

11 January 2024

Environment Division
Level 1, Arnhemica House
16 Parap Road, PARAP NT 0820

Good afternoon Onshore Gas,

As agreed to in the *NT Drilling Campaign EMP Final Incident Report – PV12 Loss of Containment (Water)*, Central Petroleum (Central) on behalf of the interest holders at Palm Valley, is submitting the annual monitoring report (Attachment 1). This report addresses the annual sampling and visual monitoring requirements and seeks to close out the incident by demonstrating:

- observed contaminant levels along the release flow path have stabilised and are now below applicable NEPM Guideline (2013) levels.
- Visual monitoring has not identified any impacts to flora in the flow path or surrounding areas

The table below provides a summary of various conditions established through the incident reporting process and how each has been met to close the incident out.

Condition	Addressed	Evidence
1. Annual soil sampling	Yes	<ul style="list-style-type: none"> ▪ 2022 Low Ecological Services Sampling Report (sent) ▪ 2023 EcOz 12-month monitoring report (attached)
2. Annual visual monitoring	Yes	<ul style="list-style-type: none"> ▪ Observations and images contained in the Low Ecological Services 2022 Sampling Report (sent). ▪ Observations and images contained in the 2023 EcOz 12-month sampling Report (attached).

In addition, Central has engaged the services of a third-party Contaminated Land specialist (and auditor) who has reviewed the sampling reports and endorsed the findings / conclusions reached in the most recent sampling report (EcOz, 2023) – this additional correspondence has been included for your information (Attachment 2).

Central trusts this final sampling and visual monitoring report, as well as the third-party endorsement, now closes out the PV12 flare pit release incident.

Should you have any questions please do not hesitate to contact me on [REDACTED] or

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

HSE Manager
Central Petroleum



Attachment 1: EcOz 12-month sampling report



PV-12 Drilling Operation

Flare pit drilling fluid release incident

12-month monitoring report, July 2023

CENTRAL PETROLEUM



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1 INTRODUCTION

EcOz Environmental Consultants (EcOz) was engaged by Central Petroleum (Central) to conduct annual sampling of a flare pit release at the PV12 drill site that occurred in June 2022. Sampling was conducted by [REDACTED] (EcOz), with assistance from [REDACTED] (Central) on the 20 July 2023, and is the second sampling event to monitor this incident.

1.1 Incident details

On the 19 June 2022, 11:00am, it was identified that fluid was leaking from the base of the flare pit to the outside of the PV-12 well pad and into the surrounding environment. The flow of fluid travelled along a natural surface drainage line downstream from the well pad through steep terrain.

The fluid was released during transition to air drilling which caused an unexpected burst of recovered drilling fluid to enter the flare pit via the blooie line, which then seeped through the flare pit, through the base of the well pad and into the surrounding environment. Released fluids contained a mixture of predominately potable water (99.5%) with ADA drilling foam, soda ash, AMC PAC low viscosity and AMC Xan Bore all of which were concentrations of approximately 0.5% at an estimated total volume of approximately 60,000L. The drilling fluid additives are considered to be biodegradable when concentrations are diluted at concentrations recorded in drilling reports.

It is noted that the flare pit was designed (as per EMP approvals) to hold some liquids with an overflow back into the lined sump. The flare pit was not required to be lined as its primary purpose was to safely contain flared gas during drilling.

Upon identification, drilling immediately ceased by way of hoisting to the shoe while the blooie line was reconfigured to discharge liquid returns to the (lined) sump instead of the flare pit. Works were then undertaken to improve fluid holding capacity of the flare pit (i.e. mixture of clay and cement lining). A hydrotest of the newly lined flare pit was conducted in the 16 July 2022, which identified no leaks.

The incident was reported to the Department of Parks, Environment and Water Security (DEPWS) the morning of 20 June 2022 through verbal communications over the phone and followed up via email. An initial report was sent on 22 June 2022 outlining further details of the incident, composition of the drilling foam released, and the immediate and ongoing actions taken by Central Petroleum to assess and rectify the incident. Further investigation and environmental assessment by Low Ecological Services determined the best course of action was to let nature take its course and wait for natural rainfall and runoff to flush the affected area (natural attenuation) and commence annual monitoring until the site was deemed to be remediated.

1.2 Initial impact assessment

Central engaged Low Ecological Services (LES) to assess the impact and recommend suitable remediation. A site visit was conducted on the 20 July 2022 to visually inspect the affected areas (i.e. one month after the drilling fluid spill, and a few days following the hydrotest potable water spill), and collect samples from downstream soil/sediments and fluid held in rock pools. White / grey staining of rocks was observed along much of the rocky creek bed, some associated with the spill and some associated with a natural complex of calcium carbonate. The inspection followed the drainage gullies for about 1.2km, to at which point there was no sign of spill impact. LES reported that evidence of the spill extended approximately 800m down the adjacent rocky gullies.

LES collected 18 soil samples along the affected drainage gully (sites PV12-1 to PV12-18), and two water samples from rock pools (site names PV12-W1 and PV12-W3) (refer to Figure 2). The water clearly contained flare pit fluids (i.e. brown coloration, with some viscosity and foam). Several soil samples were combined to

make composite samples (as per Table 1), and some soil samples were not included in the analysis: PV12-9, PV12-10, PV12-11, PV12-12, PV12-13, PV12-14 and PV12-15.

Results indicated the spill impact area is restricted to an area on the rocky plateau adjacent to the drill pad and the downstream rock drainage line, with potential detections for approximately 400m. Contamination impacts are low with minor elevated detections of hydrocarbons within water samples collected and slightly elevated salinity within soil samples approximately 400m beyond the release site. All other analytes were either within NEPM levels or levels seen in background soil chemistry.

At the time of the inspection, there was not recordable / visual impacts to vegetation along the spill path. LES indicated that a vegetation response would have been expected if there was a major impact / contaminant issue (especially in regards to salinity impacts).

Table 1: Sample sites analysed as part of the initial sampling event in July 2022

Site ID (as per July 2022 sampling by LES)	Sample sites (some composites)
PV12-1	PV12-1
PV12-23	PV12-2, PV12-3
PV12-45	PV12-4, PV12-5
PV12-678	PV12-6, PV12-7, PV12-8
PV12-1617	PV12-16, PV12-17
PV12-18	PV12-18

Note – PV12-9, PV12-10, PV12-11, PV12-12, PV-12-13, PV12-14, PV12-15 were not analysed (all located in middle gully section).

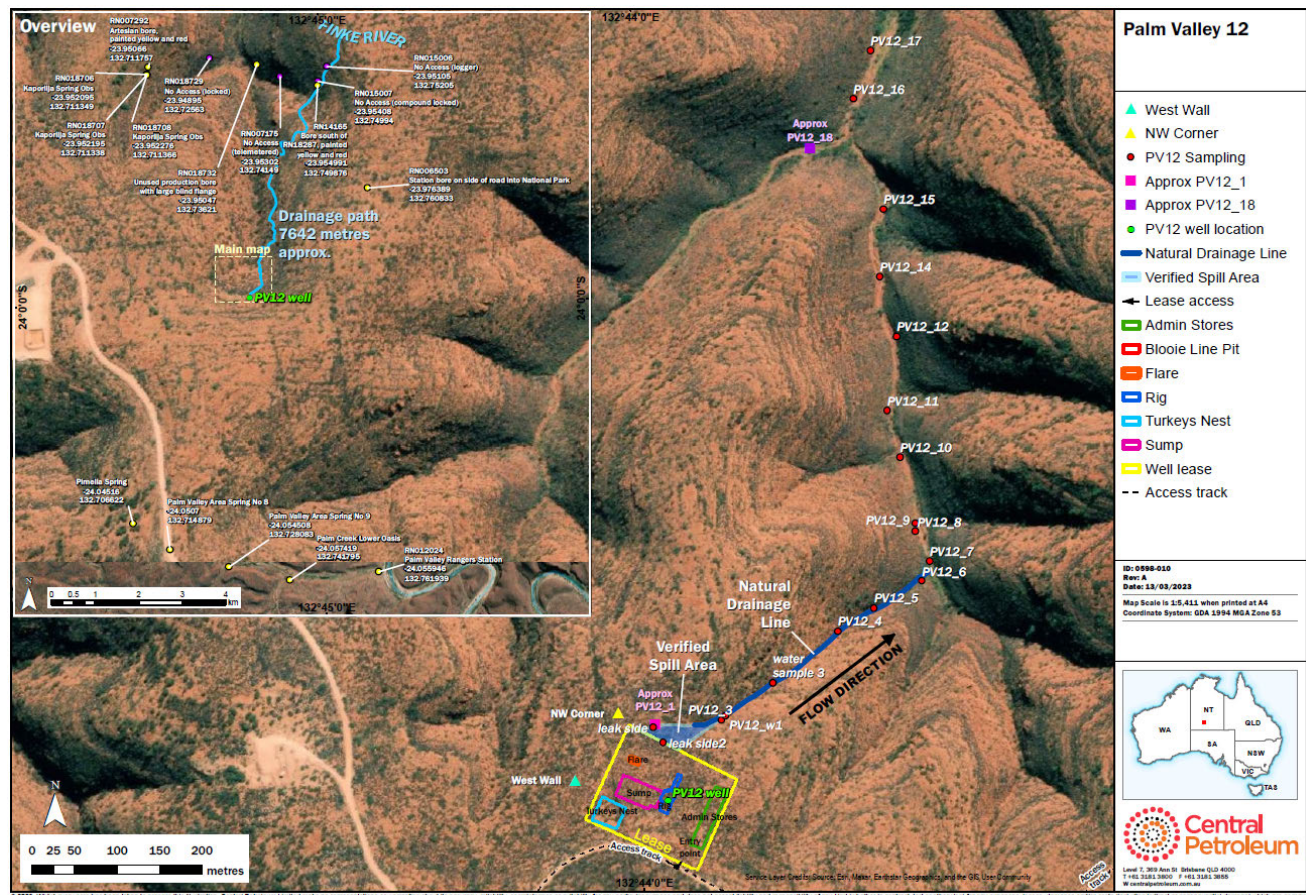


Figure 1: Map of spill site and initial sample sites in July 2022

1.3 Remediation and monitoring

After initial assessment of the incident, sampling results and topography of the receiving environment, Central and specialist third party subject matter experts determined that ‘natural remediation’ is the best strategy. This option allows for natural attenuation via rainfall flushing to provide dilution and leaching of the biodegradable drilling fluid additives.

