.11.1 Well integrity validation

Before the stimulation of each well, the wellbore will be assessed to ensure that sufficient well integrity is in place to withstand hydraulic fracturing pressures as per the Code of Practice (B.4.7.2 and B.4.13.2) and Section 302A of the Schedule of Onshore Petroleum Exploration and Production Requirements.

The assessment will include the following completed for each exploration well:

- Cement evaluation logs are run to ensure that at a minimum 150mTVD of good quality cement is present from the target reservoir to the nearest aquifer to ensure zonal isolation as per Imperial's Barrier Standard ING_POL_WELL_BARRIER_Rev_01
- Confirmation of geological barriers and assessment of geological hazards
- Mechanical integrity evaluation of the production casing via a pressure test to the Maximum Allowable Operating Pressure (MAOP)

The maximum anticipated hydraulic fracture stimulation pressures at screenout define the MAOP for each well.

The pressure testing parameters will be covered in the WOMP. The WOMP will be compiled by Imperial and reviewed and approved by DITT before the regulated activities under this EMP are carried out. Imperial will provide DEPWS notification when DITT approves the WOMP.

A Well Barrier Integrity Verification Report (WBIV) certified by an independent and reputable validator will be completed and submitted to DITT before and after hydraulic fracturing.

3.11.2 Hydraulic Fracturing Operations

A description of HF operations is included in Appendix 02.

The pressure kicks out on the pump units, and in-line pressure relief valves (where utilised) will be set below the MAOP from above.

The pressure communication between casing annuli will be monitored and controlled during HF pumping and flowback activities.

Hydraulic fracture stimulation activities have been designed not to impact aquifers. Imperial will install a groundwater level/pressure logger in the Impact Monitoring Bore (IMB) during the regulated activity as an additional measure to demonstrate the aquifer's ongoing isolation. Groundwater quality in IMB will continue to be monitored after hydraulic fracturing activities and reported to DEPWS.

Hydraulic Stimulation and Flowback Operations requirements are covered in the WOMP. The WOMP will be compiled by Imperial and reviewed and approved by DITT before the regulated activities under this EMP are carried out. Imperial will provide DEPWS Notification when DITT approves the WOMP.

3.11.3 Geological Hazard Assessment

A geohazard assessment will be conducted as part of the Drilling planning and WOMP preparation utilising the seismic program results from this work program to identify subsurface hazards that could pose an environmental risk during the drilling and HF Programs. This risk assessment results will be presented to DITT for their review and approval before drilling and HF activities are carried out.

3.11.4 Design

The Hydraulic Fracture design has been carried out using modelling to demonstrate the expected geometry. The fracture initiation points are significantly separate from each other and are designed to ensure isolation between the hydraulic fracture planes. This applies to single and multi-wellpads, and the risk on multi-wellpads is not significantly different from single wellpads. The well construction ensures the integrity of each of the individual wellbores. They are designed for the pressures expected during the operation and no interaction between the wellbores drilled from the same pad. The HF design will be developed using industry recognised software and geomechanics data, taking into consideration; the target zones, sealing mechanism(s) (both natural geological seals as well as adequate casing and annular cement), the risk of casing deformation and separation from aquifers, to minimise the possibility of hydraulic fracturing fluids migrating from the designed fracture zone(s).

The fracture stimulation design, the well construction and well integrity are more fully described within the WOMP. The WOMP will be approved by DITT before the regulated activities under this EMP are carried out. Imperial will provide DEPWS notification when DITT approves the WOMP.

3.11.5 Hydraulic Fracturing Fluids

As far as reasonably practicable, fluids with the lowest toxicity will be used in hydraulic stimulation, and the concentrations used will be the minimum required to facilitate effective operations.

During HF design HF fluid additives will be selected and managed to ensure all products are used in accordance with the manufacturer's recommendations and relevant safety data sheets.

HF fluids will not contain benzene, toluene, ethylbenzene, or xylene (BTEX).

Imperial has considered the use of recycled water for HF operations, but the volume required and the remoteness of the location does not make it reasonably practical; Imperial will consider utilising Flowback Fluid and Produced Water from this operation in future EP187 operations.

For each stage (or depth level) pumped; the as pumped composition of any fracture stimulation fluids will be monitored and recorded;

- The total volume pumped
- Pumping pressure
- The quality of water used, tested for analytes in section C.8 of the Code (Where the same fluid is used on multiple stages in the same fluid test results can apply to multiple stages)
- Typical and maximum concentrations of chemicals or other substances used.

3.11.6 HF Chemical Risk Assessment

A risk assessment was carried on HF Chemicals; the full risk assessment is provided in Appendix 06.01 (HF Chemical Risk Assessment)

The chemical risk assessment goal demonstrates that potential risks to expose human and ecological receptors have been eliminated or reduced ALARP. The life cycle of the hydraulic stimulation fluid system chemicals was assessed specifically for hydraulic stimulation operations and included:

- Activities associated with hydraulic stimulation chemical mixing and use at the well pad, and
- Management of flowback water (i.e., stored on-site) during or after the completion of hydraulic stimulation activities at the well pad

The Risk Assessment found that hydraulic stimulation chemicals within the life cycle (i.e., mixing, usage and storage) may potentially expose human receptors and the environment through accidental releases. These potential releases, whilst unexpected, are considered to have a very low probability of occurrence and are constrained by the EMP requirements to managing risk, existing legislative requirements and the ongoing mitigating of potential impacts.

Imperial has developed and implemented a range of systems and plans to control the transportation and storage of chemicals during field development and operational activities. This includes personnel induction and training, effective traffic management and routing to minimise the potential for accidents and spill management planning and response equipment. These systems and processes are considered effective in lowering the probability of consequence associated with transportation incidents. The critical controls in these systems and plans that will be implemented to minimise the potential for environmental impact can be found in the risk assessment in Appendix 04.

The human health and ecological hazard mitigation information provided in the chemical risk assessment dossiers and SDSs primarily focuses on safe handling, transportation and worker protection.

Based on the outcomes of this assessment, no further management controls were considered necessary.

3.12 Flowback and Extended Production Testing Activities

Flowback and Extended Production Testing (EPT) activities are carried out to remove the HF fluid from the formation and validate the well production rates. A three-phase separator is connected to the wellhead's outlet; the separator splits the well Flowback Fluids into gas, oil and water by gravity level controllers.

The gas is directed to flare, water to flowback tanks, and condensate to storage tanks or flare, depending on the composition. All gas, water and condensate flow volumes are measured and recorded.

Imperial will carry out extended production testing for a period of no greater than 90 days for each well.

Details of Flowback and Extended Production Testing (EPT) activities are covered in Appendix 02.

Flowback Fluid or Produced Water in drilling fluids or hydraulic fracturing fluids will not contain BTEX at levels greater than those expected in water produced (including flowback) from the well being drilled. BTEX levels in water used for drilling fluids or stimulation fluid will not exceed the levels prescribed in Table 9 of the Code. Imperial plans to use no BTEX in its drilling fluids as per Section 3.10.12.

3.13 Venting and Flaring

Due to the remoteness of EP187 and the likely volumes produced, it is not practical to capture the gas for sale or other use.

All Flowback Fluid and Produced Water will flow to a separator package fitted with accurate flow measurement devices. The gas flowing to a completion combustion device is equipped with a continuous ignition device to minimise gas release to the atmosphere.

Venting may be carried out rather than flaring if the gas flow is insufficient to allow the separator to function correctly. The use of a combustion device creates a fire or safety hazard.

When venting is the only technically feasible option for managing produced gas, the technical considerations preventing the use of the recovered gas will be recorded and included in Imperial's annual report.

Gas volumes emitted during the drilling, HF, completion, flowback, and workovers will be measured using direct measurement as governed under the Commonwealth National Greenhouse and Energy Reporting (Measurement) Determination (2008) and reported per Part D of the Code.

During system upsets or accidental release, emissions will be estimated using methods consistent with the National Greenhouse and Energy Reporting (Measurement) Determination 2008.

3.13.1 Flare design and efficiency

Produced gas, and pending results, potentially condensate, during EPT will be sent to a vertical flare system to allow a controlled release and gas burning. It is equipped with an autoignition system that provides electrical impulses to generates a spark every 1.3 seconds to ensure that the flare is always operational. Any flares used under this EMP will have a tip efficiency of greater than 96%.

3.13.2 Flare Pits

Imperial does not intend on using flare pits for the regulated activities under this EMP.

3.14 Workover and Intervention

Workover and intervention requirements are covered in the WOMP. The WOMP will be compiled by Imperial and reviewed and approved by DITT before the regulated activities under this EMP are carried out. Imperial will provide DEPWS notification when DITT approves the WOMP.

3.15 Well Suspension and Decommissioning

This EMP's project schedule is planned for a temporary well suspension before further activity. For the temporary well suspension planned, the primary considerations and activity plans will ensure that;

- Well integrity is maintained at all times as set out in Section B4.1 of the NT Code of Practice
- Monitoring requirements can be met
- All safety requirements are met.

There is scope for decommissioning and abandonment under this EMP, but the decision on whether to proceed of not is dependent on the outcome of the drilling and evaluation program. If the well is abandoned or decommissioned, the EP-187 wells will undergo the following:

1. Two permanent barriers to ground level from any:
    a. Hydrocarbon bearing zone, or
    b. Over-pressured permeable zone.
2. One permanent barrier to ground level from any:
    a. Normally pressured, non-hydrocarbon bearing, permeable zone drilled after the BOPs are installed.
3. One permanent barrier will be provided between discrete permeable zones with different pressure regimes.
4. All aquifers will be isolated:
    a. From each other and the surface by a minimum of one well barrier; and
    b. From any permeable hydrocarbon-bearing ones by a minimum of two well barriers

Section B.4.15 of the NT Code for the suspension and decommissioning of Wells will be complied with for any well abandonment and suspension activity via detailed well suspension or abandonment programs before the activities being conducted.

Well suspension and decommissioning requirements are covered in the WOMP. The WOMP will be compiled by Imperial and reviewed and approved by DITT before the regulated activities under this EMP are carried out. Imperial will provide DEPWS notification when DITT approves the WOMP.

3.16 Waste and Wastewater generation

The activities that will generate waste and wastewater, including waste proposed to be handled, stored or transported away from the Location of the Regulated Activity, are summarised in Table 15.

A more detailed explanation of the waste streams and their management is covered in Appendix 06 (Waste and Wastewater Management Plan) and SMP (Appendix 7).

Table 15: Waste Sources and types

Waste source	Waste type
Domestic activities (camp and offices)	• Treated sewage effluent • Putrescible and municipal waste • Greywater (laundry, showers, sink wastes, etc.) • Recyclables (glass and cans)
Seismic acquisition activities	• Vehicle tyres • Oily rags, filters
Civil construction activities	• Chemical bags and cardboard packaging materials • Scrap metals • Timber pallets (skids) • Vehicle tyres • Oily rags, filters
Drilling activities	• Drilling fluids • Drilling cuttings • Cement returns
Hydraulic fracture activities	• Flowback fluid • Produced water
Production testing activities	• Flowback fluid • Produced water
Ancillary activities to; drilling, hydraulic fracturing, and production testing	• Chemical bags and cardboard packaging materials • Scrap metals • Used chemical containers and fuel drums • Chemical wastes • Timber pallets (skids) • Vehicle tyres • Oily rags, filters

3.17 Ancillary activities

3.17.1 Project Water Use

For the activities under this EMP, Imperial intends to extract water from two water bores (RN041678 & RN41800) located on the Carpentaria 1 wellpad and water bores to be drilled on the new wellpads, under the approved water license GRF10316. Imperial will apply for an increase in the volume to be extracted under GRF10316 to cover this and future work programs' requirements.

The water required for the project is anticipated to be 434.28 ML. A breakdown of the water usage and its volumes is provided in Table 16.

The personnel water use will be approximately 200 L/day per person, which is a total of approximately 0.5 ML/month, over twelve months, which is the anticipated duration of the Drilling and HF Programs.

Table 16: Estimated Water Use for this EMP

Use	Scope	Total Use (ML)
Civil Construction	0.5 per wellpad	3.5
Drilling	2.5 ML per well	17.5
HF fluid make-up	55 ML per well	385
Lateral Completion	0.5 ML per well	3.5
Operational Activities	Road and site maintenance at 1ML p/m Vehicle wash downs (0.1ML per month)	18.7
Camp Use	200L/day per person per day on site (0.39ML per Month when camp used)	6.24
Totals		434.28

Figure 3.70 outlines the expected water usage by month until the end of the project scope of this EMP.

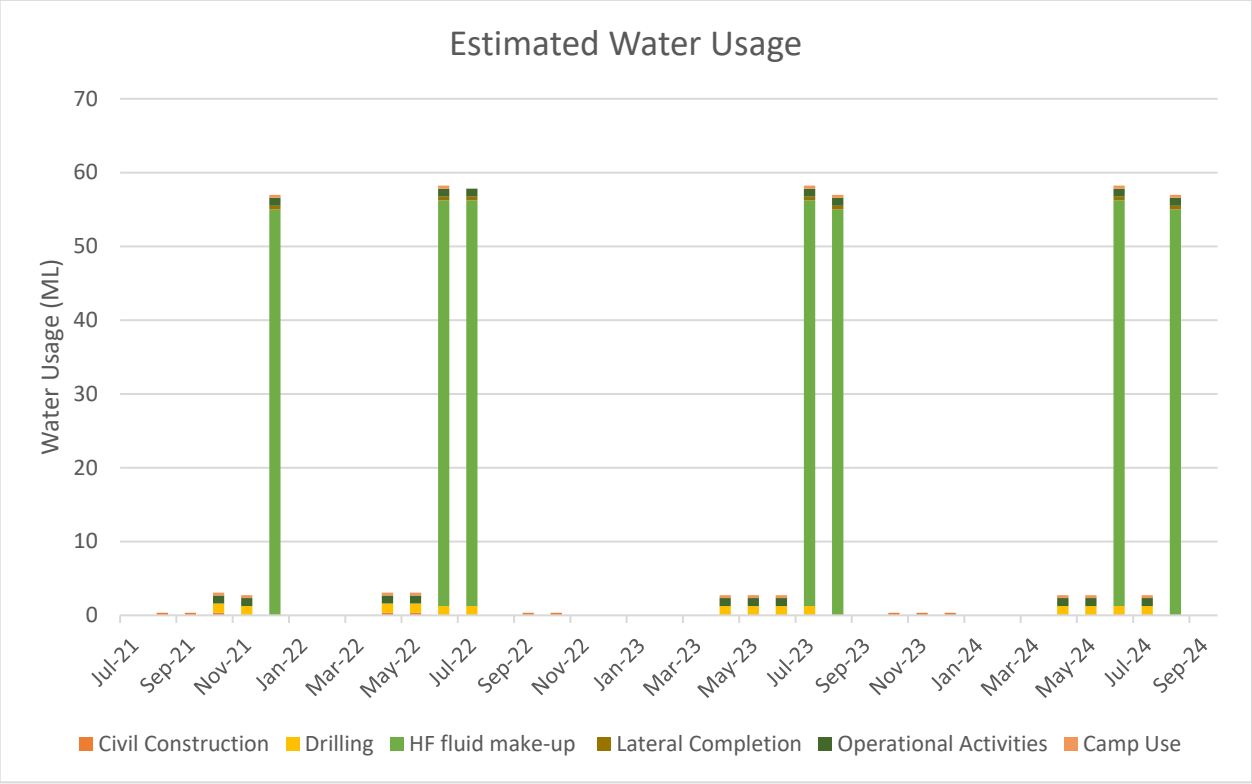

Figure 3.70: EMP IMP4-3 Water Usage

The estimated annual water usage for the activities outlined in this EMP are shown in **Table 17** below:

Table 17. EMP IMP4-3 Annual Water usage Estimate

Year	Water Usage
2021	63.48 ML
2022	122.93 ML
2023	124.46 ML
2024	123.41 ML
Total	**434.28 ML**

Table *18* presents the estimated consumption of water for the whole program.

