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c.c. Mark Curran, Jed Usback

Site Audit 0102_IDG, Goulburn Roundhouse – Interim Audit Advice #2, Review of Supplementary Detailed Site Investigation Report

Dear Tim

1. Introduction

Ian Gregson of GHD Pty Ltd (the Auditor and author of this letter) has been engaged by the Australian Rail Track Corporation Ltd (ARTC) to conduct a site audit under the provisions of the *Contaminated Land Management Act 1997* (the CLM Act) in relation to investigations and proposed remediation activities at the Goulburn Roundhouse, located at 12 Braidwood Road, Goulburn NSW 2580 (the site). The land to which this site audit pertains is described as Lot 2 in DP 1002813, and has an area of approximately 46,390 m².

The site is owned by Transport for NSW (TfNSW) and managed by ARTC. The site is currently used as a railway museum and actively operated as a Roundhouse by the Goulburn Locomotive Roundhouse Preservation Society Incorporated (GLRPS) for storage, restoration and maintenance of locomotives and rolling stock. It is understood that the proposed land use is for continuation of the site's current use.

Numerous previous investigations have been undertaken at the site, and a Remediation Options Assessment (ROA) has been undertaken to determine the preferred remediation strategy for the site. ARTC is working with TfNSW to seek approval for the preferred remedial strategy via planning pathways under a Review of Environmental Factors (REF). A previous letter of Interim Audit Advice (IAA) documenting the Auditor's review and comments on previous reports was issued on 9 February 2023 (IAA#1).

The purpose of this IAA#2 is to provide my determination of the adequacy of recent additional investigations to address comments provided in IAA#1, as a basis to make the site suitable for ongoing use as a railway museum including storage, restoration and maintenance of locomotives and rolling stock, and to address the relevant requirements of the Approved Voluntary Management Proposal (VMP) as described in Section 3 below.

This IAA#2 is based on review of the following report:

- *Supplementary Detailed Site Investigation, Goulburn Roundhouse, 12 Braidwood Road, Goulburn NSW 2580*, Cavanba Consulting Pty Ltd, 31 October 2023 [Supplementary DSI]

An earlier version (dated 7 September 2023) of the Supplementary DSI was reviewed by the Auditor. Comments on that version have generally been satisfactorily addressed in the 31 October 2023 version noted above, or can be addressed in future works. A comment log is included in Attachment 2 of this IAA#2.

This IAA#2 is intended to be read in conjunction with IAA#1, which provides a summary description of the site, heritage constraints, details of the Auditor's review of previous investigations and the ROA, and notes from a site inspection undertaken in the company of ARTC on 15 November 2022.

Please note that this communication has been provided as Interim Audit Advice only, as part of the audit process. The advice does not constitute a site audit report or site audit statement under the provisions of the CLM Act, and does not pre-empt the conclusions which will be drawn at the end of the audit process. A site audit report and site audit statement will be issued when the audit process has been completed.

This Interim Audit Advice (IAA) relates solely to the assessment and proposed remediation of contamination at the site, and is not intended to provide any opinions regarding the other aspects of the suitability of the site for any particular use.

The opinions and recommendations offered in this Interim Audit Advice are subject to the Limitations in Attachment 3.

2. Review methodology

I have reviewed the available contamination assessment and management reports in the context of guidelines made or approved by the NSW EPA under the provisions of the CLM Act and other relevant guidelines, including the following:

- ANZG 2018, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*
- HEPA 2020, *PFAS National Environmental Management Plan, Version 2.0*, Heads of EPAs Australia and New Zealand, January 2020
- NEPC 2013, *National Environment Management (Assessment of Site Contamination) Measure 1999*
- NSW DECC 2007, *Guidelines for the Assessment and Management of Groundwater Contamination*
- NSW EPA 2017, *Guidelines for the NSW Site Auditor Scheme*
- NSW EPA 2020a, *Contaminated Land Guidelines: Consultants reporting on contaminated land*
- NSW EPA 2020b, *Contaminated Land Guidelines: Assessment and management of hazardous ground gases*
- NSW EPA 2022a, *Contaminated Land Guidelines: Sampling design part 1 – application*
- NSW EPA 2022b, *Contaminated Land Guidelines, Sampling design part 2 – interpretation*