Central has committed to annual monitoring of the incident as per details in Table 2. The monitoring event will include sampling of sediment/soils, sampling of water in isolated rock pools (if present) and visual inspection of potential impacts. The annual monitoring will occur after each summer rainfall period.

Sites will be consistent with those previously sampled and in line with parameters recommended by DEPWS in previous correspondence on the 20 March 2023. However, going forward, composite sampling (i.e. combining several sites into one sample) will not be undertaken as singular site sampling allows for more accurate assessment on the level of contaminant at a particular location. This program will include additional sites downstream of the impact area, as well as reference site in a similar close-by drainage gully (outside of the impact area).

Table 2. Monitoring program details for the incident

Activity	Timing	Process	Chain of custody	Analysis	Reporting
Soil Sampling	12 monthly post incident, until results are aligned with background samples or below threshold levels. Sampling to be conducted after the summer period (as summer rainfall is more likely in this region)	Samples will be collected for a selection of sites, with site locations to be similar to previous sampling events (to allow for better results comparisons) but will also be dependent on available soil within the rocky drainage gullies / lines. Include sampling of reference sites (i.e. similar gully that has not be impacted by the spill). Composite sampling will not be undertaken.	Samples will be sent to NATA accredited lab for analysis and will be accompanied by the required chain of custody documents.	Analytes for testing will be aligned initial sample data provided (ref: CTP3-4-IN-2958-L-01)	An annual report will be produced.
Visual monitoring	12 monthly post incident, aligned with soil sampling.	Visual monitoring to track the natural remediation capacity of the drainage lines and any impacts on vegetation. The spill path will be traversed on foot and photos and notes taken as appropriate (i.e. vegetation health, staining, hydrocarbon sheen in water pools etc.).	N/A	N/A	An annual report will be produced.

2 METHODOLOGY

Sampling was conducted by [REDACTED] (EcOz), with assistance from [REDACTED] (Central) on the 20 July 2023. A total of 11 soil samples and two water samples were collected (details provided in Table 3; Figure 2). Sites were allocated into five general investigation areas – which have been created for results discussion purposes – 1) Plateau, 2) Upper Gully, 3) Middle Gully, 4) Lower Gully and 5) Reference Gully (Figure 2).

It is noted that site names differ from initial sampling sites by LES in July 2022 because of previous composite sampling (i.e. composite sampling was not undertaken for this current event) and that there was insufficient soil material or water present at exact locations of previously sampled sites (as deposition regularly changes within these rocky drainage lines after flow events).

The sites sampled for this current event will provide a comprehensive dataset starting from the release site progressing down the drainage gullies for approximately 1.1 km. This sampling effort will allow for detection of possible contaminant trends along the drainage gully, as well as comparison against an adjacent unimpacted gully (reference gully – S9) and plateau background samples (B1 – B4).

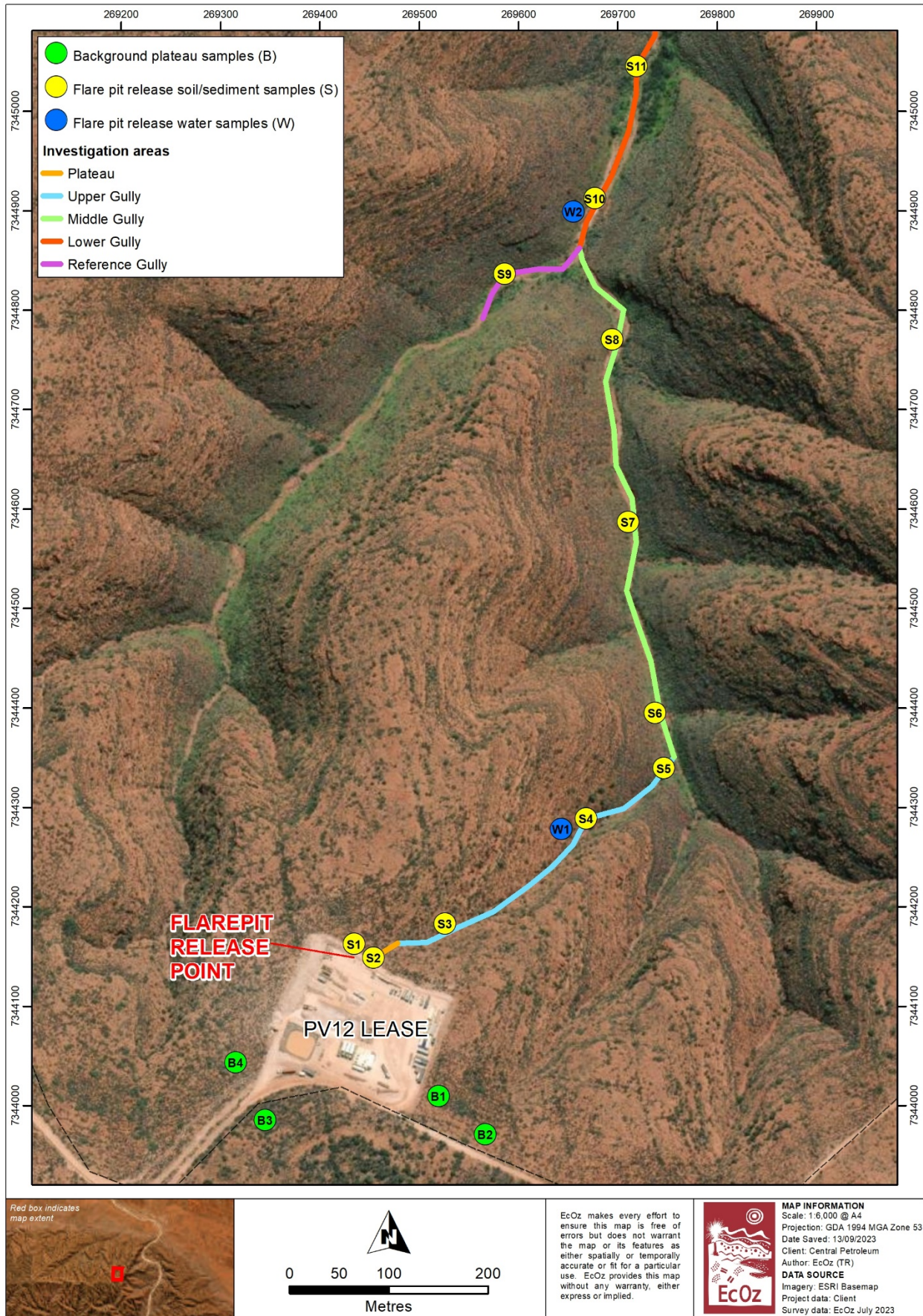
Water and soil/sediment samples were collected in accordance with appropriate Australian Standards. Samples were analysed by the NATA accredited ALS Laboratories, with the analysis suite replicating previous sampling in July 2022. For this sampling event, paired sampling and analysis was undertaken at each site, this paired analysis provides additional context for local variation within one site – it is unlikely that paired analysis for each site will be conducted in future events for this incident.

The laboratory sample receipt indicates all sample handling complied with required standards and samples were received within required holding times.

Table 3: Sample site names and coordinates for monitoring in July 2023

Site ID	Easting	Northing	Matrix	Location	Sample description	Distance from release
Sediment samples						
S1	269434	7344162	Soil	Plateau	Dry sandy material amongst rocks	0m
S2	269454	7344148	Soil	Plateau	Dry sandy material amongst rocks	0m
S3	269525	7344182	Soil	Upper Gully	Dry sediment in dry rock hole	80m
S4	269667	7344288	Soil	Upper Gully	Dry sediment in dry rock hole	260m
S5	269746	7344339	Soil	Upper Gully	Dry sediment in drainage gully	350m
S6	269737	7344394	Soil	Middle Gully	Wet sediment on edge of gully	410m
S7	269710	7344586	Soil	Middle Gully	Wet sediment from existing rock pool	610m
S8	269694	7344770	Soil	Middle Gully	Wet sediment on edge of gully	800m
S9	269585	7344836	Soil	Reference gully	Dry sediment	NA
S10	269676	7344912	Soil	Lower Gully	Wet sediment from existing rock pool	965m
S11	269718	7345045	Soil	Lower Gully	Dry sediment in drainage gully	1120m
Water samples						
W1	269712	7344585	Water	Upper Gully	Small rock pool	230m
W2	269655	7344899	Water	Lower Gully	Medium rock pool	940m
Background plateau soil samples						
B1	269519	7344009	Soil	Plateau	Dry soil – eastern side of lease	NA
B2	269566	7343970	Soil	Plateau	Dry soil – eastern side of lease	NA
B3	269344	7343985	Soil	Plateau	Dry soil – southern side of lease	NA
B4	269315	7344043	Soil	Plateau	Dry soil – western side of lease	NA

Projection GDA94, Zone 53



Path: C:\User\stom.reilly\ECOZ\OneDrive - EcOz\Documents\01_EcOz GIS Projects (TR) - new\EZ23101 (Tom) - PV11 Incident Sampling\01 Project Files\Sites_PV11_IncidentSampling_20July2023.mxd

Figure 2: Map of sample sites 20/7/2023

3 RESULTS

3.1 Rainfall

A total of 527.5 mm of rainfall has been recorded at PVGF since the incident and initial sampling event in July 2022 (data provided in Figure 3). This volume of rainfall is expected to have provided significant dilution levels within the affected drainage gully and spill impact area.