Table 18: Estimated Water Use for this EMP and preceding EMPs

Use	Scope	Total Use (ML)
2019 Seismic Program	As Per EMP IMP001-03, Epi87-EMP-XPN-RFP-007	0.5
2020 Drilling Program	As Per EMP IMP2-6.1	5.6
2021 Carpentaria 1 Program	As Per EMP IMP3-3	7.5
2021 EP187 Program	As per Table 16	434.28
Totals		447.88

3.17.2 Greenhouse Gas Emissions

The threshold calculator developed for the National Greenhouse and Energy Reporting scheme was used to estimate the Greenhouse gas (GHG) emissions related to activities covered in this EMP. The estimation was calculated using factors and formulas available in the Emissions and Energy Threshold Calculator – 2018 from the National Greenhouse and Energy Reporting (Measurement) Determination 2008 (NGER Determination).

GHG emissions generation will be mitigated through the adoption of the NT Petroleum CoP. Imperial will utilise a Reduced Emissions Completion (REC) and undertake routine monitoring for leaks. RECs involve the capture and combustion of hydrocarbons in a flare. The combustion of gasses produced will reduce the emissions generated when compared to venting. The GHG estimates for the regulated activities carried out under the EMP over three years are provided in **Table *19***.

Figure 3.71 below presents the estimated emissions per financial year produced during the regulated activities.

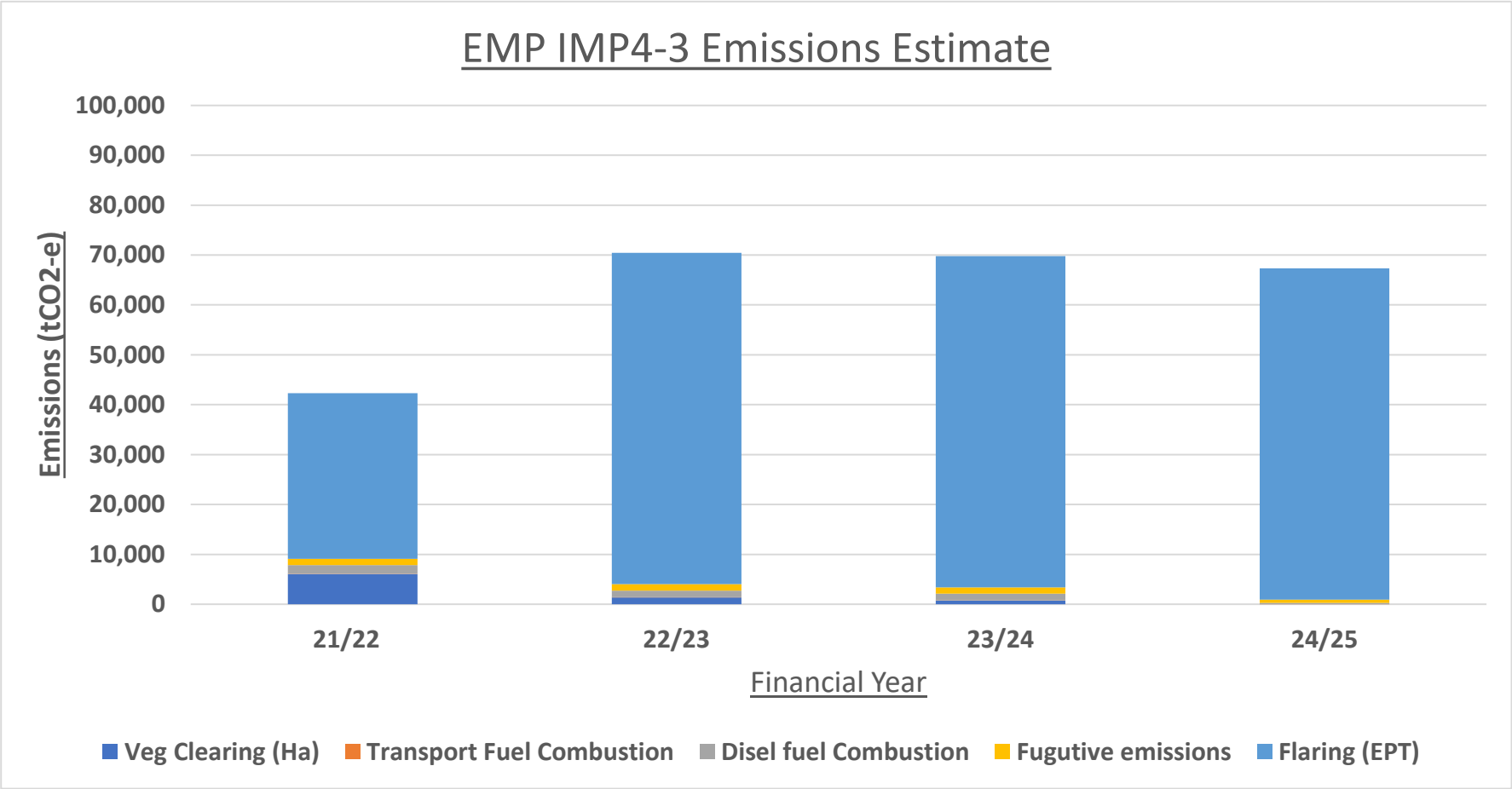

Figure 3.71: Estimated Emissions per year

Table 19: Gas emissions estimates for this EMP

Source of Emission	Inputs	Assumptions	21/22	22/23	23/24	24/25	Total tCO2-e
Vegetation Clearance	166Ha of eucalypt woodland	Based on the FullCAM model.	6,049.4	1,376.9	740.2	0.0	8166.5
Transport fuel combustion	40 kL Diesel oil (post-2004 vehicles)	Site Transport - Diesel volumes estimated at 100L/day for 400 days. Estimate based on the Emissions and Energy Threshold Calculator – 2018.	43.0	33.3	33.3	6.8	116.4
Diesel Combustion HFS	Drilling, HF and completion activities	HFS spread average fuel consumption is 8,000L/day for 6 days per well plus an additional 4kL for Completions rig Drilling average fuel consumption is 5,000L/day for 38 days per well Estimate based on the Emissions and Energy Threshold Calculator – 2018.	1,748.6	1350.9	1350.6	277.7	4,728
Fugitive emissions HFS	25.9 tonnes of methane (CH_4)	Based on Australian National Greenhouse Accounts National Inventory Report 2011 Vol 1 Emissions Factor for gas well completions of 25.9 tonnes/completion day and six days, (1 day per well). Conversion of emissions factor from CH_4 to CO_2 (25 tCO_2-e/CH_4)	1,295.0	1,295.0	1,295.0	647.5	4,532.5
Flaring	Flared gas EPT 7 of Lateral 90-day EPT 5mmscf/d 64,008 tonnes	Based on the National Greenhouse and Energy Reporting (Measurement) Determination 2008 (Section 3.44) Emissions factor of CO_2-e/tonnes flared, with assumed tip efficiency on flare (>96%) CO_2 factor tCO_2-e is 2.8 (64,008t x 2.8) = 179,222 CH_4 factor tCO_2-e is 0.8 (64,008t x 0.8) = 51,206 N_2O factor tCO_2-e is 0.03 (64,008t x 0.03) = 1,920	33,197.7	66,385.4	66,385.4	66,385.4	232,349.0
		Total	42,328.7	70,441.4	69,804.8	67,317.5	249892.4

*Flaring is the combustion of fuels for non-productive (non-commercial) reasons. For the estimation of emissions from the flaring of fuel, "Method 1" has been used.

Table 20 presents the cumulative gas emissions for the stimulation program and preceding works.

Table 20: Cumulative Gas emissions estimates for this EMP and preceding EMPs

Source of Emission	Assumptions	Total tCO_2-e
Seismic Program	As Per EMP IMP001-03, Epi87-EMP-XPN-RFP-007	6,638
Drilling Program	As Per EMP IMP2-6.1	4,158
2021 Carpentaria 1 work program	As Per EMP IMP3-3	10,619
2021 EP187 work program	As per **Table 19**, above	249892.4
Cumulative emissions		271,307.4

All flaring will be measured using flow meters compliant with NGERS. A methane emissions monitoring program will be implemented, and the wells will be tested every six months for any leaks as per the NT petroleum CoP, and the emissions will be reported per the NGERS.

3.17.3 Erosion and Sediment Control

Imperial has engaged a Certified Professional consultancy in Erosion and Sediment Control (CPESC) accreditation to prepare an Erosion and Sediment Control Plan (ESCP) for the activities covered under this EMP. The ESCP is attached as Appendix 05.

The premise for Erosion and Sediment Control (ESC) for the seismic program is to high blade as much as practicable to leave ground cover; this will not be possible in Acacia Shirleyi areas, which will require full clearing, removing all vegetation, whilst retaining as much rootstock as possible to assist with revegetation. As the seismic program will be carried out in the dry season, and rehabilitation will be carried out as part of the seismic program, the risk of erosion is small; Imperial will repair any erosion caused by the seismic clearing as part of the rehabilitation program.

As the Wellpad ESC drawings have been generated using desktop information and the wellpad locations will not be finalised until the completion of the seismic program, they will be updated via Management of Change during construction to ensure they reflect the actual site conditions and the controls needed.

Imperial will use checklists to install and monitor the condition of ESC devices and maintain them as required.

3.17.4 Groundwater monitoring

Imperial will install a Control Monitoring Bore (CMB) and Impact Monitoring Bore (IMB) to monitor the known Gum Ridge aquifer on each wellpad in line with the Preliminary Guideline: Groundwater Monitoring Bores for Exploration Petroleum Wells in the Beetaloo Sub-basin. If any unknown aquifers are discovered during the drilling activities, the requirements of the same guideline will be followed.

The CMB will be located up-gradient and within 100m of the planned location of the petroleum well. The IMB will be located 20m down-gradient of the location of the petroleum well.

The first of the monitoring bores drilled on each wellpad will be logged to establish the top and bottom of the Gum Ridge aquifer so that screens can be set for the aquifer's full extent in both bores.

Imperial has Bore Works permits in place for the installation of these bores. The monitoring program for the bores is covered in Table 27: Monitoring Plan.

3.17.5 Site Material and Fluids Management

Site Material and fluids management is covered in the Waste and Wastewater Management Plan, Appendix 06.

3.17.6 Containment of Contaminants

Activities that involve wastewater or chemical storage will be carried out according to:

- The Waste and Wastewater Management Plan, Appendix 06.
- HF Chemical Risk Assessment, Appendix 06.01
- The Spill Management Plan, Appendix 07.

An assessment has been carried out as to whether any materials (solid or liquid) used in, or produced from activities at a well site could be considered to be, or to contain, hazardous chemicals or those that may cause environmental harm. The outcomes of this assessment have been described in the spill management plan

Use, storage and handling of materials on a site of petroleum activities:

- which are or contain hazardous chemicals will comply with WHS legislation and appropriate standards for the type of chemicals
- will follow their approved safety data sheet

Liquid chemicals that may cause environmental harm will be stored in double-lined tanks or bunded areas. Bunds will have sufficient capacity to hold 100% of the largest container volume stored in the area plus 10%, unless the container is equipped with individual secondary containment.

Materials that escape from primary containment or are otherwise spilled onto secondary containment will be removed as soon as possible.

Inspection reports and maintenance records of secondary containment will be kept.

Liquid hydrocarbons, whether separated or mixed with other fluids at a concentration greater than 1% by volume, will be stored in aboveground tanks.

If condensate is produced during EPT operations in significant volumes, it will be stored for offsite disposal at a registered facility; if the condensate volumes are small, it will be sent to flare.

If condensate is stored or separated on-site, it will be done in designated double-lined storage tanks as per AS1940. These tanks will be monitored and have controls to prevent vapours from exceeding the Lower Explosive Limit (LEL) of the condensate outside the tank.

The site layout has been designed to minimise the risk of spills, including appropriate areas for chemical storage, handling and well pad design.

The lifecycle chemical handling management of risks has also been considered; see Appendix 07 – Waste and Wastewater Management Plan, section 7 waste management which includes the management and balancing of stored volumes using flow lines to avoid vehicle movements.

3.17.7 Generation of noise/light

The project activities that will produce noise and light under this EMP are shown in Table 21.

Table 21: Noise and Light production

Operation	Produce Noise	Night Operations	Produce Light
2D Seismic	Yes	No	No
Civil Construction	Yes	No	No
Drilling	Yes	Yes	Yes (Work Lighting)
Hydraulic Fracturing	Yes	Yes	Yes (Work Lighting
Extended Production Test	Yes	Yes	Yes (work Lighting and Flare)
Wastewater Treatment/Disposal	No	No	No

Due to the remote location of the proposed activities, there are no receptors as defined in table 3.5 of the Northern Territory Noise Management Framework Guideline Version 0.1 within 10km.

Regulated activities will not be above the minimum project intrusiveness noise levels as defined in table 3.4 of the same document at any receptors.

4. Existing Environment

A description of the existing Natural environment can be found in Appendix 01.

Appendix 01 is compiled from a combination of desktop assessment and on-ground environmental assessments.

The Environmental Assessment and weed survey were carried out in March 2021; it covers this EMP activities' disturbance footprint.

The Environmental Assessment report is attached as Appendix 01.02.

4.1 Rainfall

Imperial has carried out a thorough investigation of the rainfall in the Location of the Regulated Activity; this can be found in Appendix 01, covering;

- Average daily rainfall
- Significant rainfall events
- Evaporation
- 1 in 1000-year events – Wet Season
- 1 in 1000-year events – Dry Season.

4.2 Natural Environment

A description of the existing Natural environment can be found in Appendix 01.

Appendix 01 is compiled from a combination of desktop assessment and on-ground environmental assessments.

The Environmental Assessment and weed survey were carried out in March 2021; it covers these EMP activities' disturbance footprint.

Prior to undertaking field surveys, a detailed desktop assessment was conducted using publicly available information to identify relevant terrestrial and aquatic ecological values and the potential occurrence of species and communities; including Matters of National Environmental Significance (MNES) and species listed under the Territory Parks and Wildlife Conservation Act 1976 (TPWC Act) for the survey area.