My opinions on whether the contamination assessments have been appropriate, whether the nature and extent of contamination have been sufficiently determined, and whether the site can be made suitable for the proposed use are based on the above guidelines with consideration of the following factors primarily influencing these opinions:

- What is the scope of investigations that have been carried out to date?
- Is the information considered reliable and consistent with relevant guidelines?
- Has the extent and significance of contamination at the site been sufficiently characterised to determine appropriate remediation or management requirements?

A summary of the scope of investigations completed to date is presented in Attachment 1. My overall findings and conclusions are summarised below.

3. Regulation of the site

The Goulburn Roundhouse site was notified to the EPA under Section 60 of the CLM Act, and is now subject to an Approved VMP issued to TfNSW on 6 July 2023 under a Notice of Approval. Key aspects of the VMP are summarised in Table 1 below. It is noted that the current VMP is for Phase 1 of the investigation and remediation works to be undertaken at the site and involves additional site investigations to fully delineate and characterise the site's contamination. This VMP will be followed by two other VMPs, which will comprise Phase 2 and Phase 3 of the works, respectively.

For clarity of purpose, this IAA#2 relates specifically to items P2, T3 and R3 of the VMP, and represents R5 of the VMP. The "Interim Site Audit Report" referred to in item T5 is taken to be Interim Audit Advice, as in item R5.

Table 1 Summary of Approved VMP

Item	Description (as per VMP)
Notice No.	20231703
Declaration No.	20221108
Area No.	3531
Contamination	<p>Soil and/or groundwater and/or surface water at the site are contaminated with substances and the contamination is significant enough to warrant regulation under the Contaminated Land Management Act 1997. The substances of concern (“the contaminants”) are:</p> <ul style="list-style-type: none"> • Lead • Chromium • Trichloroethene (TCE) • Cis-1,2-dichloroethene (DCE) <p>The lead contamination in the soil is widespread and detected in surface soils (the top 0-0.05m). Chromium contamination was detected in the groundwater and detected in downgradient wells on the eastern border of the site, presenting a potential ecological risk.</p> <p>Additional contaminants were detected in the groundwater in 2022 which require further investigation to determine source and risk. These include TCE and DCE.</p> <p>Exposure routes for the contaminants include:</p> <ul style="list-style-type: none"> • Direct contact with contaminated soil • Inhalation of dust from contaminated soil, airborne dust • Incidental ingestion of contaminated soil, airborne dust • Root uptake of contaminants in soil and groundwater • Potential off-site groundwater migration • Potential inhalation of vapours produced by chlorinated solvents
Objectives	<p>The objectives of this proposal are to protect human health and the environment, and provide a plan to manage identified site contamination.</p> <p>The proposal is to undertake investigations and remediation of the contamination in three (3) phases:</p> <ul style="list-style-type: none"> • Phase 1 – Supplementary Detailed Site Investigation: this involves additional site investigations to fully delineate and characterise the contamination. • Phase 2 – Remediation Planning: this involves identifying and analysing the remediation options to support the preferred future land use; developing remediation action plan detailing the remediation implementation strategy and obtaining the necessary planning approvals to enable the remediation works • Phase 3 – Remediation and Validation: this involves the delivery of the remediation action plan and validation that the remediation has met the objectives of this proposal. <p>This Schedule relates only to Phase 1. Phase 2 and 3 will be implemented upon completion of Phase 1 to the satisfaction of the EPA. TfNSW will submit a S44 for Phase 2 upon the completion of Phase 1, and so on for Phase 3.</p> <p>The main objective of Phase 1 is to achieve the following outcomes within the timeframes specified in the proposal:</p> <p>O1. Fully delineate and characterise the extent of the contamination at the site</p>
Principal features of the proposal	<p>The principal features of Phase 1 include, but are not limited to:</p> <p><u>a. Capital works</u></p> <p>P1. No capital works</p> <p><u>b. Investigation</u></p> <p>P1. Update Interim Environmental Management Plan to address potential risks associated with chromium in groundwater</p> <p>P2. Supplementary Detailed Site Investigation</p> <p>P3. Update Interim Environmental Management Plan to address any risks identified in the supplementary Detailed Site Investigation</p> <p><u>c. Monitoring</u></p> <p>No monitoring activity is required under the current IEMP dated 16/05/2023 Version 3.</p>