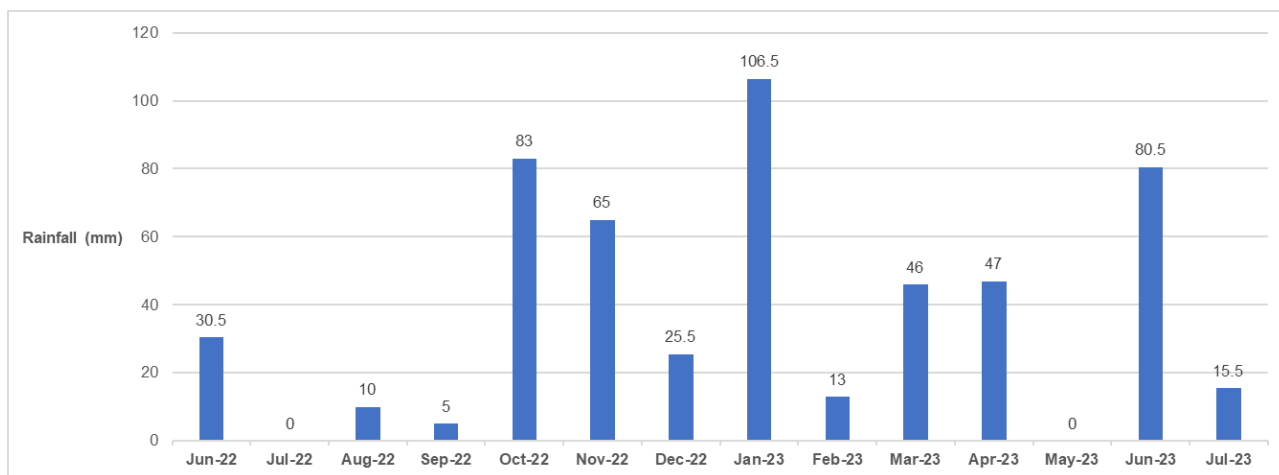


Figure 3: Graph of monthly rainfall since the leak incident

3.2 Visual assessment

There was no notable or obvious impacts to vegetation health or condition within the impact area on the plateau or along the affected drainage gully.

White-grey staining from drilling fluid was still present in the upper reaches of the rocky drainage; however, staining has reduced since previous monitoring in July 2022 (see comparison photographs in Figure 6). White-grey staining from the incident was evident for a maximum of 100m from the release point, it is now limited to the rocky plateau and the upper reaches of the upper gully. There is a darker staining on the sandstone rocks in the flow path of the rocky gully (where the white staining occurred); this may be related to the drilling fluids – however dark staining is also naturally occurring in adjacent gullies and is considered unlikely to be a significant issue. Refer to Figure 5 for comparison photographs at Site S3 within the upper gully (approximately 80m from the release point), and Figure 6 for comparison photographs approximately 1000m downstream of the release site. The previous monitoring recorded staining for at least 1000m. It is assumed to have been dissolved from rainfall flush/flow events since the previous monitoring event – and the dilution factor involved is unlikely to have resulted in further downstream staining.

Salt crusting or residue was not observed along the affected drainage area.

Numerous small and shallow rock pools were present at the time of monitoring. In all cases, water was clear/clean and had no sign of hydrocarbon sheen, nor did sediments have hydrocarbon odour (representative photographs provide in Figure 7). The sediment within the rock pools was biologically active (natural) and in good condition with algae and insect life present, as well as birds drinking from the pools. None of the pools has any sign of drilling mud/foam, such as those observed directly following the incident in July 2022 (see comparison photograph from previous event and the current event in Figure 8).



Figure 4: Photograph of current staining from the incident (head of gully adjacent to release point)



Previous event – July 2022 (LES)



Current event – Site S3 – 80m from release point – July 2023 (EcOz)

Figure 5: Photograph mid-way down the upper gully (approx. 100m downstream of release point)



Previous event – July 2022 (LES)



Current event – July 2023 (EcOz)

Figure 6: Photograph approximately 1000 m (near site W2 and S10) downstream of release site from this monitoring event (July 2023) and the previous monitoring event (July 2023)

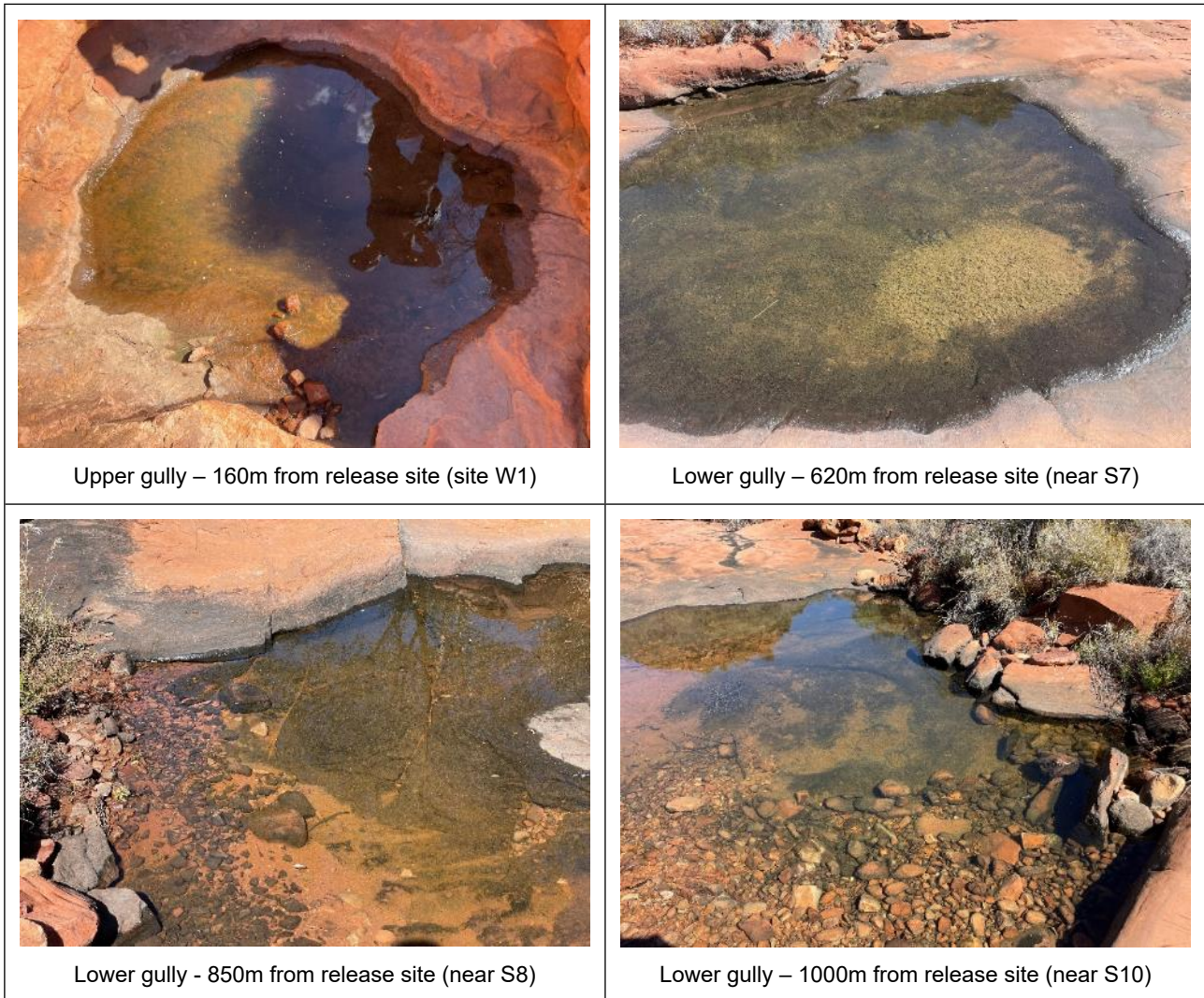


Figure 7. Photograph of rock pools present during the current monitoring event (July 2023)

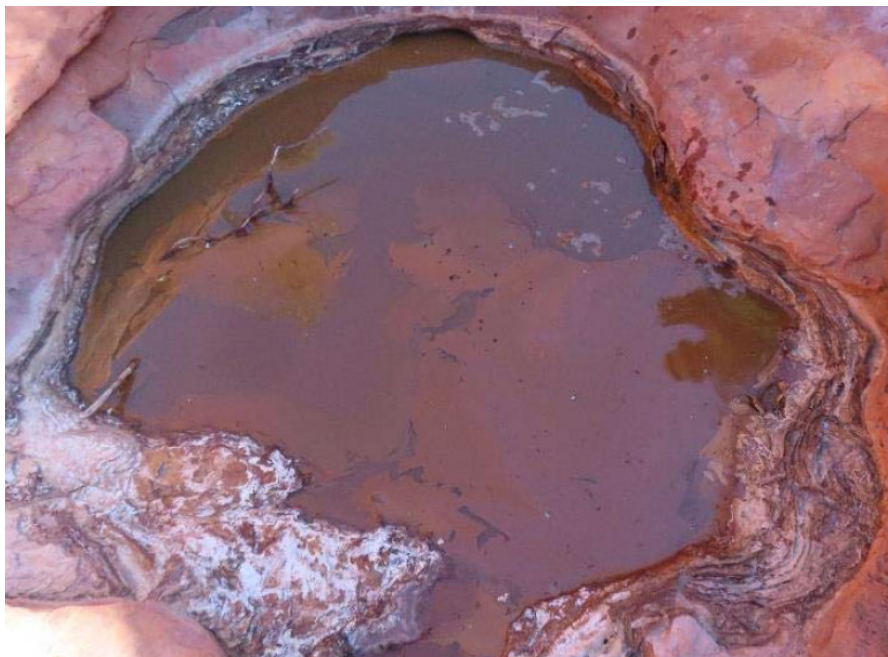


Figure 8. Photograph of impacted rock pool from the previous monitoring event (July 2022, LES)

3.3 Soil / sediment analysis

Analysis results for soil / sediment samples are summarised in Table 4 with dataset provided in Appendix C. Laboratory reports provided separately. The summary results presented in Table 4 provides ranges for each parameter in each of the four main areas – Plateau, Upper Gully, Middle Gully and Lower Gully – and compares against data collected from the previous sampling event. Direct comparison between sites could not be undertaken because previous sampling combined clusters of sites into one composite sample.