Field surveys were undertaken over a 5-day period by a principal ecologist targeting least concern (common) Fauna and Flora species and also threatened terrestrial Fauna and Flora species and habitat likely to support threatened species. Opportunistic searches and avifauna surveys were undertaken at each main fauna habitat present at the locations of the proposed seismic lines, access tracks, flowlines, and wellpads. All stream crossings were also assessed and accessed using a helicopter. No trapping was undertaken, nor was it considered necessary given the narrow linear nature of the disturbance footprint.

Habitat assessments were undertaken for the likelihood of threatened species, including but not limited to, Gouldian Finch (*Erythrura gouldiae*), Painted Honeyeater (*Grantiella picta*), Grey Falcon (*Falco hypoleucos*), Mertens Water Monitor (*Varanus mertensi*), Yellow-spotted Monitor (*Varanus panoptes*) and *Polygala petrophila* var*. petrophila*. Gouldian Finch, Painted Honeyeater, Grey Falcon, Mertens Water Monitor and Yellow-spotted Monitor are all listed as vulnerable under the TPWC Act. Grey Falcon and painted honeyeater are also listed as vulnerable under the Commonwealth Environmental Protection and Biodiversity Act 1999 (EPBC Act), whilst Gouldian Finch are listed as endangered under the EPBC Act. *Polygala petrophila* var. *petrophila* is listed as Data Deficient under the TPWC Act, but is not endemic to the area.

Vegetation community assessments were undertaken to determine the distribution and composition of native vegetation located within the Study Area. The field survey also recorded the location and extent of any invasive plant species as per the Weed Management Plan and weed survey guidelines.

The Environmental Assessment report is attached as Appendix 01.02.

4.2.1 Pests and weeds

An Environmental Assessment and a weed survey was carried out in March 2021; it covers this EMP activities' disturbance footprint.

The reports are available in Appendix 01.02 (Baseline Ecological Assessment) & Appendix 09 (Weed Management Plan).

No weeds have been identified within the proposed 2021-2025 exploration areas. The Carpentaria Highway represents the greatest threat for weed migration into the 2021-2025 exploration areas. Site construction and operation will be undertaken to include the management of weeds; see Appendix 09 for the weed management plan.

No pest species were identified during the field surveys.

4.3 Cultural Environment

4.3.1 Sacred Sites and Aboriginal archaeological sites

An extensive anthropological survey of the land area was conducted in May 2015 by the Anthropology Division of the Northern Land Council (NLC) in conjunction with the land's Traditional Owners before the grant of the tenement.

The areas proposed to be disturbed have been surveyed for sacred sites and cultural heritage significance. An AAPA certificate will be in place before works are carried out under his EMP, and all requirements under this certificate will be complied with.

An archaeological survey was conducted in December 2020 by Ellengowan Enterprises, an approved NT archaeological consultant. The following points summarise the outcomes of the archeological survey;

- Two Isoliths were located which were determined to be of low significance.
    - One was as at CSP AC, and the recommendation to avoid it will be adhered to.
    - The second was relocated the by the Aboriginal Monitors present and therefore will not be impacted.
- No further action is required by Imperial Energy on EP187 in respect to the proposed seismic lines, gravel pits, access tracks, flowlines and well sites. The proposed works are cleared and comply with the requirements of the Heritage Act 2011 (NT) as no significant archaeological material was found.
- Two rockshelters, Balbirini 1 and 2 were located during mobilisation. Both are in EP187, but these are outside of the proposed 2021 work area programme. These sites have a high archaeological significance as they may be used to date the initial Aboriginal occupation in the Carpentaria region. Imperial Energy requires no further action at this time in respect to these sites as there is no proposal for the regulated activity to be near them

See Appendix 01.01 for the survey report.

Traditional Owner representatives will be on-site during all first disturbance activities under this EMP.

Any unexpected heritage discoveries will be managed in line with inGauge's Unexpected Heritage Discovery procedure – ING_PRO_UHD_01. The purpose of this procedure is to set out the actions to be undertaken by inGauge staff and contractors if a suspected find of Aboriginal and non-Aboriginal cultural heritage is made during civil construction activities within EP187.

If suspected previously unrecorded cultural heritage is uncovered during project work:

- All work to cease within 10 metres of the suspected find
- Traditional Owner representative to assess the find and recommend any necessary management measures
- Work is not to recommence in the vicinity of the find until the Traditional Owner representative provides direction
- This direction may include flagging the discovery, deviating project work around the suspected find or relocating the work front to a new location removed from the suspected find.
- If the find is determined to be Aboriginal heritage, the Project Manager is to notify the relevant Heritage Department.

If any suspected human remains are discovered during any activity works, they must be initially assumed under the provisions of the relevant *Coroners Act* to be a crime scene and treated accordingly.

The following procedure is to be applied:

1. All activity in the vicinity must cease, and the Site Supervisor to be notified immediately.
2. The police must be notified immediately of the discovery by the Site Supervisor
3. The remains must be left in place and protected from harm or damage with a minimum of at least a 50m buffer.
    a. It is important to use best judgment and restrict all movement in the immediate vicinity around the discovery until directed otherwise by the police; this could contaminate a potential crime scene.
    b. Likewise, do not set up temporary fencing unless directed by the police.
4. If the appointed expert investigating the find under the relevant Coroners Act believes that there are reasonable grounds to believe the remains to be:
    a. A crime scene, the police will provide direction on the management of the discovery
    b. Aboriginal ancestral remains or historical remains, the relevant Director Heritage Branch, Department of Tourism and Culture, is to be contacted on (08) 8999 5039 (Darwin office) or (08) 8951 9247 (Alice Springs office) or email heritage@nt.gov.au.

4.3.2 Non-Aboriginal heritage sites

There are no known non-Aboriginal heritage sites in the Location of the Regulated Activity.

4.4 Socio-economic Environment

4.4.1 Settlements

There are no settlements within 20km of the Location of the Regulated Activity; the closest settlement is Cape Crawford, which is approximately 70km to the East of the Carpentaria Highway.

The distance from dwellings to wellpads to be constructed under this EMP is shown in Table 10.

5. Environmental Risk Assessment

5.1 Environmental Risk Assessment Methodology

The methodology that Imperial uses for an Environmental Risk Assessment is covered in Appendix 03.

5.2 Risk Assessment

An environmental risk assessment was undertaken by suitably qualified personnel for the proposed Regulated Activities under this EMP using the methodology outlined in Appendix 03 (Environmental Risk Assessment Framework)

The results of this risk assessment are shown in Appendix 04 (Environmental Risk Assessment); a summary of the environmental factors and key risks are given below in Table 22.

Table 22: Summary of the Environmental Factors and key risks

Environmental Factor	Aspects of the Regulated Activities	Key Risk
Land (Flora, Fauna and Environmental quality)	• Land Clearing • Seismic Acquisition • Civil Construction Activities • Suspension and Decommissioning • Flowline construction • Maintenance, monitoring and other minor works ancillary to operations.	• Bushfire from project activities • Disruption on landform and soils from civil works, erosion and sediment control failure and poor rehabilitation • Soil contamination due to overflow, leaks or spills of fluid storage tanks • Soil contamination due to poor waste and chemical management • Soil contamination due to chemical spills, lack of appropriate bunding and poor refuelling, fuel transfer practices and oil and chemical handling • Soil contamination due to flowline failure during pumping and flowback operations. • Introduction and spread of weeds due to vehicle movements • Loss of habitat impacting wildlife • Loss of native vegetation through competition for resources • Introduction of pest species • Loss of riparian vegetation due to inappropriate buffers instated • Loss of sensitive or significant vegetation due to failure in determining appropriate buffer distances
Water (Groundwater & Surface water)	• Land Clearing • Seismic Acquisition • Civil Construction Activities • Drilling Operations • Well Logging	• Reduction in groundwater quantity and quality due to project activities • Contamination of water bodies due to chemical spills, lack of appropriate bunding and poor refuelling, fuel transfer

Environmental Factor	Aspects of the Regulated Activities	Key Risk
	• Hydraulic Fracturing • Completion, workover and maintenance • Extended Production Testing • Suspension and Decommissioning • Flowline construction • Maintenance, monitoring and other minor works ancillary to operations	practices, oil and chemical handling and containment failure • Contamination of water bodies due to flowline failure • Contamination of water bodies due to storage (tank/vessels) failure or overflow • Cross-flow during hydraulic fracture (HF) • Impact to terrestrial and aquatic GDEs due to inappropriate buffers instalment
Air quality	• Land Clearing • Seismic Acquisition • Civil Construction Activities • Drilling Operations • Completion, workover and maintenance • Extended Production Testing • Flowline construction • Maintenance, monitoring and other minor works ancillary to operations	• Increased greenhouse gas emissions • Extended Production testing flaring.
People and community	• Land Clearing • Civil Construction Activities • Flowline construction • Maintenance, monitoring and other minor works ancillary to operations	• Transport vehicle accidents due to increase in vehicle movements • Vehicle and plant movement on regional roads and access tracks • Bushfire from project activities • Disturbance to heritage sites due to works conducted out of the approved areas • Loss of sensitive or significant infrastructure due to lack of retaining the recommended buffer distances as per the NT Land Clearing Guidelines

An acceptable level of risk has been achieved by implementing control measures that allows all risks to be reduced to ALARP. Nonetheless, ALARP is not a final position over the life of the project. Ongoing monitoring will allow for the discovery of new mitigation measures that could be implemented. Key environmental risk mitigation areas covered in the EMP include:

- Activities do not impact aquifers
- Management of seismic, construction and flaring to ensure no bushfires occur as a result of the activity
- Management of flowback activities to minimise the release of gas to the atmosphere
- Management of hydraulic fluids and chemicals to ensure no contact with aquifers or pollute soil or soil substrate

- Management of waste and various wastewater characteristics, including prevention of spills, and
- Mitigating the introduction and spread of weeds.

All the residual risks in the risk assessment in Appendix 04 have been lowered through control mitigation measures to levels that are ALARP. The development of the control mitigation measures has been undertaken considering ESD elements.

The acceptability of this risk assessment and the residual risk has been determined through the following:

- Implementing controls to ALARP
- Complying with legislative requirements to ensure not acting inconsistently with legal requirements
- Meeting stakeholder expectations to ensure not acting inconsistently with commitments made to stakeholders
- Acting consistently with national and regional plans (as relevant)
- Consistency with principles of ecological sustainable development.
- Environmental values and environmental objectives of particular importance to the NT
- The nature and scale of the effect (consequence) on the environment
- Whether there was sufficient certainty in the data used to determine the environmental impact
- Consistency with Imperials corporate levels of risk acceptance

There are well understood and established mitigation measures to manage all operational risks. The risk assessment review has determined that any additional controls applied will not reduce the risk any further.

Through the appropriate development and implementation of mitigation methods Imperial has demonstrated that the activity will be carried out in a manner by which the environmental impacts and environmental risks of the activity will be reduced to a level that is ALARP and is acceptable.

5.3 Assessment of risk against Land Clearing Guidelines

The Land Clearing Guidelines (LCG) say that riparian zones should not be cleared; however, where clearing is required, it must be demonstrated that the impact is not significant in a regional context. The LCG provide processes for determining the risk to threatened species and regional biodiversity due to clearing. The following summarises how the EMP addresses the LCG requirements.

The proposed activities under this EMP will result in land clearing in riparian zones and buffers, only for the establishment of access tracks and wastewater flowlines. Although there will be no clearing within riparian zones or their buffers for seismic acquisition, wellpads and gravel pits, these have been included in the assessment below.

The clearing footprint has been assessed against the requirements of the Land Clearing Guidelines to determine whether the proposed activities will pose a significant impact to threaten species and regional biodiversity. In summary;

- Conduct of seismic data acquisition;
    - No clearing of watercourse crossings, riparian zones and their buffers
    - No clearing of sensitive or significant vegetation as defined in the LCG
    - Decision tree for clearing of trees, as per appendix 02
- Establishment of wellpads and gravel pits;
    - All wellpads and gravel pits are proposed to be located outside of riparian zones and associated buffer areas, noting the location of the buffer is to be determined following ground-truthing of the actual location of drainage lines and streams.
    - There is no proposed clearing of high-value vegetation, riparian zones or their buffers, or areas of high density of hollow-bearing trees. Where clearing of mature trees is unavoidable, it will be assessed for active use of hollows in order to inform a clearing decision.
- Establishment of Access Tracks and Flowlines;
    - Clearing widths will be reduced to 9m within watercourse crossings, riparian zones and their buffers
    - Due to the narrow widths of disturbance, the impacted area of watercourses is minimal, as shown in **Table 24** (0.0008% of all watercourses present in the project area)
    - Decision tree for clearing of trees, as per appendix 02

5.3.1 Clearing footprint assessment

The information that has been considered at the clearing footprint scale in line with the LCG and Imperial's findings regarding the land clearing for the Regulated Activities under this EMP are:

- The area (location and extent) of native vegetation proposed to be cleared (i.e. the proposed clearing footprint)
    - The maximum proposed clearing footprint is shown in **Table *12***, noting that a high percentage of seismic acquisition lines will be traversed rather than cleared.
- The type and general condition (e.g. 'intact', 'previously cleared', 'disturbed' or 'cleared') of the native vegetation proposed to be cleared
    - Two baseline surveys have established that most streams are degraded from pastoral activity; however, the route will be amended to avoid clearing where intact riparian vegetation is located.
    - 21km of seismic acquisition line is located on cleared land (i.e. pastoral tracks)
    - 3.45km of access track is on cleared land (i.e. pastoral tracks)
- The flora and/or fauna species that are likely to occur within the proposed clearing footprint.
    - The habitat for Grey Falcons is to be left undisturbed and determined through ground-truthing before clearing. Appropriate buffers of 300m are to be adopted where evidence of active breading is found.
        - According to the Fauna and Flora Division of DEPWS, given the area of clearing proposed and the large area of potential habitat within the region, the proposal does not pose a significant risk to regional populations of this species.
    - If the riparian areas and watercourses are not disturbed, then the Fauna and Flora Division of DEPWS considers that the risk to the Merten's Water Monitor and Yellow-spotted Monitor will have been avoided.
    - While it is not possible to avoid disturbing all riparian zones and watercourses and therefore avoid disturbance to the Merten's Water Monitor and Yellow-spotted Monitor, the disturbance is minimised and is considered to be a low impact on a regional scale. **Table *23*** and 16 show the number of watercourse crossings and the length of the watercourse crossings, respectively. Both tables show information for the different stream orders and the various regulated activities under this EMP. The total maximum area of disturbance within the project area is 0.0006% of all watercourses present.

5.3.2 Regional level assessment

The regional context assessment considered the area surrounding the disturbance footprint; Imperial has defined the area immediately surrounding the disturbance footprint as the "Project Area", which is a smaller area than the catchment or bioregion recommended in the LCG. Using the smaller Project Area gives the disturbance a higher impact percentage than if benchmarked against the catchment or bioregion recommended in the LCG. The extent of the Project Area used for benchmarking is shown in ***Figure 5.1***.