Item	Description (as per VMP)	
Key milestones	All works set out in the proposal must be completed by the deadlines specified below:	
	T1. Update Interim Environmental Management Plan	31 July 2023
	T2. Develop Community and Stakeholder Engagement Plan	31 July 2023
	T3. Completion of supplementary Detailed Site Investigation	30 November 2023
	T4. Update Interim Environmental Management Plan	31 January 2024
	T5. Prepare Interim Site Audit Report on Supplementary Detailed Site Investigation	28 February 2024
Reporting requirements	The EPA must be provided with the following reports by the deadlines specified below:	
	R1. Updated Interim Environmental Management Plan	31 August 2023
	R2. Community and Stakeholder Engagement Plan	31 August 2023
	R3. Detailed Site Investigation	31 December 2023
	R5. [sic] Updated Interim Environmental Management Plan	28 February 2024
	R5. Interim Audit Advice on Supplementary Detailed Site Investigation	31 March 2024
	R6. Submission of Phase 2 VMP	31 March 24

The EPA (2017) *Guidelines for the NSW Site Auditor Scheme* (s.3.4.5) states “Where the site audit is being done as part of the planning approval process under the Environmental Planning and Assessment Act, the method for ensuring compliance with any condition should be discussed by the auditor with the consent authority. The consent authority should be asked their view on the method for ensuring compliance and given reasonable opportunity to respond”. Also, s.3.8.2 states “if an auditor is commissioned to undertake a site audit for a site which is being regulated by the EPA under the CLM Act, the auditor must contact the EPA to discuss the regulation of the site before completing their audit”.

Due to the involvement of the EPA and likely involvement of Council in the regulatory and approval processes for this site, I presume that the EPA and Council will consider this Interim Audit Advice and that opportunity will arise to discuss regulation and compliance with these authorities before completion of the site audit, in accordance with the requirement noted above.

4. Contamination assessment

4.1 Objectives and scope of Supplementary DSI

Cavvanba has previously undertaken a series of site investigations of soil and groundwater at the site comprising a DSI (2021a), Additional ESA (2021c) and GME (2022a) at the site, as summarised in IAA#1.

The stated objectives of the Supplementary DSI were to re-evaluate and supplement previous investigation data, and address the key issues raised by the Site Auditor [in IAA#1] and the NSW EPA [in the VMP]. The proposed works were also to assist in reducing uncertainties in the assessment of remedial options, and regulation of the site.

The supplementary DSI describes additional investigations of soil and groundwater at the site, as well as interim asbestos management (removal of surface asbestos containing materials (ACM) undertaken following the site investigations, and also mentions a waste classification assessment to support off-site disposal of spent grit blasting media stored at the site. The latter is not considered directly relevant to the contamination assessment or remediation, and has not been further reviewed by the Auditor.

Specific elements of the scope are outlined in Section 4.3 below. Summaries of the overall extent of investigations are presented in Table 4 and Table 5 in Attachment 1 of this IAA, including the additional scope of investigations undertaken in the Supplementary DSI. Section 5 below indicates whether issues raised in IAA#1 have been addressed by the Supplementary DSI or remain to be addressed in subsequent remediation documentation.