Results indicate that soils and sediment within the impact area and affected drainage gully have no sign of significant contamination. Results are either slightly elevated or fall within natural variation when compared to background samples collected on the plateau (sites B1, B2, B3 and B4) and the background sample collected in an adjacent gully that wasn't affected by the drill fluid release (site S9). None of the sites exceed NEPM 2013 Thresholds for any parameters (refer to Appendix F). Results also indicate that concentrations have reduced since the previous monitoring event.

There are several notable results that indicate remnant contamination – however, levels have significantly reduced since the previous monitoring event. The key results are summarised below:

- **Acid (pH).** Marginal acidic conditions were recorded at site S1 (4.5 pH) (plateau adjacent to flare pit release point). All other sites recorded values around neutral (7.0 pH), including sites within the gully and background / reference sites. Previous monitoring did not detect acidic conditions (LES 2022). Inspection vegetation condition at this location did not indicate any issues with plant health that would indicate acidic toxicity.
- Elevated **Electrical Conductivity** and **Chloride** was recorded at site S1 (plateau adjacent to flare pit release point), with EC concentrations ranging from 1140 uS/cm to 1250 uS/cm, and Chloride concentrations ranging from 1870 mg/kg to 2050 mg/kg. These measurements are higher than the previous sampling event (EC – 667 uS/cm; Chloride – 1100 mg/kg). However, results indicate that higher readings are localised to a small area and not detected in the receiving rocky gully. Inspection vegetation condition at this location did not indicate any issues with plant health that would indicate salinity toxicity.
- Marginally elevated **Electrical Conductivity** and **Chloride** was recorded at downstream sites S7 (middle gully) and S11 (lower gully), with EC concentrations ranging from 180 uS/cm to 272 uS/cm, and Chloride concentrations ranging from 150 mg/kg to 280 mg/kg. This was also observed in the previous sampling event, and results indicate that concentrations are decreasing (refer to Table 4).
- **Total Nitrogen** is marginally elevated within the gully in comparison to reference site (sites include S3, S4, S5 and S7).
- **Carbon** and **Phosphorus** concentrations are marginally higher at several sites when compared with background and reference site samples.
- **Chromium** was detected at low concentrations at Sites S3 and S4 and was not detected at any other sites or background / reference sites.
- **Cobalt, Lead, Mercury** concentrations are within natural variation levels at all sites.
- **Copper** concentrations marginally elevated within the upper gully sites S3 and S4 (4.6 – 6.7 mg/kg compared with other sites around 1 mg/kg). Although Copper concentrations are elevated at S3 and S4 are likely a result of the drilling fluid release, concentrations are still at low levels and there is no current observable impacts to the environment.
- Marginally elevated **Manganese** concentrations within lower gully site S11
- Marginally elevated **Nickel** concentrations detected at sites S3 and S4 in the upper gully, and were not detected elsewhere – including any of the background / reference sites within the gully and plateau.

- Marginally elevated **Vanadium** concentrations were detected at sites S6 and S7 in the middle gully and were not detected elsewhere – including any of the background / reference sites within the gully and plateau.
- Marginally elevated **Barium** concentrations were detected within the upper gully sites S3 and S4.
- Elevated concentrations of **Strontium** at site S1 (plateau adjacent to flare pit release point), and sites S3 and S4 (upper gully). However, Strontium concentrations have reduced since the previous monitoring event within the upper gully (refer to Table 4).
- Very low concentrations **Total Recoverable Hydrocarbons** were detected at sites S3 and S4 (110 to 140mg/kg, respectively) – within the upper gully approximately 80m to 260m from release point. No other hydrocarbon detections occurred. No BTEXN detections occurred.
- **Radionuclides / activity** ranged between <500 and 2820 Bq/kg DW (Gross Alpha) and <500 to 1170 Bq/kg DW (Gross beta). Results indicate slightly elevated levels in comparison to the reference / background sites, which ranged 590 and 900 Bq/kg DW (Gross Alpha) and <500 Bq/kg DW (Gross beta). Only one site was analysed for radionuclides / activity in the previous sampling (site PV12_23 – at the head of the upper gully near site S3) which measured 810 Bq/kg DW.
- All other parameters were below laboratory detection limits of reporting.

Background sample site B1 showed unexpectedly high level of Electrical Conductivity and concentrations of Chloride – when compared to other background sites. As such, those elevated readings were not used as a background comparison. All other parameters appear to be within normal expected range for background samples. Investigation into the anomaly is recommended.

3.4 Water analysis

Analysis results for water samples are summarised in Table 5 with full dataset provided in Appendix E. Laboratory reports provided separately.

Results indicate that rock pools within the impact area have no sign of significant contamination. Results also indicate that concentrations have significantly reduced since the previous monitoring event, and it is likely that the currently detected levels reflects natural conditions.

Unfortunately, hydrocarbon results are not available due to a sample jar error – and when the site was revisited approximately one month later to recollect samples for hydrocarbon analysis (on 28 August 2023), water within all rock pools within the gullies had evaporated. Although no data is available for hydrocarbons, the visual inspection of the rock pools did not indicate an oily sheen or odour (often present when hydrocarbon present in the water). Additionally, several moist / wet sediment samples were collected – all of which either had low TPH concentrations or below laboratory limit of reporting (see Section 3.3).

The key results are summarised below:

- **Total Dissolved Solids, Suspended Solids, Ammonia, Total Nitrogen, Total Phosphorus** concentrations have significantly reduced since the last monitoring event.
- **Bromide, Chloride, and Sulfate** concentrations have significantly reduced since the last monitoring event. **Fluoride** concentration has also reduced but was already at low levels at the previous monitoring.
- **Total Alkalinity** has significantly reduced since the last monitoring event (refer to Table 5).
- All **Major Cations** concentrations have significantly reduced since the last monitoring event.
- **Metal** detections and concentrations have significantly reduced since the last monitoring event.

Table 4: Comparison of Soil / Sediment site results between previous sampling (July 2022) and current sampling (July 2023) of key parameters.

Note: concentration ranges have been provided for each “area”. Direct comparison of sites could not be undertaken due to composite sampling conducted in previous sampling. DNA = Did Not Analyse

PARAMETER		Background		Plateau		Upper gully		Middle gully		Lower gully	
		July-22	July-23	July-22	July-23	July-22	July-23	July-22	July-23	July-22	July-23
		PV12_18	S9	PV12_1	S1, S2	PV12_45	S3, S4, S5	PV12_678	S6, S7, S8	PV12_1617	S10, S11
pH	pH unit	7.0	7.6 - 7.8	7.0	4.5 - 6.6	8.0	6.8 – 8.1	7.2	7 – 7.9	8.1	7.4 – 8.8
EC	µS/cm	38	20 - 24	667	24 - 1250	2100	29 - 92	469	38 - 196	295	70 - 272
Chloride	mg/kg	20	<10	1100	10 - 2050	5680	20 - 100	860	20 - 170	70	40 - 280
Fluoride	mg/kg	90	70 - 90	120	100 - 120	220	100 - 410	170	100 - 150	120	80 - 90
Nitrite + Nitrate	mg/kg	3.3	0.9 - 1.4	6.4	1.5 – 3.8	1.1	0.7 – 3.5	7.4	<0.1 – 3.3	2.1	<0.01 – 10.6
Total Nitrogen	mg/kg	360	410 - 450	370	430 - 580	370	340 - 910	400	240 - 1760	550	310 - 660
Total Phosphorus	mg/kg	154	113 - 135	119	100 - 112	168	147 - 386	153	134 - 232	127	86 - 197
Organic Carbon	%	0.45	0.3 - 0.66	0.45	0.55 – 0.81	0.69	0.29 – 1.76	0.47	0.27 – 1.52	3.63	0.22 – 0.41
Total Carbon	%	0.49	0.7 - 0.73	0.50	0.56 – 0.81	0.86	0.34 – 1.88	0.55	0.28 – 1.79	5.08	0.23 – 0.48
Inorganic Carbon	%	0.04	0.03 - 0.04	0.05	<0.02 – 0.03	0.17	0.03 – 0.12	0.08	<0.2 – 0.27	1.45	<0.02 – 0.07
METALS											
Chromium	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	1.3 – 2.6	<1.0	<1.0	<1.0	<1.0
Cobalt	mg/kg	0.6	0.7 – 0.9	<0.5	<0.5 – 0.5	1.3	0.9 – 2.4	0.9	0.6 – 1.3	0.7	0.5 – 1.6
Copper	mg/kg	<1.0	<1.0 - 1	<0.1	<1.0 – 1.2	<1.0	<1.0 – 6.7	<1.0	<1.0 – 1.5	<1.0	<1.0 – 1.1
Lead	mg/kg	<1.0	<1.0 – 1.1	1.0	<1.0 – 1.1	1.4	1.4 – 2.3	1.5	<1.0 – 2.3	<1.0	<1.0 – 1.5
Manganese	mg/kg	34	38 - 47	19	<10 - 31	39	16 - 82	42	15 - 46	64	21 - 133
Nickel	mg/kg	<1.0	<1.0	<1.0	<1.0	1.6	<1.0 - 4	<1.0	<1.0	<1.0	<1.0
Zinc	mg/kg	<1.0	<1.0 – 1.3	<1.0	<1.0	2.0	1.3 – 5.5	1.3	<1.0 – 2.0	<1.0	<1.0 – 1.3
Vanadium	mg/kg	<1.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0 – 3.8	<2.0	<2.0
Barium	mg/kg	23.3	23.7 – 31.6	48.1	62.6 - 119	84.5	58.4 - 273	45.8	20.4 – 47.5	40.1	11.3 – 48.1
Strontium	mg/kg	3.3	3.6 – 4.7	24.2	7.2 – 61.5	112	29.7 – 73.9	8.8	2.7 – 6.3	14.6	1.4 – 8.1
Mercury	mg/kg	0.01	<0.01	0.01	<0.01 – 0.01	0.01	0.01 – 0.02	0.01	0.01 – 0.02	0.01	<0.01
TPH											
C6 – C9	mg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
C10 – C14	mg/kg	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
C15 – C28	mg/kg	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
C29 – C36	mg/kg	<100	<100	<100	<100	<100	<100 - 140	<100	<100	<100	<100
TRH (NEPM 2013)											
C6 – C10	mg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C10 – C16	mg/kg	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
>C16 – C34	mg/kg	<100	<100	<100	<100	<100	110 - 200	<100	<100	<100	<100
>C34 – C40	mg/kg	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Radionuclides / activity											
Gross alpha	Bq/kg DW	DNA	590 - 660	DNA	840 - 1270	810	1140 - 2820	DNA	620 - 1670	DNA	<500 - 1290
Gross beta	Bq/kg DW	DNA	<500	DNA	<500 - 1170	DNA	<500 - 550	DNA	<500	DNA	<500