The information that has been considered regarding the land clearing for the regulated activities under this EMP is as follows:

- The composition and extent of remnant vegetation (i.e. intact/uncleared native vegetation)
    - All of EP187 and the majority of the Betaloo sub-basin and the McArthur basin are used for pastoral purposes, and therefore are impacted by grazing, as observed during two baseline surveys in EP187; see appendix 01.01 for further details.
- Connectivity between areas of remnant vegetation
    - The combined width of access tracks and flowlines is 12m (or 9m within riparian zones and their buffers), and large hollow-bearing trees will be avoided to the greatest extent possible. Fragmentation is not considered significant because the width for the clearing is not sufficient to impede fauna movement.
- The relative importance of the affected vegetation as habitat for threatened or significant species
    - The habitat for Grey Falcons is to be left undisturbed and determined through ground-truthing before clearing. Appropriate buffers of 300m are to be adopted where evidence of active breading is found.
    - While it is not possible to avoid disturbing all riparian zones and watercourses and therefore avoid disturbance to the Merten's Water Monitor and Yellow-spotted Monitor, the disturbance is minimised and is considered to be a low impact on a regional scale. **Table *23*** and 16 show the number of watercourse crossings and the length of the watercourse crossings, respectively. Both tables show information for the different stream orders and the various regulated activities under this EMP. The total maximum area of disturbance within the project area is 0.0006% of all watercourses present.
    - The activities under this EMP will result in the clearing of up to 166 ha of potential Gouldian Finch foraging habitat. The Fauna and Flora Division of DEPWS considers that the loss of this habitat would have a low impact on the species. This is due to the relatively small area of habitat being impacted compared to the area of remaining foraging habitat within EP187.
    - There are no records of Crested Shrike-tit in EP187 however, suitable habitat is likely to be present within the tenement area and potentially within the clearing footprint. The Fauna and Flora Division of DEPWS considers that while suitable habitat occurs on the site, the area proposed to be cleared is relatively small compared to the area of available habitat within EP187.
    - There is a low to moderate potential for the Painted Honeyeater to occur in the project area. Suitable habitat is likely to be present within the project area and potentially

within the clearing footprint. The Fauna and Flora Division of DEPWS considers that while suitable habitat occurs on the site, the area proposed to be cleared is relatively small compared to the area of available habitat within EP187.

- Surrounding land uses.
  - The surrounding land is utilised for grazing stock; as such, the clearing for the regulated activities under this EMP will have a negligible impact.

Based on the information in the EMP, a desktop review of data and expert opinion, the Flora and Fauna Division considers that the proposed activities do not pose a significant risk to threatened species. The Division considers that the proponent has generally identified relevant biodiversity values associated with the proposal.

5.3.3 Biodiversity

Imperial has assessed the overall risk to biodiversity on the likelihood of occurrence of biodiversity values in line with table 17 of the LCG, the potential impact of the clearing on those values, and any measures proposed to reduce potential impact with a focus on the conservation of significant biodiversity values.

There are species present that are listed, but the proportion of habitat that is cleared for access tracks and flowlines is not considered significant as only a small area is to be cleared. The maximum forecast extent of clearing riparian communities is 0.23Ha, representing 0.060% of the 374.85Ha riparian communities in the project area; further detail is shown in **Table *25***.

Imperial has used the LCG for assessing risk to biodiversity as a medium risk for the activities under this EMP because while significant biodiversity values are present, there are effective mitigation measures proposed which will reduce the likely impact of the proposed clearing to negligible levels.

Imperial does not consider the clearing to be assessed as high risk, as;

- The species present are listed as vulnerable, not threatened
- There is no clearing of their habitat for seismic acquisition and wellpads; there is only a small amount of their habitat cleared for access tracks and flowlines, but not enough to cause a significant reduction in the regional extent of significant vegetation types
- Mitigation measures outlined such as outlined in the Erosion and Sediment Plan will avoid downstream impacts such as impacts to surface water quality

The significance of biodiversity has been assessed based on expert advice from Fauna and Flora Division; six species have a low to moderate chance of being present; further, ground-truthing will be carried out to confirm the presence /absence. A summary of the mitigation measures proposed that reduce the risk are as follows;

- Seismic acquisition is limited to a six-week work program
- Clearing of riparian zones will be avoided at all times during seismic acquisition and clearing for wellpads and gravel pits
- Ground truthing to identify areas of sensitive or significant vegetation types as defined in Section 4.4.6 of the LCG
- Ground truthing to identify areas of high-density hollow-bearing trees as defined in Section 4.4.6 of the LCG
- Ground Truthing to confirm the best watercourse crossing points that will create the least disturbance i.e.; shallow bank angle, low vegetation density
- Ground Truthing to confirm presence/absence of listed species
- Ground truthing to confirm presence/absence of Grey Falcon breeding and establishment of a 300m buffer if located
- Clearing widths of access tracks and flowlines minimised and reduced to a maximum of 9m within watercourses and riparian zones
- Mitigation measures such as outlined in the Erosion and Sediment Plan will avoid downstream impacts such as impacts to surface water quality.

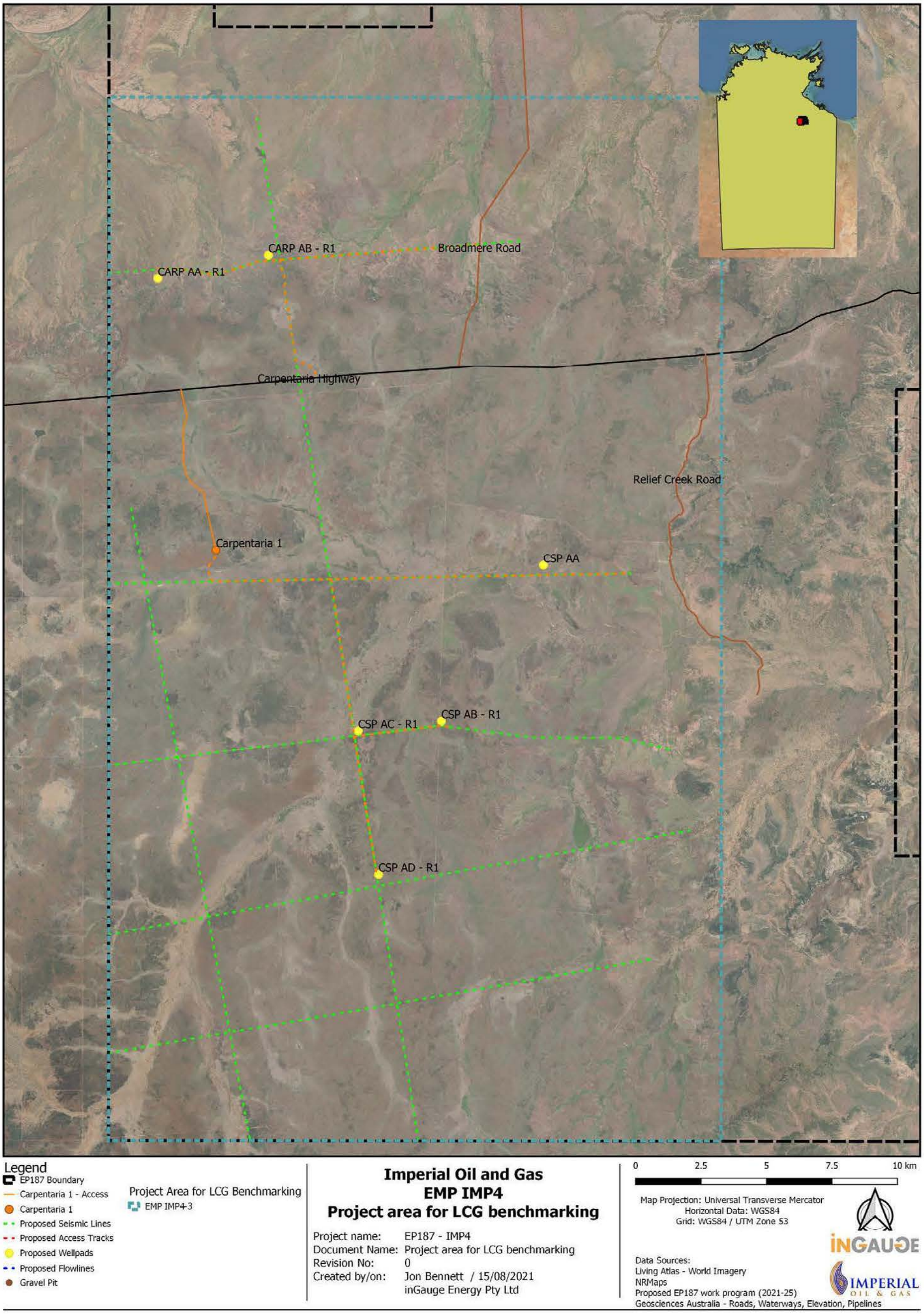

Figure 5.1:Project area for LCG benchmarking

Table 23presents the number of watercourse crossings and their respective stream orders that will be required to be crossed during the conduct of the regulated activities.

Table 23. Number of creek crossings

Stream order	Seismic Lines	Access Tracks and flowlines
1	25	13
2	10	7
3	6	5
4	3	3
>4	0	0

As linear infrastructure will be co-located, access tracks will be utilised to construct and maintain flowlines. This colocation allows for a combined width of disturbance of 12m, which will be reduced to 9m within stream crossings and riparian buffer zones; this width is driven by the requirement of offsetting a buried flowline from an access track for safety reasons

Table 24 presents the length of the different Stream Orders in the Project Area, along with the cumulative length and the cumulative percentage of each Stream Order that will be disturbed from the conduct of the regulated activities.

Table 24: Combined length of stream crossings

Stream order	Length of Stream Order in Project Area	Cumulative length of Access Track and Flowline Crossings	Percentage clearing length in Project Area
1	247.68km	0.117km	0.00047%
2	114.71km	0.063km	0.00055%
3	49.75km	0.045km	0.00090%
4	13.26km	0.027km	0.00204%
>4	0km	0km	0%
Total	425.40km	0.252km	0.0006%

Note: Cumulative length of Access tracks and flowline crossings is the number of crossings multiplied by the combined width of an access track and flowline, which is 9m in these locations.

Table 25: Extent of clearing within riparian zones and clearing of Lancewood for the project activities

Vegetation Type	Total in Project Area (Ha)	Forecast Clearing (Ha)				Forecast Clearing (% of PA)
		Seismic	Access Tracks & flowlines	Wellpads	Total	
Acacia shirleyi (Lancewood)	17,449	11.44	1.88	0.00	13.32	0.076%
Eucalyptus microtheca +/- Eucalyptus camaldulensis	198.19	0.00	0.00	0.00	0.00	0.000%
Deciduous Microphyll Vine Forest (DVMT)	11.95	0.00	0.00	0.00	0.00	0.000%
Melaleuca vindiflora +/- Corymbia spp. and Petalostigma pubescens	164.71	0.09*	0.23*	0.00	0.32	0.191%
Melaleuca nervosa +/- Melaleuca vindiflora and Asteromyrtus symphycarpa	0	0.00	0.00	0.00	0.00	0.000%
Subtotal riparian communities only	374.85	0.00	0.23	0.00	0.23	0.060%
Total, including Lancewood	17,824.28	11.53	2.1	0.00	13.62	0.076%

*note: The vegetation mapping indicates that this vegetation community is not associated with a riparian zones, this will be verified by ground-truthing.

5.4 Referral to DAWE and NT EPA

5.4.1 Significant Impact test for EPBC listed species

Conservation significant Fauna and Flora species are those species listed under the provisions of the Commonwealth EPBC Act or the Territory Parks and Wildlife Conservation Act 2000 (TPWC Act), including threatened species and internationally protected wildlife and migratory species. Threatened species include those with conservation status listed as Endangered, Vulnerable or Near Threatened (EVNT) under the EPBC Act or Extinct in the Wild, Critically Endangered, Endangered or Vulnerable under the TPWC Act. Potentially occurring threatened Fauna and Flora species are listed in the EP187 Environmental Assessment Report 2019 Seismic and Drilling Program. This document also accounts for their likelihood of presence within the study area based on public records, species biology and ecology and habitats available within the study area.

The ALA database returned records for two significant and/or threatened fauna species Ardeotis australis (Australian bustard) and *Mesembriomys macrurus* (golden-backed tree rat) listed under the EPBC Act and/or TPWC Act within the search area. The Northern Territory Government (NR Maps) was used to identify threatened Fauna and Flora species, sites of conservation significance and sites of botanical significance recorded in EP187.

A query of the DEPWS NR Maps database returned 1 Data Deficient (DD) plant species and five fauna species that have been historically recorded within the study area. There are no historical records for threatened flora species within the search area. Data Deficient species, while not considered threatened species under the EPBC Act or TPWC Act, they are considered Significant Species under the TPWC Act.

The EPBC PMST identified the search area as having potential habitat for no nationally threatened flora species, 13 threatened terrestrial species and 14 migratory species listed under the EPBC Act (Appendix A). Eight (8) of the 14 migratory species are specialist marine species and have therefore been excluded

from the assessment (including estuarine crocodiles as no suitable habitat exists within the Location of the Regulated Activity). The *Erythrura gouldiae* (Gouldian Finch) was observed in a rest area approximately 22km east of the proposed exploration area.

The Matters of National Environmental Significance (MNES), Significant Impact Guidelines 1.1 (2013) were used to assess the potential for environmental impacts. The proposed well locations and their access is outside of the known critical habitat for Gouldian Finch (refer to Appendix 01.02 for the likelihood of occurrence and risk assessment for impacts to MNES). Therefore, The project will not be referred to the Department of Environment and Energy.

5.4.2 Significant impact test for Environment Protection Act

Petroleum activities that could reasonably be considered capable of significantly affecting the environment are referred to the Northern Territory Environment Protection Authority (NT EPA). Imperial has assessed the regulated activities under this EMP in line with the Environment Protection Act 2019 (EP Act) and the Environment Protection Regulations 2020 (EP Regulations). The self-assessment of the potential environmental impacts of the proposed activities was conducted using the screening tool available on the NT EPA guidelines (NT EPA b., 2019). The assessment results demonstrate that the proposed activities have been suitably managed and risks addressed; the controls proposed in Appendix 04 shows how the objectives can be met.

6. Management Plans

6.1 Weed Management

A project-specific weed management plan has been developed as part of the EMP; refer to Appendix 09.

6.2 Fire Management

A project-specific fire management plan has been developed as part of the EMP; refer to Appendix 08 for the Fire Management Plan.

6.3 Rehabilitation Plan

A project-specific rehabilitation management plan has been developed as part of the EMP; refer to Appendix 12 for the Rehabilitation Management Plan.

6.4 Erosion and Sediment Control Plan

Imperial has engaged a Certified Professional consultancy in Erosion and Sediment Control (CPESC) accreditation to prepare an Erosion and Sediment Control Plan (ESCP) for the activities covered under this EMP. The ESCP is attached as Appendix 05.

As the Wellpad ESC drawings have been generated using desktop information, they will be updated via Management of Change during construction to ensure they reflect the actual site conditions and the controls needed.