4.2 Compliance with guidelines

As a report intended to be read in conjunction with previous investigations, the Supplementary DSI is considered to adequately comply with the NSW EPA (2020) *Guidelines for Consultants Reporting on Contaminated Land*. The report includes a summary of the site setting and previous investigations, Data Quality Objectives (DQOs), sampling plan and methodology, assessment criteria, site observations, analytical results, assessment of results and an updated Conceptual Site Model (CSM). Analyses were undertaken by NATA accredited laboratories. A Data Usability assessment was undertaken by Cavvanba which indicated a number of minor outliers or non-compliances, which were not considered to affect the overall accuracy of the data or the conclusions drawing within the report. The Auditor agrees with this. Where potentially significant, these are discussed in the review of contamination in Section 4.3 below.

4.3 Nature and extent of contamination

The Auditor notes that assessment of contamination as reported in the Supplementary DSI is generally focussed on the results for the specific investigations carried out as part of the Supplementary DSI. Except for consideration of some contaminant trends in groundwater as part of an assessment of Monitored Natural Attenuation (MNA), the Supplementary DSI does not provide an overall assessment of site conditions based on all existing data, although historical data is included in Appendix G of the report, and some statistical assessment of lead in soil has been included as discussed in Section 4.3.1 below.

The Auditor notes that subsequent remediation documentation will need to consider all investigations in determining an appropriate remediation and validation strategy.

4.3.1 Soil

Cavvanba's rationale for additional soil sampling at the site is summarised as follows:

- **Railway lines:** The "four-foot" (space between) railway lines was not previously investigated. A total of 34 surface soil locations and 2 boreholes were completed to target this feature.
- **Southern portion of site:** 11 test pits were excavated using hand tools to further characterise areas of limited spatial coverage or not previously assessed.
- **North of the Roundhouse:** 3 boreholes and 5 surface soil locations were completed to further characterise an area of limited spatial coverage.
- **Northern portion of the site:** 2 surface soil locations and 5 test pits excavated using hand tools were completed to further characterise an area of limited spatial coverage.
- **East of Roundhouse and surrounding the administration building:** 7 surface soil locations, 6 boreholes and 2 test pits were excavated to further characterise an area of limited spatial coverage.

Soil samples were analysed for heavy metals (arsenic, cadmium, chromium, copper, lead, nickel, zinc and mercury), Total Recoverable Hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN) and polycyclic aromatic hydrocarbons (PAH). Assessment of asbestos was undertaken as described in Section 4.3.2 below.

Soil conditions observed at the site are described in Section 6.1 of the Supplementary DSI, generally consistent with previous investigations. Cavvanba noted that petroleum hydrocarbon staining, consistent with oil and grease, was present within the four-foot of the railway lines in the southern and north-western portions of the site. These stains appeared superficial and did not appear to extend below the immediate ground surface, conservatively estimated to be less than 0.2 m depth. The Auditor notes that sampling in these areas was primarily surface soil sampling, and the vertical extent of contamination was not generally delineated by analysis, however it seems reasonable to expect that surface staining that was associated with rolling stock (i.e. as opposed to storage tanks) would be limited to near surface soils.

Cavvanba reported that exceedances of the adopted soil assessment criteria were limited to the following [with asbestos as discussed in Section 4.3.2 below]:

- TRH F3 (>C16-C34) in excess of the adopted ecological screening levels in fill material at three locations (SS105, SS106 and SS125), with maximum concentration of 5,540 mg/kg;

- TRH F3 (>C16-C34) in excess of the adopted management limits in surface fill material at SS105 with a reported concentration of 5,540 mg/kg;
- lead in excess of the health investigation level and ecological investigation level in fill material at two locations (SS110 and BH108_0.3-0.4), with maximum concentration of 2,260 mg/kg;
- arsenic in excess of the adopted ecological investigation level in fill material at two locations (SS112 and TP104_0.0-0.1), with a maximum concentration of 282 mg/kg;
- copper in excess of the adopted ecological investigation level in fill material at twenty locations, with a maximum concentration of 2,280 mg/kg;
- zinc in excess of the adopted ecological investigation level in fill material at eleven locations, with a maximum concentration of 2,520 mg/kg.