Table 5: Comparison of Water sample site results between previous sampling (July 2022) and current sampling (July 2023) of key parameters.

Note: water sampling only occurred in the upper gully in previous sampling (as no water available in middle or lower gullies). Additionally, hydrocarbon analysis could not be undertaken during the current event due to an issue with sample container types.

PARAMETER		Upper gully		Upper gully	Lower gully
		July-22	July-22	July-23	July-23
		W1	W3	W1	W2
pH	pH Unit	7.44	7.33	7.11	8.04
Total Dissolved Solids (TDS)	mg/L	28,300	35,600	1480	439
Suspended Solids (SS)	mg/L	142	684	8	<5
Ammonia as N	mg/L	0.24	0.33	0.01	0.04
Nitrate as N	mg/L	<0.1	0.22	<0.01	<0.01
Total Kjeldahl Nitrogen as N	mg/L	40.7	44.9	1.8	0.4
Total Nitrogen as N	mg/L	40.7	45.1	1.8	0.4
Total Phosphorus as P	mg/L	1.75	2.79	0.03	<0.01
Dissolved Oxygen	mg/L	1.0	0.9	DNA	DNA
Anions					
Bromide	mg/L	116	141	3.83	0.652
Chloride	mg/L	15,200	16,300	639	140
Fluoride	mg/L	0.4	0.4	0.250	0.080
Iodide	mg/L	DNA	DNA	<0.100	<0.020
Sulfate	mg/L	244	150	86.6	11.1
Alkalinity					
Bicarbonate Alkalinity as CaCO ₃	mg/L	462	658	40	67
Total Alkalinity as CaCO ₃	mg/L	462	658	40	67
Major Cations					
Calcium	mg/L	2690	3390	101	40
Magnesium	mg/L	167	229	40	20
Sodium	mg/L	8280	8880	257	42
Potassium	mg/L	359	317	15	4
Total Petroleum Hydrocarbons					
C6 – C9	ug/L	270	700	DNA	DNA
C10 – C14	ug/L	22,100	28,300	DNA	DNA
C15 – C28	ug/L	6,280	4,390	DNA	DNA
C29 – C36	ug/L	2,380	1,290	DNA	DNA
SUM C6 – C36	ug/L	30,800	34,000	DNA	DNA
Total Recoverable Hydrocarbons					
C6 – C10		250	680	DNA	DNA
>C10 – C16		24,100	28,600	DNA	DNA
>C16 – C34		5,740	3,700	DNA	DNA
>C34 – C40		960	560	DNA	DNA
SUM >C10 – C40		30,800	33,000	DNA	DNA
BTEXN					
All BTEXN parameters		Below detection	Below detection	DNA	DNA
Total metals					
Arsenic	mg/L	0.011	0.015	<0.001	<0.001
Barium	mg/L	10.9	42.3	1.06	0.162
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001
Chromium	mg/L	0.481	0.195	0.001	<0.001
Cobalt	mg/L	0.053	0.173	0.002	<0.001
Copper	mg/L	0.607	0.698	0.002	<0.001
Lead	mg/L	0.004	0.016	<0.001	0.001
Manganese	mg/L	1.34	5.19	0.100	0.004
Nickel	mg/L	0.298	0.452	0.003	<0.001
Vanadium	mg/L	<0.01	0.02	<0.01	<0.01
Zinc	mg/L	0.028	0.097	<0.005	<0.005
Boron	mg/L	0.26	0.26	0.19	<0.05
Mercury	mg/L	0.0002	<0.0001	<0.0001	<0.0001

4 CONCLUSION







Results from the current sampling event indicate that there is no significant impact on the environment from the drill fluid release incident (results are significantly lower than NEPM 2013 thresholds where applicable), and that contaminant levels have reduced/dissipated significantly since the previous monitoring event. This meets the performance indicator for contaminated sites within the approved EMP for the Northern Territory Drilling Campaign, the Palm Valley Filed EMP and indicates that the natural remediation approach proposed in the initial incident notification has been effective. This is largely attributed to the high rainfall (and associated 'flushing') over the past 12 months which has diluted (and likely biodegraded) drill fluids. Consequently, no further sampling of the spill site is recommended and the site is considered remediated.

5 REFERENCES






Low Ecological Services (2022). *PV 12 Flare Pit June 2022: analyses, Impact Assessment and Recommendations*. Report Version 3, prepared for Central Petroleum January 2023.

NEPM (2013), *Guideline on Investigation Levels for soil and groundwater. Schedule B1*. National Environment Protection (Assessment of site contamination) Measure April 2011

APPENDIX A SITE PHOTOGRAPHS – SOIL SAMPLE SITES

Site	General site	Sample point
S1		
S2		
S3		

Site	General site	Sample point
S4		
S5		
S6		

Site	General site	Sample point
S7		
S8		
S9		

Site	General site	Sample point
S10		
S11		

APPENDIX B SITE PHOTOGRAPHS – WATER SAMPLE SITES

Site	General site	Sample point
W1		
W2		

APPENDIX D BACKGROUND SOIL SAMPLE RESULTS

The below has also been provided as an Excel Document.

PV12 Background soil sampling			Site ID	B1	B2	B3	B4
Sample date: 20/07/2023			Type	Soil / background	Soil / background	Soil / background	Soil / background
Sampler: Stuart Lyman (Central Petroleum)			Location	15m from eastern boundary	75m from eastern boundary	55m from southern boundary	30m from western boundary
Analyte grouping / Analyte	Unit	LOR					
Moisture Content	%	1.0		3.8	2.3	3.7	3.2
pH Value	pH Unit	0.1		4.5	6.6	6.9	7.4
Electrical Conductivity	µS/cm	1		1160	24	86	81
Chloride	mg/kg	10		1830	10	90	60
Fluoride	mg/kg	40		120	80	90	110
Nitrite + Nitrate as N (Sol.)	mg/kg	0.1		1.6	3.7	3.5	3.3
Total Kjeldahl Nitrogen as N	mg/kg	20		470	550	480	240
Total Nitrogen as N	mg/kg	20		470	550	480	240
Total Phosphorus as P	mg/kg	2		88	133	103	83
Total Organic Carbon	%	0.02		0.37	0.65	0.57	0.27
Total Carbon	%	0.02		0.38	0.66	0.58	0.28
Total Inorganic Carbon	%	0.02		<0.02	<0.02	<0.02	<0.02
Metals							
Arsenic	mg/kg	1.0		<1.0	<1.0	<1.0	<1.0
Cadmium	mg/kg	0.10		<0.10	<0.10	<0.10	<0.10
Chromium	mg/kg	1.0		<1.0	<1.0	<1.0	<1.0
Cobalt	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Copper	mg/kg	1.0		<1.0	<1.0	<1.0	<1.0
Lead	mg/kg	1.0		<1.0	1.0	1.3	1.1
Manganese	mg/kg	10		14	28	36	<10
Nickel	mg/kg	1.0		<1.0	<1.0	<1.0	<1.0
Selenium	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Zinc	mg/kg	1.0		<1.0	<1.0	<1.0	<1.0
Antimony	mg/kg	2.0		<2.0	<2.0	<2.0	<2.0
Silver	mg/kg	1.0		<1.0	<1.0	<1.0	<1.0
Vanadium	mg/kg	2.0		<2.0	<2.0	<2.0	<2.0
Tin	mg/kg	2.0		<2.0	<2.0	<2.0	<2.0
Uranium	mg/kg	1.0		<1.0	<1.0	<1.0	<1.0
Barium	mg/kg	1.0		27.9	12.5	30.4	24.4
Boron	mg/kg	5.0		<5.0	<5.0	<5.0	<5.0
Strontium	mg/kg	0.5		4.7	2.0	3.7	4.9
Mercury	mg/kg	0.01		0.01	0.02	0.01	<0.01
Polynuclear Aromatic Hydrocarbons							
Naphthalene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Acenaphthylene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Acenaphthene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Fluorene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Phenanthrene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Anthracene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Fluoranthene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Pyrene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Benzo(a)anthracene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Chrysene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Indeno(1,2,3-cd)pyrene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Dibenz(a,h)anthracene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Benzo(g,h,i)perylene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Sum of PAH	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ (zero)	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ (half LOR)	mg/kg	0.5		0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (LOR)	mg/kg	0.5		1.2	1.2	1.2	1.2
Total Petroleum Hydrocarbons							
C6 - C9 Fraction	mg/kg	10		<10	<10	<10	<10
C10 - C14 Fraction	mg/kg	50		<50	<50	<50	<50
C15 - C28 Fraction	mg/kg	100		<100	<100	<100	<100
C29 - C36 Fraction	mg/kg	100		<100	<100	<100	<100
C10 - C36 Fraction (sum)	mg/kg	50		<50	<50	<50	<50
Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
C6 - C10 Fraction	mg/kg	10		<10	<10	<10	<10
C6 - C10 Fraction minus BTEX (F1)	mg/kg	10		<10	<10	<10	<10
>C10 - C16 Fraction	mg/kg	50		<50	<50	<50	<50
>C16 - C34 Fraction	mg/kg	100		<100	<100	<100	<100
>C34 - C40 Fraction	mg/kg	100		<100	<100	<100	<100
>C10 - C40 Fraction (sum)	mg/kg	50		<50	<50	<50	<50
>C10 - C16 Fraction minus Naphthalene (F2)	mg/kg	50		<50	<50	<50	<50
BTEXN							
Benzene	mg/kg	0.2		<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
ortho-Xylene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Total Xylenes	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Sum of BTEX	mg/kg	0.2		<0.2	<0.2	<0.2	<0.2
Naphthalene	mg/kg	1		<1	<1	<1	<1
Phenolic Radionuclides / activity							
Gross alpha	Bq/kg DW	500		600	740	850	900
Gross beta	Bq/kg DW	500		<500	<500	<500	<500