6.5 Wastewater and Waste Management Plan

A project-specific Wastewater Management Plan has been developed as part of the EMP; refer to Appendix 06.

6.6 Spill Management Plan

A project-specific Spill Management Plan has been developed as part of the EMP; refer to Appendix 07.

6.7 Methane Emissions Monitoring Plan

A project-specific Methane Emissions Management Plan has been developed as part of the EMP; refer to Appendix 10.

6.8 Emergency Response Plan

An Emergency Response Plan has been developed as part of the EMP; refer to Appendix 14.

Imperial will update its Emergency Response Plan and associated bridging documents with contractors Emergency Response Plans for the proposed activities.

7. Implementation Strategy

7.1 Health Safety Environment Management System

Imperial Oil & Gas Pty Ltd Health Safety Environment Management System (HSEMS) is the central system that contains the policies and procedures that Imperial has to manage and minimise the impact from its activities.

In addition to meeting legal requirements, Imperial's activities are also governed by several additional internal directives and risk control directives designed to ensure best practices in environmental risk management.

Policies, procedures and controlled documents include, but are not limited to the following:

- Emergency Response Plan
- EHS Manual
- Quality Management Plan
- Equipment Refueling
- Biosecurity and Hygiene
- Chemical spill and release
- Fitness for work
- Hazardous Substance Management
- Incident Report and Investigation
- Induction and Training
- Manual Handling
- Personal Protective Equipment
- Vehicle Operations
- Waste Management Procedure
- Logistics Planning
- Quality Assurance policy
- Code of conduct policy
- Health and Safety policy
- Environmental policy
- Stop the Job policy

7.2 Roles and Responsibilities

The following sections reflect the management of the HSEMS and the key specific components of the management hierarchy. The key roles and responsibilities for regulated activities under this EMP are;

- Project Manager:
    - Oversees the whole planning and execution of the exploration program and is ultimately responsible for ensuring all other parties are working within the HSE guidelines
    - The Project Manager's role is predominantly office-based

- Civil Construction Superintendent:
    - Responsible for ensuring all areas of civil construction and 2D seismic acquisition are carried out following the EMP and Imperial's HSE Policy
    - All Civil Construction and Seismic Acquisition contractors report to this position
    - Act as the designated point of contact for any civil-related complaints and incidents following the pre-determined strategies in this EMP or relevant ERP
    - This role will also cover the part of the Weeds Officer, who will be responsible for:
        - Planning and execution of weed monitoring requirements during civil construction and seismic acquisition
        - Facilitate training all workers (including contractors) in weed management requirements, with support from the Northern Territory Government Regional Weed Officer - Onshore Shale Gas Development
        - Oversight of implementation of weed control mechanisms, including but not limited to wash-downs and proactive weed control programs
    - The Civil Construction Superintendent is field-based and reports to the Project Manager
- Drilling and Completions Lead:
    - Responsible for ensuring the drilling, stimulation and well testing activities are designed and implemented per the NT legislation and Code of Practice.
    - Ensures all drilling, completion and stimulation activities are undertaken per the NT Petroleum Code of Practice.
    - Selection and design of equipment and practices to manage environmental risk
    - Responsible for selecting and engaging drilling, stimulation and well testing contractors.
    - Ensuring all contractors comply with the contract terms, including compliance with the EMP requirements.
- Drilling and Completions Superintendent:
    - Responsible for ensuring the drilling, stimulation and well testing activities are executed following the works program, EMP and Imperial's HSE Policy
    - Ensures all drilling, completion and stimulation activities are undertaken per the NT Petroleum Code of Practice
    - Selection and design of equipment and practices to manage environmental risk
    - Responsible for selecting and engaging drilling, stimulation and well testing contractors
    - Ensuring all contractors comply with the contract terms, including compliance with the EMP requirements
    - This role reports to the Drilling and Completions Lead

- Well Site Representative:
    - Responsible for ensuring all areas of drilling, completion and well testing are carried out following the associated programs, WOMP, EMP and Imperial's HSE Policy
    - Responsible for the planning and execution of the drilling, stimulation and well testing activities on-site, including understanding and communicating the environmental requirements of this plan
    - Facilitate all workers' (including contractors) training to manage weeds, spills, waste, emissions and other aspects
    - Ensuring all reporting requirements are met
    - Act as the designated point of contact for, and rapidly responding to, any drilling, stimulation and well testing environmental incidents and emergencies following the pre-determined strategies in this EMP or relevant ERP
    - Undertake field inspection and assurance activities
    - All drilling, stimulation and well testing contractors report to this position
    - The Well Site Representatives is based at the well pad and reports to the Drilling and Completions Superintendent
- Lead Contractor:
    - A nominated member within each contracting company (Civil construction, Seismic acquisition, Drilling, Stimulation, Well Testing service providers) that are responsible for delivering the commitments outlined in this plan
    - The Lead Contractor for each service provider will comply with the nominated contractual terms and work instructions issued under this EMP
    - The Lead Contractor must ensure all staff are aware of their obligations, are approximately trained and that procedures and controls are fully implemented and complied with
- Field Personnel:
    - All staff, including Imperial, inGauge and contractors that are working in the exploration permit areas. Responsible for day-to-day management and reporting of environmental aspects.

7.3 Training

Imperials HSEMS outlines the policies and procedures governing all personnel (staff and contractors) training and competency to ensure they can fulfil their obligations under this EMP and the broader Imperial HSEMS.

The majority of work undertaken under this EMP will be via contractors under Imperial and inGauge staff's supervision. Assuring the selected contractors and supervisors' training and competency is a major focus of the EMS implementation strategy.

These includes:

- Contractor HSE prequalification process
- Contractor management system
- General HSE inductions
- Site-specific inductions
- Task-specific training, procedures and competency requirements

Contractors will be required to demonstrate they have appropriate systems, procedures and training to manage specific risks covered under this EMP before award.

The following aspects will be considered during the tender and award:

- Maturity of HSE systems and process
- Previous HSE performance
- Existing procedures and training
- Hazardous material and waste management procedures
- Spill management
- Incident notification and management processes
- Internal training programs
- Internal auditing processes

All staff and contractors entering the site will be required to attend a site-specific induction. The induction covers the following aspects:

- Regulatory requirements for the area, including specific conditions on the exploration permits and agreements with the NLC
- Environmental considerations and special procedures to be used for environment protection, as well as protection of archaeological and cultural sites within the permit areas
- Safety procedures covering the safe use of vehicles, equipment and explosives first aid and HSE in remote area operations
- Emergency response
- Landowner sensitivities, including Aboriginal communities and their specific cultural requirements
- Procedures for handling any culturally or archaeologically sensitive materials that may be discovered.

7.4 Review and Update

Implementation of this EMP will be continually monitored and revised following regulation 22, as required based on monitoring and audit results, complaints, employee and stakeholder feedback, change to the proposed work program or a material increase in risk level.

A formal review, update and resubmission of this EMP will be undertaken every five years.

7.5 Governance

7.5.1 Management of non-conformances

For the activity, a non-conformance is classed as:

- A breach of an Environmental Outcome or Environmental Performance Standard (Section 7.7)
- Is inconsistent with commitments specified within the current plan for the activity
- Failure to implement a requirement in the implementation strategy
- An environmental impact or environmental risk not specified in the EMP for the activity

Non-conformances are identified via:

- Audits and inspections
- Incident reporting and investigations

These non-conformances or corrective actions shall be logged, and remedial actions identified and implemented. Where a recordable incident is identified, actions will be implemented to assess the cause of the recordable incident, to correct it and prevent reoccurrence immediately.

To ensure that recordable incident lead to learning and improvements for the activity and on a company-wide basis, non-conformance are:

- Communicated to the Imperial and inGauge management, along with corrective actions to help prevent recurrence of similar incidents
- Communicated to operational personnel at daily pre-start meetings via the Site Supervisor to ensure personnel are made aware of non-conformances and corrective actions to help prevent recurrence of similar incidents

Recordable incident and corrective actions will be:

- Recorded in Imperial's Incident Management System, and actions tracked to completion.
- Reviewed by the actioner's manager before being closed to ensure actions are completed and implemented.
- The status of corrective actions will be tracked and reported annual in the annual environmental report.

7.5.2 Inspection and audits

Imperial will carry out daily inspections on operational sites and weekly inspections on sites that are not operational.

Audits of implementation of the EMP commitments will be completed for each activity or at least annually. Audit scheduling is presented in

Table 26. The results will be included in the annual environmental report.

Table 26: EMP Audit Schedule

Audit Type	Scope of Audit	Frequency	Responsibility	Audit Type
Operational assurance	Operational compliance checks to ensure risk management controls are implemented	Monthly	Environmental and Compliance Reporting Officer	Operational assurance
Annual Assurance	Compliance against EMP commitments and risk management controls	Annually	Environmental and Compliance Reporting Officer	Annual Assurance

7.5.3 Management of change

Imperial will use inGauge's Management of Change Procedure for operations in EP187.

The Internal Management of Change process is applied to all changes and deviations for regulated activities. These activities include planning and operations, including civil construction, drilling, hydraulic stimulation, production testing, well abandonments or workovers, or any other work designed and executed by Imperial on EP187.

Deviations from the operations may become necessary due to uncertainties in the operating environment or problems encountered during operations. It is the purpose of the change control procedures contained within the Management of Change procedure (ING_PRO_MOC_01) to guide for facilitating the agreement of change with the various stakeholders (e.g., Imperial, inGauge Management Team). It is achieved by determining and agreeing on the value and impact of a change and subsequently documenting the approval process of accepting the change.

The Management of Change process includes an assessment of risk, to determine whether there is a change to the risk profile.

Figure 7.1 below outlines the process Imperial take to determine which change process will be applied.

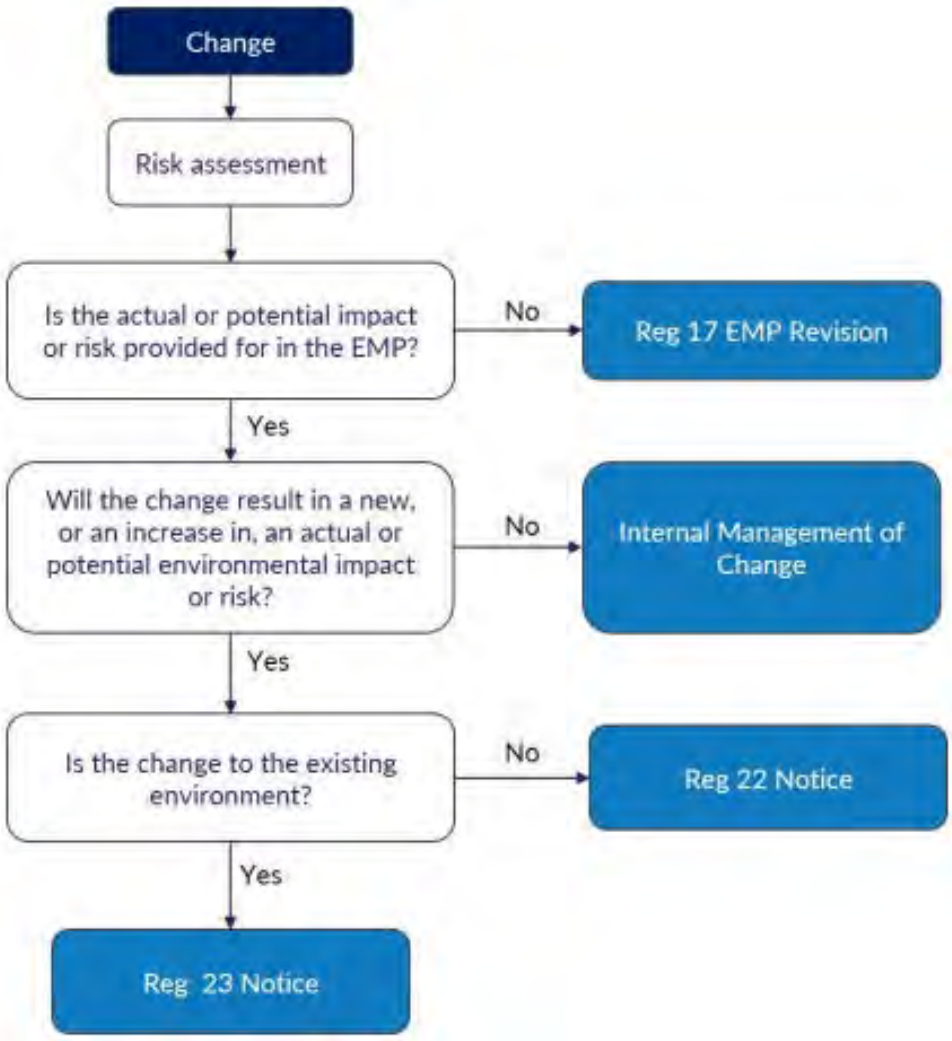

Figure 7.1. Key questions for determining the applicable change process

7.5.4 Monitoring and tracking

The purpose of monitoring in an Implementation Strategy is to monitor the effectiveness of the strategy in mitigating impacts and risks. This is done through the consideration of:

1. Risk reviews. These are done to ascertain if the risk profile has changed, and if so, whether the outcomes and standards are able to be achieved, and whether the controls need to be amended
2. The effectiveness of controls is evaluated to ascertain if the outcomes and standards are able to be achieved.
3. Monitoring is undertaken to determine if an impact is occurring.
2. Monitoring of emissions and discharges for government tracking purposes.

A summary of Monitoring and tracking is presented in Table 27.

The movement of all wastewater will be documented and available upon request. Tracking will be carried out following:

Table 27: Monitoring Plan

Monitoring program	Location	Factors Assessed/Actions		Frequency
		Quality	Quantity	
Risk Analysis Reviews	Operationally, office based	Review of the monitoring programs outcomes	N/A	Review officed based yearly against the risk matrix, or as required due to operational incident.
Baseline water	CMBs IMBs	• Bore water tested for analytes, as described in Table 6 of The Code	Water level of the Gum Ridge aquifer. Tracking of water level when taking samples	A minimum of eight samples before undertaking hydraulic fracturing
General water	Water bores Monitoring Bores	• Bore water tested for analytes, as described in Table 6 of The Code	Water volume extracted will be measured using flow-meters	Quarterly for a minimum of 3 years from the spud date, and yearly thereafter.
Drilling cuttings	Pits	• Representative samples of drilling fluids and cuttings for analytes described in Section C.8 of The Code	Based on drilling data and estimated before disposal or burial	At drilling rig demobilisation
Drilling fluids	Pits	• Representative samples of drilling fluids and cuttings for analytes as described in Table 9 of The Code	Based on drilling data and estimated at demobilisation	At drilling rig demobilisation
Fluid levels	Pits & tanks	• Numerical telemetry monitoring		Continuous, while operational (6 hourly logging)

Monitoring program	Location	Factors Assessed/Actions		Frequency
		Quality	Quantity	
Hydraulic fracturing fluid	Post blender, before injection	• Analytes, as described in Table 6 of The Code • Quality of Groundwater known through general water sampling (above) • Records of the concentrations of chemical additives will be used to confirm the maximum concentrations	The total volume pumped at each stage (depth intervals)	Where fluid source changes. Where multiple stages in the same formation use the same source fluid, fracture fluid test results from the first such stage will be representative of multiple stages.