Cavvanba noted the extent of lead contaminated soils through data collected from this, and previous investigations can be summarised as widespread, but discontinuous within the southern and north-western portion of the site. While not discussed within the report, Cavvanba included a historical data set in Appendix G of the report, including a 95% UCLav calculation for lead in fill material across the entire site (685 mg/kg), and Figures 5a and 5b present historical and current lead exceedances. Cavvanba noted in their response to Auditor's comment (9b) in Attachment 2 that groundwater monitoring results for the site do not indicate there are leachability issues associated with the lead impacted material.

The Auditor notes that more detailed discussion including statistical assessment of all results and potential impacts to groundwater (eg. if contaminated soils are managed on site) should be provided in future remediation documentation.

Cavvanba noted that arsenic, copper, zinc and TRH F3 (>C16-C34) concentrations exceeded ecological investigation levels within fill material at multiple locations advanced across the site, with the higher concentration samples collected from the four-foot of the railway lines in the southern portion of the site, which is linear railway corridor that is highly disturbed and is purposely phytotoxic to preserve the integrity of the railway line. These are a possible result of historical herbicide and pesticide application to the rail line and accumulation over time. Isolated EIL exceedances within other areas of the site are most likely to be attributed to fill material rather than pesticide/herbicide application. Cavvanba noted that the significance of these exceedances should therefore be considered in conjunction with health investigation level exceedances, and where isolated exceedances are reported, they are unlikely to represent an unacceptable risk to ecological receptors on-site.

Cavvanba noted that whilst EIL exceedances are unlikely to drive remediation actions on this site, phytotoxic conditions could result in a reduction of grass cover in areas where management of ACM in soils relies on the presence of grass cover to minimise erosion and dust generation. While not obvious at this stage, it is plausible that other future stresses such as drought will strongly exacerbate metal phytotoxicity, and should therefore be considered in the IEMP.

TRH concentrations exceeding EILs or management limits were associated with surface staining. Cavvanba stated that whilst the localised presence and magnitude of the reported concentrations are not considered to indicate the presence of LNAPL or a potential risk of hazardous atmospheres, they do represent aesthetic issues that require appropriate management.

4.3.2 Asbestos

Cavvanba reported that a visual appraisal of surface soils for the presence / absence of ACM was also completed within the vicinity of each sampling location. A 10 litre (L) soil sample was collected at all test pit and borehole locations, which was sieved and visually inspected for potential ACM. Representative ACM samples [fragments] were collected for laboratory analysis. Asbestos was positively identified in all ACM samples analysed.

Cavvanba reported that potential ACM was identified to be widespread on soils within areas previously identified during the DSI and Additional ESA, and was also observed to extend into the following areas as presented on Figures 5a and 5b:

- isolated fragments within the four-foot of railway lines in the southern portion of the site;

- high frequency of ACM within the location of the former maintenance pits and sub-terranean waste oil line, being Bays 1 to 15 which were observed to have been filled; and
- isolated fragments within the area immediately surrounding and to the east of Building 8.

Potential ACM was identified in soils as part of the Supplementary DSI at the following locations:

- TP109, comprising a single fragment weighing 13.6 grams, located immediately to the southwest of the Roundhouse from a depth of 0.0 – 0.1 m;
- TP113, comprising multiple ACM fragments (< 10) intermixed within ash fill material, located within the filled area immediately to the east of the roundhouse from a depth of 0.4 m – 0.5 m; and
- BH104, comprising layered ACM sheeting, located immediately adjacent to the north of the administration building from a depth of 0.4 m to the maximum depth of investigation.