APPENDIX E WATER SAMPLE RESULTS

The below has also been provided as an Excel Document.

PV12 Flarepit Release Monitoring Results			NEPM Threshold (2013) (freshwater)	Site	W1	W2
Sample date: 20/07/2023				Type	Water	Water
Sampler: Tom Reilly (EcOz); Stuart Lyman (Central Petroleum)				Location	Upper gully	Lower gully
Analyte grouping/Analyte	Unit	LOR		Distance	230m	950m
pH Value	pH Unit	0.01	---		7.11	8.04
Total Dissolved Solids (TDS)	mg/L	10	---		1480	439
Suspended Solids (SS)	mg/L	5	---		8	<5
Sulfate as SO4 - Turbidimetric	mg/L	1	---		75	11
Chloride	mg/L	1	---		622	136
Fluoride	mg/L	0.1	---		0.2	0.1
Ammonia as N	mg/L	0.01	900		0.01	0.04
Nitrite as N	mg/L	0.01	50		<0.01	<0.01
Nitrate as N	mg/L	0.01	3		<0.01	<0.01
Nitrite + Nitrate as N	mg/L	0.01	---		<0.01	<0.01
Total Kjeldahl Nitrogen as N	mg/L	0.1	---		1.8	0.4
Total Nitrogen as N	mg/L	0.1	---		1.8	0.4
Total Phosphorus as P	mg/L	0.01	---		0.03	<0.01
Reactive Phosphorus as P	mg/L	0.01	---		<0.01	<0.01
Anions						
Bromide	mg/L	0.010	---		3.83	0.652
Chloride	mg/L	0.100	---		639	140
Fluoride	mg/L	0.010	---		0.250	0.080
Iodide	mg/L	0.010	---		<0.100	<0.020
Sulfate	mg/L	0.100	---		86.6	11.1
Alkalinity						
Hydroxide Alkalinity as CaCO3	mg/L	1	---		<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	---		<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	---		40	67
Total Alkalinity as CaCO3	mg/L	1	---		40	67
Major Cations						
Calcium	mg/L	1	---		101	40
Magnesium	mg/L	1	---		40	20
Sodium	mg/L	1	---		257	42
Potassium	mg/L	1	---		15	4
Total metals						
Arsenic	mg/L	0.001	13		<0.001	<0.001
Beryllium	mg/L	0.001	---		<0.001	<0.001
Barium	mg/L	0.001	---		1.06	0.162
Cadmium	mg/L	0.0001	0.2		<0.0001	<0.0001
Chromium	mg/L	0.001	---		0.001	<0.001
Cobalt	mg/L	0.001	---		0.002	<0.001
Copper	mg/L	0.001	1.4		0.002	<0.001
Lead	mg/L	0.001	3.4		<0.001	0.001
Manganese	mg/L	0.001	1900		0.100	0.004
Nickel	mg/L	0.001	11		0.003	<0.001
Selenium	mg/L	0.01	5		<0.01	<0.01
Vanadium	mg/L	0.01	---		<0.01	<0.01
Zinc	mg/L	0.005	8		<0.005	<0.005
Boron	mg/L	0.05	370		0.19	<0.05
Mercury	mg/L	0.0001	0.06		<0.0001	<0.0001

APPENDIX F NEPM 2013 THRESHOLDS

Table 1B(6) ESLs for TPH fractions F1 – F4, BTEX and benzo(a)pyrene in soil

CHEMICAL	Soil texture	ESLs (mg/kg dry soil)		
		Areas of ecological significance	Urban residential and public open space	Commercial and industrial
F1 C ₆ -C ₁₀	Coarse/ Fine	125*	180*	215*
F2 >C ₁₀ -C ₁₆		25*	120*	170*
F3 >C ₁₆ -C ₃₄	Coarse	-	300	1700
	Fine	-	1300	2500
F4 >C ₃₄ -C ₄₀	Coarse	-	2800	3300
	Fine	-	5600	6600
Benzene	Coarse	10	50	75
	Fine	10	65	95
Toluene	Coarse	10	85	135
	Fine	65	105	135
Ethylbenzene	Coarse	1.5	70	165
	Fine	40	125	185
Xylenes	Coarse	10	105	180
	Fine	1.6	45	95
Benzo(a)pyrene	Coarse	0.7	0.7	0.7
	Fine	0.7	0.7	0.7

Notes:

- (1) ESLs are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability.
- (2) '-' indicates that insufficient data was available to derive a value.
- (3) To obtain F1, subtract the sum of BTEX concentrations from C₆-C₁₀ fraction and subtract naphthalene from >C₁₀-C₁₆ to obtain F2.

Table 1 B(7) Management Limits for TPH fractions F1–F4 in soil

TPH fraction	Soil texture	Management Limits ¹ (mg/kg dry soil)	
		Residential, parkland and public open space	Commercial and industrial
F1² C ₆ -C ₁₀	Coarse	700	700
	Fine	800	800
F2² >C ₁₀ -C ₁₆	Coarse	1000	1000
	Fine	1000	1000
F3 >C ₁₆ -C ₃₄	Coarse	2500	3500
	Fine	3500	5000
F4 >C ₃₄ -C ₄₀	Coarse	10 000	10 000
	Fine	10 000	10 000

¹ Management limits are applied after consideration of relevant ESLs and HSLs

² Separate management limits for BTEX and naphthalene are not available hence these should not be subtracted from the relevant fractions to obtain F1 and F2.

Table 1A(1) Health investigation levels for soil contaminants

Chemical	Health-based investigation levels (mg/kg)			
	Residential ¹ A	Residential ¹ B	Recreational ¹ C	Commercial/ industrial ¹ D
Metals and Inorganics				
Arsenic ²	100	500	300	3 000
Beryllium	60	90	90	500
Boron	4500	40 000	20 000	300 000
Cadmium	20	150	90	900
Chromium (VI)	100	500	300	3600
Cobalt	100	600	300	4000
Copper	6000	30 000	17 000	240 000
Lead ³	300	1200	600	1 500
Manganese	3800	14 000	19 000	60 000
Mercury (inorganic) ⁵	40	120	80	730
Methyl mercury ⁴	10	30	13	180
Nickel	400	1200	1200	6 000
Selenium	200	1400	700	10 000
Zinc	7400	60 000	30 000	400 000
Cyanide (free)	250	300	240	1 500
Polycyclic Aromatic Hydrocarbons (PAHs)				
Carcinogenic PAHs (as BaP TEQ) ⁶	3	4	3	40
Total PAHs ⁷	300	400	300	4000
Phenols				
Phenol	3000	45 000	40 000	240 000
Pentachlorophenol	100	130	120	660
Cresols	400	4 700	4 000	25 000
Organochlorine Pesticides				
DDT+DDE+DDD	240	600	400	3600
Aldrin and dieldrin	6	10	10	45
Chlordane	50	90	70	530
Endosulfan	270	400	340	2000
Endrin	10	20	20	100
Heptachlor	6	10	10	50
HCB	10	15	10	80
Methoxychlor	300	500	400	2500
Mirex	10	20	20	100
Toxaphene	20	30	30	160
Herbicides				
2,4,5-T	600	900	800	5000
2,4-D	900	1600	1300	9000
MCPA	600	900	800	5000
MCPB	600	900	800	5000
Mecoprop	600	900	800	5000
Picloram	4500	6600	5700	35000
Other Pesticides				
Atrazine	320	470	400	2500
Chlorpyrifos	160	340	250	2000
Bifenthrin	600	840	730	4500
Other Organics				
PCBs ⁸	1	1	1	7
PBDE Flame Retardants (Br1– Br9)	1	2	2	10

Notes:

- Generic land uses are described in detail in Schedule B7 Section 3
 HIL A – Residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake (no poultry), also includes childcare centres, preschools and primary schools.
 HIL B – Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.
 HIL C – Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. This does not include undeveloped public open space where the potential for exposure is lower and where a site-specific assessment may be more appropriate.
 HIL D – Commercial/industrial, includes premises such as shops, offices, factories and industrial sites.
- Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability may be important and should be considered where appropriate (refer Schedule B7).
- Lead: HIL is based on blood lead models (IEUBK for HILs A, B and C and adult lead model for HIL D where 50% oral bioavailability has been considered. Site-specific bioavailability may be important and should be considered where appropriate.
- Methyl mercury: assessment of methyl mercury should only occur where there is evidence of its potential source. It may be associated with inorganic mercury and anaerobic microorganism activity in aquatic environments. In addition the reliability and quality of sampling/analysis should be considered.
- Elemental mercury: HIL does not address elemental mercury. A site-specific assessment should be considered if elemental mercury is present, or suspected to be present.
- Carcinogenic PAHs: HIL is based on the 8 carcinogenic PAHs and their TEFs (potency relative to B(a)P) adopted by CCME 2008 (refer Schedule B7). The B(a)P TEQ is calculated by multiplying the concentration of each carcinogenic PAH in the sample by its B(a)P TEF, given below, and summing these products.