Monitoring program	Location	Factors Assessed/Actions		Frequency
		Quality	Quantity	
Flowback Fluid and Produced Water	Each wellpad bulk storage and treatment tank	• pH, temperature and electrical conductivity (EC.) • Analytes, listed in Section C.8 of The Code	Cumulative Flowback Fluid and Produced Water volume and stabilisation	• Daily for water level and evaporation rates • Sampling frequency of at least once per 24 hours for pH, temperature and electrical conductivity (EC) until the weekly fluid-volume is stable • Sampling frequency of at least weekly for Analytes, listed in Section C.8 of The Code until the weekly fluid is stable, then every six months. • Flowback Fluid and Produced Water volume to record the cumulative at 1month, 3months, 6 months and 12months after flowback has commenced. • Weekly inspection for all stored volume and available freeboard for all Flowback Fluid and Produced Water storage facilities, and daily telemetry inspections checks during the wet season • 6monthly sampled all Flowback Fluid and Produced Water storages as per Section C.8.

Monitoring program	Location	Factors Assessed/Actions		Frequency
		Quality	Quantity	
Fauna interaction	Wastewater treatment tanks, pits, and surrounding lease area	1. Tanks and pits inspection for carcasses to identify if they are listed or not listed species. 2. Carcasses present during tank and pit emptying 3. Ongoing bird or fauna mortality is defined as >4 per week for two (2) consecutive weeks or any mortality of a threatened fauna species. 4. Ad hoc fauna observations and photos to be taken around wastewater treatment tanks When fauna mortality is triggered further mitigation measures will be considered to be implemented depending on the species. e.g: • Relocation of nest in consultation with Parks and Wildlife specialists • Installation of small fauna-proof barrier • Instatement of reflective flicker-tape to assist bats detecting barbed wire strand		• Weekly during operations and non-operational periods
Bushfire	NAFI website	• Hotspot alerts • Fire danger and planned burning in the NT		• Weekly
Weather	BoM	• Weather forecast and predicted significant rainfall events		• Daily during the wet season, otherwise weekly during operations

Monitoring program	Location	Factors Assessed/Actions		Frequency
		Quality	Quantity	
Soil stability (Erosion and sediment control devices)	Areas of disturbance	**Daily (during rainfall) & Weekly** • All drainage, erosion and sediment control measures in place • Occurrences of excessive sediment deposition (whether on-site or off-site) • All site discharge points (including dewatering activities as appropriate) • All temporary flow diversion and drainage works • Occurrences of construction materials, litter or sediment, placed, deposited, washed or blown from the site, including deposition by vehicular movements from the site, including deposition by vehicular movements • Litter and waste receptors • Oil, fuel and chemical storage facilities **Prior to anticipated rainfall** • All drainage, erosion and sediment control measures • All temporary flow diversion and drainage works		**Monitoring** • Daily - During rainfall and operation activities • Weekly (even if works is not occurring on site) • Within 24 hours of expected rainfall (during operation activities) • Within 18 hours of rainfall event (during operation activities)
Potential fugitive emissions	• Well • Flowlines • All gas containing equipment following major maintenance	• Personal gas detectors • Potential fugitive methane emissions • All operational personnel will carry and monitor personal calibrated gas detectors during every routine operational visit to well sites		• Ongoing during well testing. • Six monthly leak detections during non-well testing periods • Within 48 hours of recommissioning
	• Flowline high point vents	• Monitor for leaks		• Weekly (while flowlines contain wastewater)

Monitoring program	Location	Factors Assessed/Actions		Frequency
		Quality	Quantity	
Weeds	• Seismic Lines • Access tracks • Camp area • Wellpads (CARP AA-R1, CARP ABR1, CSP AA, CSP AC-R1, CSP AB-R1, CSP AD-R1)	• No introduction of new weed species		• End of the wet season
Fluids/chemical	• Fuel storage • Liquid chemical storage	• Visual inspection for leaks		• Daily, while operational

Monitoring program	Location	Factors Assessed/Actions		Frequency
		Quality	Quantity	
Structural integrity	• Liners • Structural integrity of pits & tanks	• Inspect for leaks		• Daily while operational
	• Secondary containment (when in use)	• Inspect for signs of damage or compromised		• Weekly • Daily during the wet season
	• Wellpad transfer lines • Valves • Hoses	• Visual inspection for leaks		• Daily while operational
	• Buried flowlines	• Monitor for leaks (numerical telemetry monitoring)		• Continuous, while operational (hourly reporting)
	• Bunded Areas	• Structural integrity • Presence of spill or rainwater		• Daily while operational
	Road • Sealed carriageway • Unsealed shoulders	• inspections to ensure the integrity of both the sealed carriageway and unsealed shoulders is of an appropriate standard in the vicinity of the three access points		• Weekly during operational periods
Wellhead pressure	• Wellhead	• Well pressure as per WOMP		• As per WOMP

Monitoring program	Location	Factors Assessed/Actions		Frequency
		Quality	Quantity	
Rehabilitation				
Decommissioning	Areas of disturbance	• Removal of all above-ground infrastructure. • Removal of all site wastes • Backfill pits • Re-spread vegetation previously cleared All RCCA items closed out to the satisfaction of DEPWS/DITT		• Commence within 12 months of site/infrastructure closure. **Monitoring**: • Following the first wet season, • One year after rehabilitation works commenced • Annual ongoing until rehabilitation is completed.
Soil Stability	Areas of disturbance	• All compacted areas to be deep ripped and recontoured to as close to natural landform as practicable • Remove any flow concentration points that may block overland sheet flow • Reinstate natural drainage channels (e.g., removal of any structure that temporarily altered flow paths) • Ensure all cleared areas have a scarified surface to aid in water and seed retention • Return soil profile with topsoil replaced over disturbed land • Vegetation stockpiles re-spread across disturbed land • Erosion and sedimentation devices maintained and installed as per site-specific ESCP (to be updated at the time of rehabilitation) • Assess post wet season for soil stability and amend ESCP if applicable.		• Commence within 12 months of site/infrastructure closure. **Monitoring**: • Following the first wet season, • One year after rehabilitation works commenced • Annual ongoing until full rehabilitation is completed.

Monitoring program	Location	Factors Assessed/Actions		Frequency
		Quality	Quantity	
Revegetation	Areas of disturbance	• Vegetation stockpiles re-spread post-civil soil rehabilitation operations. • Allow for natural passive re-seeding, assess after wet season and apply active re-seeding if re-growth not in line with expectations • compare the appearance of rehabilitation areas to the surrounding environment.		• Commence within 12 months of site/infrastructure closure. **Monitoring**: • Following the first wet season, • One year after rehabilitation works commenced • ongoing until full rehabilitation is completed.
Weeds	Areas of disturbance	• Inspection of all disturbed areas including, seismic lines, lease pads, access tracks, pits, laydown yards, camp pads.		• Visual inspection post first wet season

7.6 Reporting

7.6.1 Incident reporting

Incident reporting and investigation provides the mechanism to prevent a recurrence. All personnel are required to proactively report all incidents, near-misses and identification of potential hazards.

All personnel are encouraged to report minor events to act as an alert to environmental risks and maintain a continual improvement program. Table 28 presents the incident and Reporting Requirements.

Table 28: incident and Reporting Requirements

Requirements	How and by when
Petroleum (Environment) Regulations	
Recordable Incident Reporting A recordable incident is a breach of an Environmental Objective or Environmental Performance Standard in the Environment Management Plan that applies to the activity, and is not a reportable incident.	
The recordable incident report must contain: (i) a record of all recordable incidents that occurred during the reporting period; and (ii) all material facts and circumstances concerning the recordable incidents that the operator knows or is able, by reasonable search or enquiry, to find out; and (iii) any action taken to avoid or mitigate any adverse environmental impacts of the recordable incidents; and (iv) the corrective action that has been taken, or is proposed to be taken, to prevent similar recordable incidents	Notify DEPWS (this may be oral or in writing) as soon as practicable but not later than 15 days after the reporting period.

Requirements	How and by when
Reportable Incident Reporting A reportable incident is an incident relating to the activity that has caused or has the potential to cause material or serious environmental harm as defined under the Petroleum Act.	
The initial verbal report will include as much preliminary information as is available about the incident (e.g., interest holder, location, type of incident, affected stakeholders, initial assessment of environmental harm and initial response).	Notify DEPWS Onshore gas non-compliance hotline 1800 413 567 or Onshoregas.DEPWS@nt.gov.au. Initial notification (this may be oral or in writing) will be as soon as practicable but no later than two hours after the first occurrence of the incident or after the time the interest holder becomes aware of the incident.
The initial written report will include: a) The results of any assessment or investigation of the conditions or circumstances that caused or contributed to the occurrence of the reportable incident, including an assessment of the effectiveness of the designs, equipment, procedures and management systems that were in place to prevent the occurrence of an incident of that nature; b) the nature and extent of the material environmental harm or serious environmental harm that the incident caused or had the potential to cause; c) any actions taken, or proposed to be taken, to clean up or rehabilitate an area affected by the incident; d) any actions taken or proposed to be taken to prevent a recurrence of an incident of a similar nature.	Any verbal report will be followed up by a written report within 24hours of giving verbal notice. Then, an initial report will be provided to DEPWS not later than three days after the incident occurs.
The final reportable incident report must include a root cause analysis of the reportable incident.	The final report to be provided to the Minister as soon as practicable but no later than 30 days after the cleanup or rehabilitation of the area affected by the reportable incident is completed.
Waste Management and Pollution Control Act	
Duty to notify of incidents causing or threatening to cause pollution. Where an incident occurs in the conduct of an activity and the incident causes, or is threatening or may threaten to cause, pollution resulting in material environmental harm or serious environmental harm. A notification is required to specify a) the incident causing or threatening to cause pollution; b) the place where the incident occurred; c) the date and time of the incident; d) how the pollution has occurred, is occurring or may occur; e) the attempts made to prevent, reduce, control, rectify or clean up the pollution or resultant environmental harm caused or threatening to be caused by the incident; and the identity of the person notifying.	The proponent must notify the NT EPA as soon as practicable after (and in any case within 24 hours) first becoming aware of the incident or the time they ought reasonably be expected to become aware of the incident.

Requirements	How and by when
Heritage Act	
When a proponent discovers a place or object that is known to be Aboriginal or Macassan archaeological place or object, they must provide • a description of the place or object; • its location; • the person's name and address; • if known by the person –the name and address of the owner or occupier of the place or place where the object is located.	The proponent must provide the CEO of the NLC a written report as soon as practicable but within seven days of discovery.
Work Health and Safety (National Uniform Legislation) Act and Regulations	
A person who conducts a business or undertaking must ensure that the regulator is notified immediately after becoming aware that a notifiable incident arising out of the conduct of the business or undertaking has occurred. notifiable incident means: a) the death of a person; or b) a serious injury or illness of a person; or c) a dangerous incident Requirement to notify NT WorkSafe if the volumes of chemicals held onsite exceed requirements.	Any person who conducts a business or undertaking
Transport of Dangerous Goods by Road and Rail (National Uniform Legislation)	
If a driver of a road vehicle transporting dangerous goods and the vehicle is involved in an incident resulting in a dangerous situation, they must notify the prime contractor for the goods, the Competent Authority, and the police or fire service of the incident	As soon as practicable after the incident occurred

7.6.2 Routine Reporting

Table 29 presents the routine reporting details required under this EMP.

Table 29: EMP reporting schedule

Frequency	Report detail	Recipient
Before the commencement of regulated activities	A commencement of a regulated activity	2. The Minister for Environment 3. The occupier of the land in which the activity is carried out 4. The owner of the land for which the activity is to be carried out
Quarterly	• Quarterly recordable incident report summarizing recordable incidents during the operational and non-operational activities and groundwater monitoring data.	DEPWS
Annually	An annual environmental performance report will be prepared and submitted to the Minister covering the following: • Summary of the works completed under the EMP during the reporting period • Summary of performance against measurement criteria • A summary of all the recording, monitoring and reporting information about the regulated activity to which this EMP relates in a manner that will enable the Minister to determine whether the environmental outcomes and environmental performance standards in the plan are being met.	DEPWS
Report about flowback fluid	A report regarding flowback is required within six months of the flowback commencing, in accordance with section 37A of the NT Petroleum (Environment) Regulations 2016.	The Minister for Environment
Report about produced fluid	A report regarding produced fluid is required within six months of the water being extracted, in accordance with section 37B of the NT Petroleum (Environment) Regulations 2016.	The Minister for Environment

7.6.3 Record Keeping

Imperials HSEMS outlines the policies and procedures governing the management of data and prescribed records.

To the extent the following documents are "prescribed records" for the NT Petroleum (Environment) Regulations 2016, they will be kept for the longer of five (5) years following the period during which the petroleum interest is in force, or 15 years after the record comes into existence:

- Records linked to measurement criteria, commitments and statutory reporting requirements
- Induction records
- Waste records
- Hazardous goods manifest
- Fuel usage
- Chemicals stored and transported
- Weed inspections
- Non-compliances and corrective action records
- Internal audits and inspection records
- Management of change records.

The records will be kept within Australia and in a manner that allows for easy retrieval.

7.7 Environmental Outcomes, Performance Standards and Measurement Criteria

As ALARP and Acceptability are key approval criteria that the Minister is to be satisfied with, robustly addressing ALARP and Acceptability is a strict requirement and requires proper consideration. Clause 1 of the Code of Practice states the Code outlines standards and processes to ensure risks are managed to ALARP, regulated activities are carried out consistently with ESD principles, and environmental impacts and risks are reduced to ALARP and acceptable.

However, the Code does not include mandatory requirements for all impacts and risks. Imperial has its mitigation methods for those not covered in the Code. Imperial has also supplemented the Code with additional controls where it is practicable and justifiable to reduce risk.

Imperial has undertaken risk reduction following the hierarchy of controls, i.e.;

1. elimination
2. substitution
3. Engineering/design
4. procedures and administrative controls.

This EMP has been developed to specifically protect and ensure the integrity of the existing and surrounding environment from risks associated with the project activities; through the establishment and implementation of:

- Environmental Performance Outcomes, means an outcome that will be achieved if the environmental impacts and environmental risks of a regulated activity are reduced to a level that is:
  a. as low as reasonably practicable; and
  b. acceptable.
- Environmental Performance Standards means a standard that:
  a. relates to the management of environmental impacts and environmental risks of a regulated activity; and
  b. applies to persons, systems, equipment or procedures involved in carrying out the activity.
- Measurement Criteria means the criteria to be used in determining whether an environmental outcome or environmental performance standard has been met.
- Responsibility means the person who is responsible for the process or the implementation of an activity.

The following section provides the management controls that Imperial will implement during its activities to protect environmental values, such as:

- Terrestrial Fauna and Flora,
- Terrestrial Environmental Quality,
- Inland Environmental Water Quality,
- Hydrological processes,
- Air Quality and Greenhouse Gasses, and
- Human Health

The tables below (Table 30 to Table 35) focus on those impacts which have the greatest consequence, should they occur and outline the environmental values, the environmental outcomes, the performance standards and Imperial's management controls and measurement criteria to reduce these higher levelled risks identified in Appendix 04.

Risk from each environmental value associated with the EP187 area will be managed to ALARP to meet Imperial's management objectives and successfully deliver the detailed environmental outcomes For the full risk assessment, see Appendix 04.

Table 30: Environmental Outcomes, Performance & Measurement – Human Health

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
Conduct of the regulated activity does not create any: • safety risks for the public or landholders, • activities do not impede on the activities of stakeholders, • activities have no negative impacts on the community and cultural heritage	Operations resulting in the creation of dust	• No complaints from the community around excessive dust	• Community complaints register shows no complaints received concerning dust generation • Site induction records show all personnel inducted and induction materials include consideration of impact on air quality from dust generation	Project Manager
		• Speed limits adhered to	• Speed limit of 60km/hr on all non-gazetted roads within the Exploration Permit. • Speed limits of Northern Territory adhered to on all gazetted roads • Site induction records show all personnel inducted, and induction materials include requirements related to adhering to speed limits. • Incident management system shows no records of non-adherence to speed limits	Project Manager
		• Minimal incidences of dust created from unsealed roads. (minimal being under 4 incidents reported within a 2 week period)	• Roads to be dampened with water when required to minimise dust potential • Daily records show the use of water carts linked to access track condition assessment and site activities. • Dust suppression activities are undertaken on unsealed access roads during the dry season	Project Manager
	Vehicle and Plant Movement	• Speed limits posted on unsealed access tracks adhered to	• Site induction records show all personnel inducted, and induction materials include requirements related to adhering to speed limits. • Incident management system shows no records of	Project Manager

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
			non-adherence to speed limits	
		• Vehicle movements on publicly accessible roads carried out in a safe manner	• Community complaints register shows no complaints received concerning dangerous driving • Incident management system shows no records of dangerous driving or non-adherence to road rules	Project Manager
		• No damage to or loss of public infrastructure, private infrastructure and equipment or community lands	• Only approved access routes to be used • Implementation of the Traffic Management Plan • Adhere to road speed limits at all times or to the weather conditions, whichever is the lowest • Inductions for all employees and contractors cover pastoral, conservation, legislation and infrastructure issues • Vehicle movement along gravel roadways will be restricted in wet or adverse conditions	Project Manager
	General Operations	• Well site fenced and signposted permanently with the well name, well number, major hazards and details of the interest holder	• Signage that is compliant with the Code of Practice is erected at the well site before commencement of the regulated activity • The name of the person in charge of any active well operations is displayed in writing at all approaches to the well site	Project Manager

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
		• No impact on cultural heritage sites.	• Aboriginal Area Protection Authority certificates to be attained for any proposed area prior to clearing • The employment of Cultural Clearance Monitors during land clearing activities • The implementation of the Unexpected Heritage Discovery procedure should a heritage site be found.	Project Manager
		• No instances of overtopping of pits, Flowback Water and Produced Water tanks due to significant weather events	• No overtopping to occur due to significant rain events • Records show that the daily wet season weather forecast checks occur • Records show that weekly wet-season forecast calculations to determine the available storage capacity occur	Project Manager
		• No impact on the stakeholder to their use of the land.	• Communication programs to be implemented • Install and maintain adequate warning signs and fences • Ongoing rehabilitation of disturbed areas not in use • All activities to stay within the approved areas • Only stakeholder approved access routes to be used • Community complaints register shows no complaints received in regards to the use of the land.	Project Manager
		• To deliver benefits to the local community	• Where possible, local and/or indigenous people employed • Where possible, local facilities and suppliers to be used	Project Manager

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
		• No impacts on landholders or the community regarding from lighting, noise or vibrations	• Community complaints register shows no complaints received concerning noise, vibration or light spill • Majority of vehicle movements will be limited to daylight hours • Task focussed lighting will be used, and all boundary lighting will be positioned inwards • Engines/machinery to be maintained as per planned maintenance system • Distance to dwellings is greater than 10km • Monitoring of ground vibrations via seismicity sensor system during all hydraulic fracturing operations	Project Manager
		• No livestock on site	• The weekly checklist shows the well site fence installed and intact throughout the regulated activity.	Project Manager

Table 31: Environmental Outcomes, Performance & Measurement – Terrestrial Fauna and Flora

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
Ensure that sensitive receptors, significant conservation areas, or listed species or their habitat are not permanently affected by the conduct of the regulated activity	• Clearing of vegetation for conduct of the regulated activity	• No vegetation cleared beyond the approved areas	• Site induction records show all personnel involved in clearing operations inducted and induction materials include requirements related to clearing limits • Spatial analysis of final disturbance footprint against approved clearing areas and buffers shows that all clearing is within cleared footprint • No clearing for seismic lines or wellpads within buffer zones • An ecologist will be on site before, or during, clearing operations to undertake ground-truthing for ground disturbing activities in advance of any ground disturbance to ensure the actual riparian zones and the buffers for drainage depressions, and stream orders 1 to 4, and the location and density of hollow-bearing trees and their buffers, are checked, and regulated activities are avoided in sensitive areas. • Clearing of trees to follow the tree clearing decision tree in appendix 2 • On ground supervisor during all land clearing operations • Install buffer zones and distances into clearing machinery GPS units, so machine operators be alerted when reaching buffer distances. • Access tracks and flowlines to cross watercourses at right angles, and maintain original watercourse contours	Project Manager

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
	• Vehicle and plant movements	• No introduction of new weed species or spread of existing weed populations as a result of conduct of the regulated activity	• Site induction records show all personnel inducted, and induction materials include requirements related to weed impacts and prevention of spread. • Weed inspections as outlined in the Weed Management Plan (Appendix 09) conducted according to the timetable indicated • Weed control activities undertaken as specified in the approved Weed Management Plan • All vehicles entering the site are inspected for the presence of weed seeds/vegetative material • Results of weed monitoring (post wet season) demonstrates that there has been no weed incursions as a result of project activities	Project Manager

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
	• Ignition sources from plant and machinery	• No fires in surrounding areas resulting from conduct of the regulated activity	• Appropriate fire breaks on wellpad with minimum setbacks to infrastructure • Flares or flare stacks must be designed, prepared and operated following industry standards. • Flare stack will be monitored during flaring • Monitor weather and fire danger to plan operations accordingly • Fire extinguishers and operational VHF or UHF radio transceivers fitted to all vehicles and clearing machinery • Appropriate firefighting equipment available and serviced • No burning of waste • All personnel to be trained and informed before the commencement of the activity relating to: o Restricted smoking areas and requirements o Firefighting equipment operation and communication o Emergency Response Plan and procedures during a fire emergency • Designated smoking areas with appropriate waste receptacles • Implementation of Fire Management Plan (Appendix 08) • Machinery and vehicles should be parked in areas of low fire risk	Project Manager

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
	• Waste handling and disposal	• No vermin attracted to site due to improper storage of general wastes	• All putrescible waste stored in vermin-proof enclosed receptacles • Site induction records show that all personnel inducted and induction materials include waste segregation, storage, and disposal requirements. • Daily checklist records show no incidences of introduced pests in the waste storage area • Daily checklist records show no incidences of putrescible waste being accessible to wildlife and/or vermin	Project Manager
		• No instances of overtopping of pits, Flowback Water tanks, and Produced Water tanks due to significant weather events	• No overtopping to occur due to significant rain events • Records show that the daily wet season weather forecast checks occur • Records show that weekly wet-season forecast calculations to determine the available storage capacity occur	Project Manager
		• Waste transported appropriately	• All listed waste transported by licensed waste contractors • Listed waste transfer records show Environment Protection Licence (EPL) number of waste contractor • Waste records show the volume of wastewater removed from the well site for off-site disposal by a licensed waste contractor • Waste records show removal of all putrescible waste from site	Project Manager

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
			• No putrescible waste is disposed of on-site	
		• No leaks from flowlines	• Flowlines to be engineered and tested to meet the relevant Australian standards • Flow balance monitoring during use of flowlines to detect leaks • Implementation of the Wastewater Management Plan • Laboratory analysis and risk assessment of the HF flowback wastewater will be conducted prior to sending the wastewater to treatment tanks	Project Manager
		• All waste segregated on-site according to whether it is hazardous, recyclable or for general disposal	• Weekly checklists confirm waste appropriately segregated	Project Manager
		• Maintain the freeboard in open-topped wastewater treatment tanks over the wet season	• No overtopping events to occur during the wet season as a result of excessive rain	Project Manager
		• Wastewater from drilling stored in lined pits	• Documentation available demonstrating the lining in pits meet the requirements of the Code of Practice clause C.4.1.2 (b)	Project Manager
	• Lighting, noise and vibration from vehicles,	• Disturbance to biodiversity from increased noise,	• Site induction records show all personnel inducted and induction materials include requirements related to minimising noise, vibration and light spill.	Project Manager

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
	plant and equipment	vibration and light is minimised to the greatest extent possible •	• Maintenance records for vehicles demonstrate all vehicles serviced following service schedule. • Maintenance records for equipment demonstrate servicing following the manufacturers specifications and/or Imperial's maintenance and service schedule. • Site inspections conducted during night time to confirm that lights are directed inwards to the greatest extent.	

Table 32: Environmental Outcomes, Performance & Measurement – – Terrestrial Environmental Quality

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
Terrestrial environmental quality, including surface waters, are not permanently affected by the regulated activity's conduct.	• Clearing of vegetation for conduct of the regulated activity	• No ground disturbance occurs outside of designated areas approved for ground disturbance	• Site induction records show all personnel involved in clearing operations inducted and induction materials include requirements related to clearing limits • Spatial analysis of final disturbance footprint against approved clearing areas and buffers shows that all clearing is within cleared footprint	Project Manager
	• Civil construction and operation of infrastructure	• Actively preventing erosion and sedimentation • Not allowing areas to continuously erode or create ongoing sedimentation desposits	• As-built ESC drawings show that ESCP implemented • Weekly reports to show ESC operating and maintained correctly.	Project Manager
	• Vehicle and plant movements	• No vehicle movements outside of designated areas approved for ground disturbance during construction and seismic acquisition or off access tracks for all other activities	• Site induction records show all personnel inducted, and induction materials include the prohibition of movement outside of approved areas. • The incident management system has no records related to unauthorised movement off-site	Project Manager

	•	• Vehicles on access tracks are only allowed to cross intersecting flowing creeks or watercourses with specific authorisations to do so.	• Site induction records show all personnel inducted and induction materials include the prohibition of crossing of flowing creeks or watercourses unless approved by the Site Manager • The incident management system has no records related to the unauthorised crossing of flowing creeks or watercourses • Evidence of risk assessment undertaken and subsequent decision available for each instance of an approved crossing of a flowing creek or watercourse	Project Manager
	• Storage and handling of hazardous substances, including HF fluid and flowback wastewater	• All hazardous chemicals or those that may cause environmental harm to be stored in secondary containment, which has sufficient capacity to hold 100% of the volume of the largest container stored unless the container has its own secondary containment.	• Site induction records show all personnel inducted and induction materials include requirements related to the use and storage of hazardous chemicals. • Weekly inspection records confirm all hazardous materials stored in compliance with relevant SDS • Inspection records confirm that all hazardous chemicals are stored in secondary containment, which can hold 100% of the largest container, weekly during the dry season and daily during the dry season. • Weekly inspection records confirm tanks and storage vessels intact and free from defects or tears • Incident management system includes records	Project Manager

			of failures of the integrity of storage vessels	
		• No instances of loss of containment of wastewater	• Incident management system includes records of loss of containment of wastewater • Any wastewater flowline leak reported to DEPWS	Project Manager
		• No instances of overtopping of pits, Flowback Water and Produced Water tanks due to significant weather events	• No overtopping to occur due to significant rain events • Records show that the daily wet season weather forecast checks occur • Records show that weekly wet-season forecast calculations to determine the available storage capacity occur	Project Manager
		• Freeboard for all pits, Flowback Water and Produced Water tanks maintained at all times	• Site induction records show all personnel inducted, and induction materials include requirements related to the storage of wastewater. • All tanks marked with freeboard levels as per seasonal requirements • Daily inspections confirm wastewater levels do not exceed freeboard • Records of exceedance of the freeboard are included in the incident management system and evidence of corrective actions and preventative measures implemented • A minimum of 1.1m freeboard will be maintained in all tanks/pits that contain Flowback Fluid and Produced Water throughout the wet season	Project Manager

		• All spills remediated immediately on discovery	• Site induction records show all personnel inducted, and induction materials include requirements to remediate all spills to the ground immediately. • Daily inspections show no evidence of soil contamination from spills/leaks not immediately rectified • Weekly inspections show the hazardous materials and storage area is clean and free from spills and leaks • Daily inspections show bunds inspected and contents removed daily during wet season • Hazardous materials register to be maintained during site operations • Records of spill remediation to confirm immediate response • SDS register compliant with NT WorkSafe requirements and kept at location of chemicals at all times • Daily inspections show spill kits appropriate to the chemical in use are available at the location of use	Project Manager
		• No water to be taken from surface water sources	• Site induction records show all personnel inducted and induction materials include prohibition of surface water use at any time. • Incident management system includes records of unauthorised use of surface water	Project Manager

Table 33: Environmental Outcomes, Performance & Measurement – Hydrological Process

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
The conduct of the regulated activity does not result in the over-extraction or contamination of groundwater resources	• Groundwater extraction for project activities	• Compliance with the groundwater extraction licence	• Groundwater extraction volumes recorded on-site and provided to DITT and DEPWS at the end of the project operations • Groundwater taken is less than the maximum permitted volume for the activity • Water extraction to be undertaken at approved registered groundwater bores.	Project Manager
	• Drilling and Hydraulic Fracturing of wellbore/s	• No contamination of aquifers from the regulated activities	• local baseline data collection for water quality indicators • Groundwater monitoring per the *Preliminary Guideline: Groundwater Monitoring Bores for Exploration Petroleum Wells in the Beetaloo Sub-Basin* • Groundwater monitoring results do not show contamination of the local aquifers from the regulated activities	Project Manager

Table 34: Environmental Outcomes, Performance & Measurement – Inland Environmental Water Quality

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
Local inland water quality is not permanently affected by the conduct of the regulated activity.	• Vehicle and plant movements	• Vehicle crossing of flowing creeks or watercourses to only occur with specific authorisations.	• Site induction records show all personnel inducted and induction materials include prohibition of crossing of flowing creeks or watercourses, unless approved by Site Manager • The incident management system has no records related to unauthorised crossing of flowing creeks or watercourses • Evidence of risk assessment undertaken and subsequent decision available for each instance of an approved crossing of a flowing creek or watercourse • No clearing for seismic lines or wellpads within buffer zones • On ground supervisor during all land clearing operations • Install buffer zones and distances into clearing machinery GPS units, so machine operators be alerted when reaching buffer distances. • Access tracks and flowlines to cross watercourses at right angles, and to maintain original watercourse contours	Project Manager
		• No loss of riparian flora	• On ground supervisor during all land clearing operations • An ecologist available on site prior to seismic	Project Manager