Table 1C Groundwater Investigation Levels (GILs)

Substance	Groundwater Investigation Levels		
	Fresh Waters ^A	Marine Waters ^A	Drinking Water ^B
	(µg/L)	(µg/L)	(mg/L)
Metals and Metalloids			
Aluminium, Al pH>6.5	55	-	-
Antimony	-	-	0.003
Arsenic	24 as As(III) 13 as As(V)	-	0.01
Barium	-	-	2
Beryllium	-	-	0.06
Boron	370 ^C	-	4
Cadmium	H 0.2	0.7 ^D	0.002
Chromium, Cr (III)	H -	27	-
Chromium, Cr (VI)	1 ^C	4.4	0.05
Cobalt	-	1	-
Copper	H 1.4	1.3	2
Iron, (Total)	-	-	-
Lead	H 3.4	4.4	0.01
Manganese	1900 ^C	-	0.5
Mercury (Total)	0.06 ^D	0.1 ^D	0.001
Molybdenum	-	-	0.05
Nickel	H 11	7	0.02
Selenium (Total)	5 ^D	-	0.01
Silver	0.05	1.4	0.1
Tributyl tin (as Sn)	-	0.006 ^C	-
Tributyl tin oxide	-	-	0.001
Uranium	-	-	0.017
Vanadium	-	100	-
Zinc	H 8 ^C	15 ^C	-
Non-metallic Inorganics			
Ammonia ^E (as NH ₃ -N at pH 8)	900 ^C	910	-
Bromate	-	-	0.02
Chloride	-	-	-
Cyanide (as un-ionised Cn)	7	4	0.08
Fluoride	-	-	1.5
Hydrogen sulphide (un-ionised H ₂ S measured as S)	1	-	-
Iodide	-	-	0.5

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Substance	Groundwater Investigation Levels		
	Fresh Waters ^A	Marine Waters ^A	Drinking Water ^B
	(µg/L)	(µg/L)	(mg/L)
Nitrate (as NO ₃)	refer to guideline	refer to guideline	50
Nitrite (as NO ₂)	refer to guideline	refer to guideline	3
Nitrogen	refer to guideline	refer to guideline	-
Phosphorus	refer to guideline	refer to guideline	-
Sulphate (as SO ₄)	-	-	500
Organic alcohols/other organics			
Ethanol	1400	-	-
Ethylenediamine tetra-acetic acid (EDTA)	-	-	0.25
Formaldehyde	-	-	0.5
Nitritotriacetic acid	-	-	0.2
Anilines			
Aniline	8	-	-
2,4-Dichloroaniline	7	-	-
3,4-Dichloroaniline	3	150	-
Chlorinated Alkanes			
Dichloromethane	-	-	0.004
Trichloromethane (chloroform)	-	-	0.003
Trihalomethanes (total)	-	-	0.25
Tetrachloromethane (carbon tetrachloride)	-	-	0.003
1,2-Dichloroethane	-	-	0.003
1,1,2-Trichloroethane	6500	1900	-
Hexachloroethane	290 ^D	-	-
Chlorinated Alkenes			
Chloroethene (vinyl chloride)	-	-	0.0003
1,1-Dichloroethene	-	-	0.03
1,2-Dichloroethene	-	-	0.06
Tetrachloroethene (PCE) (Perchloroethene)	-	-	0.05
Chlorinated Benzenes			
Chlorobenzene	-	-	0.3
1,2- Dichlorobenzene	160	-	1.5
1,3- Dichlorobenzene	260	-	-

Schedule B 1 - Guideline on Investigation Levels for Soil and Groundwater

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Substance	Groundwater Investigation Levels		
	Fresh Waters ^A	Marine Waters ^A	Drinking Water ^B
	(µg/L)	(µg/L)	(mg/L)
1,4- Dichlorobenzene	60	-	0.04
1,2,3- Trichlorobenzene	3 ^D	-	0.03
1,2,4- Trichlorobenzene	85 ^D	20 ^D	for individual or total trichlorobenzenes
1,3,5-Trichlorobenzene	-	-	
Polychlorinated Biphenyls (PCBs)			
Aroclor 1242	0.3 ^D	-	-
Aroclor 1254	0.01 ^D	-	-
Other Chlorinated Compounds			
Epichlorohydrin	-	-	0.1
Hexachlorobutadiene	-	-	0.0007
Monochloramine	-	-	3
Monocyclic Aromatic Hydrocarbons			
Benzene	950	500 ^C	0.001
Toluene	-	-	0.8
Ethylbenzene	-	-	0.3
Xylenes	350 (as o-xylene) 200 (as p-xylene)	-	0.6
Styrene (Vinyl benzene)	-	-	0.03
Polycyclic Aromatic Hydrocarbons (PAHs)			
Naphthalene	16	50 ^C	-
Benzo[a]pyrene	-	-	0.00001
Phenols			
Phenol	320	400	-
2-Chlorophenol	340 ^C	-	0.3
4-Chlorophenol	220	-	-
2,4-Dichlorophenol	120	-	0.2
2,4,6-Trichlorophenol	3 ^D	-	0.02
2,3,4,6-Tetrachlorophenol	10 ^D	-	-
Pentachlorophenol	3.6 ^D	11 ^D	0.01
2,4-Dinitrophenol	45	-	-
Phthalates			
Dimethylphthalate	3700	-	-
Diethylphthalate	1000	-	-
Dibutylphthalate	10 ^D	-	-
Di(2-ethylhexyl) phthalate	-	-	0.01

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Substance	Groundwater Investigation Levels		
	Fresh Waters ^A	Marine Waters ^A	Drinking Water ^B
	(µg/L)	(µg/L)	(mg/L)
Pesticides			
Acephate	-	-	0.008
Aldicarb	-	-	0.004
Aldrin plus Dieldrin	-	-	0.0003
Ametryn	-	-	0.07
Amitraz	-	-	0.009
Amitrole	-	-	0.0009
Asulam	-	-	0.07
Atrazine	13	-	0.02
Azinphos-methyl	-	-	0.03
Benomyl	-	-	0.09
Bentazone	-	-	0.4
Bioresmethrin	-	-	0.1
Bromacil	-	-	0.4
Bromoxynil	-	-	0.01
Captan	-	-	0.4
Carbaryl	-	-	0.03
Carbendazim (Thiophanate-methyl)	-	-	0.09
Carbofuran	0.06	-	0.01
Carboxin	-	-	0.3
Carfentrazone-ethyl	-	-	0.1
Chlorantraniliprole	-	-	6
Chlordane	0.03 ^D	-	0.002
Chlorfenvinphos	-	-	0.002
Chlorothalonil	-	-	0.05
Chlorpyrifos	0.01 ^D	0.009 ^D	0.01
Chlorsulfuron	-	-	0.2
Clopyralid	-	-	2
Cyfluthrin, Beta-cyfluthrin	-	-	0.05
Cypermethrin isomers	-	-	0.2
Cyprodinil	-	-	0.09
1,3-Dichloropropene	-	-	0.1
2,2-DPA	-	-	0.5
2,4-D [2,4-dichlorophenoxy acetic acid]	280	-	0.03
DDT	0.006 ^D	-	0.009
Deltramethrin	-	-	0.04

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Schedule B 1 - Guideline on Investigation Levels for Soil and Groundwater

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EcOz Environmental Consultants

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Attachment 2: Mach 1 Flarepit / Overspray concurrence letter

22 November 2023

██████████
Central Petroleum Limited
Level 7, 369 Ann Street, Brisbane Qld 4000
GPO Box 292, Brisbane, QLD 4001

Via email: ██████████

Document Ref: 022-002-004 Independent Reviewer Concurrence Letter

Dear ██████████,

Re: Independent Reviewer Concurrence Letter, PV 12 Drilling Operation, Flare Pit Drilling Fluid Release Incident and Overspray from Flare Pit, Mereenie Oil and Gas Field, near Mereenie, Northern Territory

MACH1 Environmental Pty Ltd (MACH1) have been commissioned by Central Petroleum Limited to provide the Independent Reviewer services for the investigation and monitoring works at two different incident sites associated with the PV 12 drilling operations. The first site is described as the Flare Pit Fluid Release Incident site, and the second site is the Overspray from Flare Pit site.

Review works have included a review of four environmental reports produced by EcOz Environmental Consultants (EcOz). The purpose of this letter is to confirm the review and Independent Reviewer concurrence of the EcOz documents titled:

- *“PV 12 Flare Pit June 2022, Analyses, Impact Assessment and Recommendations”*, Reference No. Final V3, dated 7 January 2023.
- *“PV-12 Drilling Operation Flare pit drilling fluid release incident 12-month monitoring report, July 2023”* Reference No. 229653-23, dated 13/09/2023.
- *“PV-12 Overspray – Final Incident Report”*, dated 17 February 2023.
- *“PV 12 Drilling Operation Overspray from Flare Pit Annual Monitoring Report, July 2023”*, Reference No. 229654-13, dated July 2023.

It should be noted that the review services for this site were undertaken in the capacity of an Independent Reviewer, however, they were completed in general accordance with general best practise and currently accepted guidelines. It should be noted that the works were completed by ██████████ of MACH1 (who is a Queensland Department of Environment and Science (DES) appointed CLA under Approval No. CLAD010001639 dated August 2022, provided in **Attachment A**). ██████████ is also a Certified Environmental Practitioner (CEnvP) Contaminated Land Specialist and Suitably Qualified Person (SQP) for the assessment of contamination.

It is noted that the role was specific and limited to addressing a review of the reports listed above only and not designed to be a commentary on general compliance of the sites in question.

██████████ has been engaged by Central Petroleum Limited to review and verify the current work completed by the above consultants. It should be noted, however, ██████████ is acting independently of both the client and consultant to provide an Independent Review which can provide concurrence to verify the work completed. As necessary, this verifies the IR review and concurrence with the reports provided by the consultants.

It should be noted that the Independent Reviewer has verified the suitability of the reports, but has not completed a site inspection, nor has obtained any samples directly. The works have therefore, been a peer review and desktop assessment only.

It is noted and accepted that the sole purpose of the Independent Reviewer review is to inform the administering authority, as required. The Independent Reviewer has employed evidence-based auditing methods to reach reliable and reproducible conclusions which are consistent with current legislation, policies and guidelines. This Concurrence Letter Report has been prepared to confirm the Independent Reviewer review and to provide supporting evidence with relation to the works completed.

Independent Reviewer Review of the Flare Pit Fluid Release Incident Report and the Overspray from Flare Pit Report

The Independent Reviewer can confirm that:

- The Independent Reviewer possesses sufficient expertise and technical expertise for the site in question and is appropriately qualified to complete the audit review works;
- the Independent Reviewer has acted independently with integrity, diligence and impartiality and there were no conflicts of interest between the Independent Reviewer and the site operator / owner and consultant;
- the review has been completed in an objective and honest manner, to a high professional standard and with all due care and diligence, avoiding misrepresentation and prejudice;
- the Independent Reviewer has not concealed or omitted information so as to mislead opinion about the sites;
- the review function (voluntary review of the Flare Pit Fluid Release Incident Report and the Overspray from Flare Pit Report) has been completed to achieve the best environmental outcomes and protection of environmental values, including ecological and human health, amenity and safety;
- the Independent Reviewer holds an appropriate level of professional indemnity insurance for the works completed;
- the Independent Reviewer is a member of the Environmental Institute of Australia and New Zealand (EIANZ);

- the Independent Reviewer is certified by one of the recognised bodies in the contaminated land field, being an EIANZ Certified Environmental Practitioner (CEnvP), Contaminated Land Specialist;
- the Independent Reviewer has had access to sufficient information to enable all pertinent aspects of the report to be evaluated, which includes independent verification of raw data where available and applicable. All reasonable and practicable measures have been taken to verify any opinion of others which have been relied upon, and the data and information their opinion is based on; and
- the Independent Reviewer has provided a comprehensive and reliable review of the report, which does not appear to exclude any material aspects.

In addition, the Independent Reviewer can confirm the following legislation/guidelines were referenced (as applicable) as relevant to the works completed (within the Flare Pit Fluid Release Incident Report and the Overspray from Flare Pit Report) and the general review process:

- Australian Standard AS 4482.1-2005, *Guide to the Sampling and Investigation of Potentially Contaminated Soil – Part 1: Non-volatile and semi-volatile compounds* (Standards Australia, 2005) – noting these are no longer in publication, but redundant.
- *National Environment Protection Council 2013, National Environmental Protection (Site Contamination) Measure (NEPM),. Schedule B9 – Guideline on competencies and acceptance of environmental auditors and related professionals; Schedule B8 Community Engagement and Risk Communication.*
- Northern Territory Government *Petroleum (Environment) Regulations 2016.*
- Northern Territory Government NT Environmental Protection Agency Northern Territory Contaminated Land Guideline (2017).
- New South Wales (NSW) Environment Protection Authority (EPA) (2022), *Contaminated Land Guidelines – Sampling Design Part 1 – Application, and Sampling Design Part 2 – Interpretation.*

The Independent Reviewer comments regarding the Flare Pit Fluid Release Incident Report were summarised as follows:

- The Flare Pit Fluid Release Incident Report was completed in general accordance with the NEPM/NT EPA guidelines and were considered suitable for Independent Reviewer concurrence.
- The works undertaken to address specific elements of the site and contamination (limited to the investigation of the Flare Pit Fluid Release Incident site), were considered to be in accordance with the appropriate guidelines (as applicable) and were suitable for Independent Reviewer concurrence.
- The works were focused on area of the site likely to have been impacted by the incident and this is deemed as appropriate.
- The extent of the works was suitable to provide a general coverage, specific to both the area of concern and the likely contaminants of concern, which was appropriate.

- The details provided in the Flare Pit Fluid Release Incident Report were suitable for Independent Reviewer concurrence to meet the general requirements of the currently applicable guidelines.

The Independent Reviewer comments regarding the Overspray from Flare Pit Report were summarised as follows:

- The Overspray from Flare Pit Report was completed in general accordance with the NEPM/NT EPA guidelines and were considered suitable for Independent Reviewer concurrence.
- The works undertaken to address specific elements of the site and contamination (limited to the investigation of the Overspray from Flare Pit site), were considered to be in accordance with the appropriate guidelines (as applicable) and were suitable for Independent Reviewer concurrence.
- The works were focused on area of the site likely to have been impacted by the Overspray from Flare Pit site and this is deemed as appropriate.
- The extent of the works was suitable to provide a general coverage, specific to both the area of concern and the likely contaminants of concern, which was appropriate.
- The details provided in the Overspray from Flare Pit Report were suitable for Independent Reviewer concurrence to meet the general requirements of the currently applicable guidelines.

4 *Independent Reviewer Independent Data Verification*

Independent verification of the primary sources of data, presented as part of the Flare Pit Fluid Release Incident Report and the Overspray from Flare Pit Report review, was undertaken by the Independent Reviewer and comprised of the following:

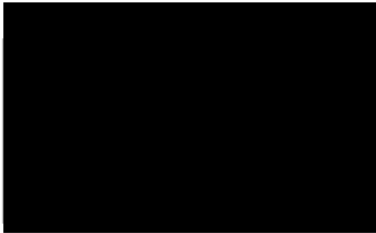
- Verification of current site status on Google Earth, including a search and review of site layout (and historical layout, as appropriate) and site surrounds.
- Verification of location of Environmental Sensitive Areas and surface water bodies.
- Verification of geology and hydrogeology using online mapping, including an independent search of local water bores, checking the geological areas and determining the appropriate assessment of the source-pathway-receptor.
- Verification of the groundwater quality based on online mapping.
- Verification of the site activities and potential for contaminants of concern. The Independent Reviewer experience and expertise were also employed to make a learned judgement on aspects of the site, as applicable.
- Verification of the site setting and the detail discussions, based on the Independent Reviewer's local knowledge and knowledge of other sites in vicinity of the area or sites of a similar nature.
- Verification of the Conceptual Site Model (CSM), based on cross-referencing the requirements of NEPM in addition to knowledge of both the site, likely contaminants, likely pathways and likely receptors within the area.
- Verification of field methods and review of the verification of data quality.

- Verification that there is no evidence of misrepresentation or omission of material information by EcoZ or Independent Reviewer that may compromise the review process.

The Independent Reviewer can confirm that this letter provides an endorsement of the conclusions of the Flare Pit Fluid Release Incident Report and the Overspray from Flare Pit Report, noting this was based on a voluntary engagement for Independent Reviewer review and concurrence and does not form a specific statutory submission.

We trust that the information provided in this letter meets your requirements and allows submission of the Flare Pit Fluid Release Incident Report and the Overspray from Flare Pit Report, however, should you wish to discuss any aspects or need any additional details, please do not hesitate to contact me further.

Yours sincerely,



*Principal
Independent Reviewer*

Attachment A
Contaminated Land Auditor Approval

Certificate

Environmental Protection Act 1994
Certificate of Approval - Auditor
Approval No: CLAD010001639

This certificate of approval as an auditor is issued by the chief executive¹ pursuant to section 573 (2)(a) of the Environmental Protection Act 1994.

1. Approved person

[REDACTED]

2. Approved auditor functions

The approved person is approved to perform auditor's functions under s.568(b) of the *Environmental Protection Act 1994*.

3. Term of approval

This approval will remain in force until 24 June 2025 unless it is cancelled or suspended.

4. Conditions of approval

The approved person must:

- continue to hold professional indemnity insurance for at least \$5 million of cover
- comply with the most recent version of the Queensland Auditor Handbook for Contaminated Land, Module 4: Code of Professional Conduct
- have and maintain an expert support team whose support and advice can be obtained when the auditor is not an expert in any of the competencies and proficiencies listed in Schedule B9 of the *National Environment Protection (Assessment of Site Contamination) Measure 1999*, amended 2013.

[REDACTED]

Director, Technical and Assessment Services
Department of Environment and Science
Delegate of the chief executive
Environmental Protection Act 1994

5 August 2022

Date

Enquiries:

[REDACTED]
Phone: (07) 3330 5574
Email: technicalsupport@des.qld.gov.au

¹ The Director-General of the Department of Environment and Science is the chief executive under the *Environmental Protection Act 1994*.