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
			lines clearing to identify and mark location and density of hollow-bearing trees as well as sensitive vegetation. • An ecologist inspection prior to access tracks, flowlines and wellpads land clearing. • Line preparation plant, to have GPS installed to alert when approaching no-go zones • No unauthorised clearing	
	• Storage and handling of hazardous substances, including HF fluid and flowback wastewater	• All hazardous chemicals or those that may cause environmental harm to be stored in secondary containment, which has sufficient capacity to hold 100% of the volume of the largest container stored unless the container has its own secondary containment.	• Site induction records show all personnel inducted and induction materials include requirements related to the use and storage of hazardous chemicals. • Weekly inspection records confirm all hazardous materials stored in compliance with relevant SDS • Weekly inspection records confirm that all hazardous chemicals are stored in secondary containment, which has a capacity to hold 100% of the largest container. • Weekly inspection records confirm that all hazardous chemicals are stored in secondary containment which has a capacity to hold 100% of the largest container. • inspection records confirm tanks and storage vessels intact and free from defects or tears	Project Manager

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
			• Incident management system includes records of failures of integrity of storage vessels	
		• No pit or tank failure due to flooding inundation	• Wellpad location based on 1 in 100-year ARI Flood modelling • Pits to be constructed with 500mm bund to prevent water entry from overland flow. • Pits to be constructed with 500mm bund to prevent escape of water from a catastrophic failure will prevent water entry from overland flow.	Project Manager
		• No instances of loss of containment of wastewater	• Incident management system includes records of loss of containment of wastewater • Site induction records show all personnel inducted, and induction materials include requirements related to wastewater storage. • All tanks marked with freeboard levels as per seasonal requirements • Daily inspections confirm wastewater levels do not exceed freeboard • Records of exceedance of the freeboard are included in the incident management system and evidence of corrective actions and preventative measures implemented • A minimum of 1.1m freeboard will be	Project Manager

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
			maintained in all tanks/pits that contain Flowback Fluid and Produced Water throughout the wet season	
		• All spills remediated immediately on discovery	• Site induction records show all personnel inducted, and induction materials include requirements to immediately remediate all spills to the ground. • Daily inspections show no evidence of soil contamination from spills/leaks not immediately rectified • Weekly inspections show the hazardous materials and storage area is clean and free from spills and leaks • Daily inspections show bunds inspected and contents removed daily during wet season • Hazardous materials register to be maintained during site operations • Records of spill remediation confirm immediate response • SDS register compliant with NT WorkSafe requirements and kept at location of chemicals at all times • Daily inspections show spill kits appropriate to the chemical in use are available at the location of use	Project Manager

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
		• No leaks from flowlines	• Flowlines to be engineered and tested to meet the relevant Australian standards • Flow balance monitoring during use of flowlines to detect leaks • Implementation of the Wastewater Management Plan • Laboratory analysis and risk assessment of the HF flowback wastewater will be conducted prior to sending the wastewater to treatment tanks • Any wastewater flowline leak will be reported to DEPWS.	Project Manager
		• All storage vessels for wastewater and hazardous substances are maintained at 100% integrity	• Daily inspection records confirm tanks and storage vessels intact and free from defects or tears • Incident management system includes records of failures of integrity of storage vessels	Project Manager
	• Crossflow during drilling and HF, operations, testing and decommissioning • Fracture growth into aquifer from HF activities	• No impact on inland water environmental quality	• Well, is constructed following the Code requirements, and passes well acceptance criteria • Shallow aquifers isolated behind cemented concentric casing strings. • Distance of target shale formations (Velkerri formation) from the nearest high-quality aquifer (Cambrian Limestone aquifer) is over 600m • Mechanical Earth Model based on Logging,	Project Manager

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
	• Faults or major structures enables crossflow. • Well blow out		core, drilling, and offset data is created to aide in understanding HF geometry and subsequent design • A geohazard assessment will be carried out using the upcoming seismic and that the risk will be addressed in the WOMP to mitigate for subsurface hazards such as abnormal pressure zones, shallow gas, lost circulation and potential zones of instability • A WOMP in place and approved. Activities will not commence until approval received from the regulator • Installation of blow-out prevention equipment systems • Hydraulic fracture diagnostics, including chemical tracers and logging is used to understand the spatial extent and orientation of the induced fracture to improve ongoing design • HF is not linked to major seismic events (reinjection of wastewater is generally recognised as the main cause). No reinjection of wastewater proposed • HF stages deployment will be away from geohazards to reduce the loss of fluids into any encountered faults	

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
			• Geohazard Risk Assessment will be carried out using the upcoming seismic and that the risk will be addressed in the WOMP • No significant faults within proximity of activity, and • Any faults encountered during drilling will be assessed to determine the risk before HF operations • Separation factor between wellbores >2, unless under risk assessment/MOC • Continuous positional tracking of the drill bit to detect and respond to vertical and horizontal well deviations during drilling • Each adjacent well designed and constructed with multiple casing barriers and specifically-engineered cement in place to protect aquifers- • Well, being drilled will have multiple barriers (at least the conductor casing and surface casing) and blow out prevention in place during drilling	
	• Surface water usage	• No water to be taken from surface water sources	• Site induction records show all personnel inducted and induction materials include prohibition of surface water use at any time. • Incident management system includes records of unauthorised use of surface water	Project Manager

Table 35: Environmental Outcomes, Performance & Measurement – Air Quality and Greenhouse Gasses

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
Minimise emissions, including greenhouse gases, created by the conduct of the regulated activity.	• General project activities creating emissions	• Operations carried out in a manner that does not create excessive emissions	• Community complaints register shows no complaints received concerning excessive emissions from site • Site induction records show all personnel inducted and induction materials include consideration of the impact on air quality from emissions	Project Manager
	• Vehicle and plant emissions	• All vehicles, plant and equipment maintained and operated per manufacturer requirements to minimise emissions	• Records and schedules to be managed for machinery and vehicles maintenance as per manufacturers requirements	Project Manager
	• Production testing creating fugitive emissions	• Flaring to be used rather than venting during production testing	• All venting and flaring during production testing will be measured using flow meters compliant with NGERS • Records kept of venting and flaring events and volumes during production testing • Emissions will be reported per NGERS	Project Manager
		• Gas leak detection, repair and notification to be conducted throughout all phases of the project that have live equipment	• Site induction records show all production and evaluation personnel inducted and induction materials include leak detection, repair and notification requirements • Weekly inspection reports confirm leak detection carried out on live equipment	Project Manager

Environmental Performance Outcome	Activity	Environmental Performance Standard (Performance measure)	Measurement Criteria (Monitoring and records)	Responsibility
			• Records of leak remediation confirm the immediate response • Records of leak remediation confirm reporting within five business days of the remediation of the leak	

8. Stakeholder Engagement

8.1 Overview

Imperial's approach to stakeholder engagement ensures that key stakeholders are fully informed of Imperial's activities. And that they are consulted and involved to ensure their aspirations are considered.

Imperial Oil & Gas seeks to establish and maintain enduring and mutually beneficial relationships with the communities of which it is a part, ensuring that activities generate positive economic and social benefits for and in partnership with these communities.

A stakeholder communications log is attached as Appendix 11.

8.2 Identification of Stakeholders

The NT Petroleum (Environment) Regulations define "Stakeholder" as meaning:

- A person or body whose rights or activities may be directly affected by the environmental impacts or environmental risks of the regulated activity proposed to be carried out; or
- An agent or representative or a person or body mentioned in the point above

Using this Stakeholder Definition, Imperial has identified the following as the key relevant stakeholder groups for EP187:

- Traditional Owners
- The Northern Land Council as the representative and agent of traditional Aboriginal owners in accordance with the Aboriginal Land Rights (Northern Territory) Act 19076 (Cth), whose functions in accordance with section 23 of the Act include ascertaining and expressing the wishes and opinions of Aboriginals living in the area as to the management of the land, to protect the interests of traditional Aboriginal owners and to consult with traditional Aboriginal owners with respect to any proposal relating to the use of the land within the Location of the Regulated Activity
- S-19 Leaseholders within the Location of the Regulated Activity
- Other authorised land users within the Location of the Regulated Activity.

Other community members who do not meet the definition of stakeholder but are consulted more broadly by Imperial are:

- Pipeline operators within the Location of the Regulated Activity
- Community members in the area surrounding the Location of the Regulated Activity
- Businesses operating in the area surrounding the Location of the Regulated Activity
- Government agencies
- Industry representative bodies
- Tourism groups

8.3 Stakeholder contact details

Stakeholder	Contact Details
Murphy Pastoral Co Pty Ltd	PMB 77 Carpentaria Downs Katherine NT 0852
Relief Creek	P.O. BOX 559 Relief Creek Borroloola. NT. 0854.
West Balbarini	Po Box 1262 Charters Towers QLD 4820
Northern Land Council	1800 645 299

8.4 Assessment of merit of objections and claims

Objections and complaints related to the activities carried out under this EMP are recorded on a register and acknowledged in writing.

Imperial assesses the merit of any objections or complaints made and responds accordingly.

Complaints are investigated as incidents, including formal responses to remedy the complaint if relevant and appropriate.

8.5 Requirement under NLC processes

Imperial does not consider interactions with the NLC regarding Work Permits and engaging Traditional Owner Monitors for agreed Work Programs to be a Stakeholder interaction under the Regulations' definition; thus, these interactions are not reported in this document. Under the exploration agreement for EP187, Imperial has reporting requirements; Imperial does not consider the interaction to be a Stakeholder interaction under the Regulations' definition; thus, these interactions are not reported in this document.

Under the exploration agreement for EP187 with NLC, Imperial has a confidentiality requirement, which must be adhered to; any information exchanged between Imperial and NLC covered by this requirement is not reported in this document.

The Land Rights Act sets out the functions of the NLC and provides that the NLC is the representative of traditional Aboriginal owners of the Land Trust. The Land Rights Act provides that the functions of the Land Council include "to consult with traditional Aboriginal owners of, and other Aboriginals interested in, Aboriginal land in the area of the Land Council with respect to any proposal relating to the use of that land". Accordingly, the NLC is a stakeholder

During the preparation of this EMP, Imperial has carried out engagement with the NLC as the representative of the traditional Aboriginal owners and other Aboriginals interested in the activities

Imperial has also given the NLC the information required by Regulations and allowed a reasonable period for the NLC to respond to the information given by Imperial in satisfaction of the Regulations.

The NLC and Imperial have previously conducted on-country meetings and plan to conduct more on-country meetings with Traditional Owners.

Leading up to the submission of this EMP, Imperial has had representatives present at On-country Meetings with traditional owners. The conversations were carried out respectfully and collaboratively between Imperials Managing Director, inGauge staff, and many traditional owners of the land trust in November 2020.

Imperials Managing Director and Non-Executive Director met with traditional owner's, including previously employed cultural heritage monitors, local artists and further community representatives, in May 2021 to discuss current operations and future operations.

In recent times there was an on-country meeting planned for the 24th of June. This meeting was postponed due to NLC scheduling issues, and after some time, a new meeting was planned for the 30th of June. This most recent on-country meeting was unfortunately also postponed to a later date due to travel restrictions with COVID-19. Imperial has made its best endeavors to engage with the stakeholders and will continue this engagement effort. Imperial understands its stakeholder requirements and takes this responsibility very seriously. For the avoidance of doubt, Imperial will not undertake any Hydraulic Fracturing operations of flowline installation under this EMP until these have been presented to the community at an on-country meeting. All other activities under this EMP have been covered in the November 2020 On-country Metting.

8.6 Stakeholder Engagement Activities

Imperial has consulted with the NLC as agents for the traditional owners of the land, the relevant pastoralists of the area, the gas flowline managers, and other key relevant stakeholders.

Imperial consults and communicates directly with traditional owners of the land, as well as via the NLC, and NLC coordinated face to face meetings.

Key relevant stakeholder engagement has been facilitated through face-to-face meetings. Briefing sessions with key individuals and groups has been carried out with timely feedback on the project's issues and concerns. The purpose of the consultation has been to give each stakeholder information about:

i. The regulated activity Imperial proposes to carry out; and

ii. The location (or locations) where Imperial proposes to carry out the activity; and

iii. The anticipated environmental impacts and environmental risks of the activity; and

iv. The proposed environmental outcomes in relation to the activity; and

v. The possible consequences of carrying out the activity to the stakeholder's rights or activities; and

By providing honest and clear stakeholder engagement and allowing a reasonable period for the stakeholder to respond to the information given by Imperial, the following is aiming to be achieved:

- Informed stakeholder feedback on analysis, alternatives on decisions
- Work directly with the stakeholders throughout the process to ensure their concerns and aspirations are consistently understood and considered
- Partner with the stakeholder in each aspect of the decision making including the development of alternatives and the identification of the preferred solutions
- Build and maintain stakeholder confidence through regular consultation
- Gain trust and acceptance in the local community and groups through appropriate stakeholder engagement
- Work with stakeholders to build understanding as to why and how the company operates

The ongoing consultation has included discussions related to controls implemented, such as:

- Work Programs
- Weed management planning
- Fire management planning
- Land access negotiations
- Compensation agreements where relevant and necessary
- Implementation and monitoring of wash down of all vehicles before entry to the site
- Implementation of erosion and sediment control as per the DLRM guidelines

Imperial has communicated with other community members who are not key relevant stakeholders, or as an inquired basis, mainly via direct conversation, either face to face or via phone.

A log of communications with key relevant stakeholders since lodging the Drilling EMP in relation to Imperial's activities in EP187 are attached in Appendix 11.

Although not key stakeholders, Imperial has maintained an ongoing relationship with local businesses, where practicable. The site works that Imperial has engaged local supplies for the delivery of previous work programs and intend on sourcing from a local business where sources available and economically accessible are;

- Civil construction of Carpentaria Highway intersection
- Civil construction for seismic programs
- Civil construction for wellpad and access track construction
- Weed control
- Water Bore Drilling
- Supply, installation and maintenance of water bore pumps
- Water bore monitoring
- Wellpad monitoring during non-operation periods
- Fencing construction and maintenance
- Traffic control.

8.7 Ongoing Consultation

During the program activities, Imperial will have field representatives in the region. They will be the primary point of contact for all landholders and community members during the work phases. The field representative will also manage the day-to-day activities and communications concerning the landholders to ensure they are consistently updated on the program's status.

Imperial takes a proactive engagement strategy in its Northern Territory operations to ensure that stakeholders are consistently engaged and informed.

Imperials strategy for engagement is to inform stakeholders of current operations, the past operations' status and findings, and plans for any potential future operations.

Before any land access, the field representative will carry out on-ground scouting and consultation to ensure any impact or interruption to landholders is minimised. Imperial will not access any person's land without prior consent, following the DITT policies and guidelines.

Where stakeholders have requested, or Imperial believes it would be beneficial to engage with stakeholders on an ongoing basis during the activity, communications will continue until the activity has concluded.

9. References

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