Cavvanba reported that friable asbestos was not identified.

Cavvanba considered the identification of high frequency ACM on surface soil beneath locomotives and rolling stock within Bays 1 to 15 of the Roundhouse is an indication that the maintenance pits within the portion have been filled with uncontrolled fill material. The use of uncontrolled fill containing ACM is consistent with that observed in the southern portion of the site and therefore, it should be assumed that ACM is present throughout fill material in this area.

Cavvanba reported that the distribution of ACM can be summarised as widespread in and on soil within the southern and north-western portion of the site, and can generally be attributed to areas where historical filling has occurred and/or where known ACM buildings and structures have been demolished. The sporadic and unexplained nature of ACM in soils in some areas of the site (i.e. at BH104 from a depth of 0.4 m) indicates a risk of ACM being present within areas where known filling has occurred, and should therefore be managed accordingly. This also applies to the central portion of the roundhouse, gravel access road and vehicle parking areas which have been repaved with imported material by GLPRS, and likely provide a barrier to potential ACM fragments which may be present within underlying fill materials within this area.

Cavvanba reported that management is currently guided by the IEMP, and routine hand-picking events are taking place to reduce the hazard.

Section 11.1 of the Supplementary DSI summarises an asbestos-picking exercise completed in June 2023 [after the Supplementary DSI investigations] across the work area, in which a total of approximately 80 kg of ACM was identified and removed as part of the works. Areas of surface ACM were categorised as the following:

- higher risk area, being an area where multiple fragments of ACM were identified and creates a higher risk of generating airborne fibres if disturbed; and
- lower risk area, being areas where isolated ACM fragments were identified and presents a lower risk due to the incidental presence and non-friable nature.

A letter report (Cavvanba, 30 June 2023) describing the asbestos-picking exercise was provided in Appendix I of the Supplementary DSI. The letter report states that the higher risk areas should be demarcated as exclusion zones in accordance with the IEMP, meaning restricting access and movements with these areas. No additional management measures beyond that stipulated within the IEMP, are required for the lower risk areas.

Cavvanba (June 2023) recommended that ACM on-site continues to be managed under the current IEMP until such time that remedial works and/or more permanent measures are in place. The IEMP includes biannual inspections and handpicking. Cavvanba acknowledged that the presence of thick grass and vegetation limited a visual appraisal of surface soils across some portions of the site, however this also provides natural protection from erosion and discourages direct access by site personnel. Therefore, it is not recommended to change or disturb these areas, however should conditions change (i.e. removal or thinning of vegetation cover), additional inspections and hand-picking exercises are recommended.

The letter report describes some areas where potential ACM fragments were unable to be removed, and areas where ACM is likely to be exposed through natural erosion / weather events or mechanical

disturbance. The Auditor recommends management of these areas be documented as part of implementation of the IEMP. Future asbestos-removal events should document the approximate grid spacing of the systematic walk-over, how many personnel were involved in the inspection and removal, and the quantity removed from each respective area, in order to further facilitate ongoing assessment of risk and progress of management in the respective areas.

4.3.3 Groundwater

Three new groundwater wells were installed on 18 and 19 April 2023 within accessible areas in the northern portion of the site to target the decommissioned diesel above ground storage tanks (ASTs) and effluent treatment plant. All existing monitoring wells on site were gauged and sampled for analysis, except for MW06 in which an increased (0.53 m) thickness of light non-aqueous phase liquid (LNAPL) was found.

Groundwater purging and sampling was undertaken on 26 and 27 April 2023. Groundwater samples were analysed for heavy metals (including speciated chromium), TRH, BTEXN, PAHs, volatile organic compounds (VOCs), per- and polyfluorinated substances (PFAS) and natural attenuation parameters (nitrate, sulfate, ferrous iron, methane and manganese).

Cavvanba reported that the groundwater standing water levels (SWLs) were an average of 0.7 m lower than the 2022 monitoring event. The LNAPL observed in MW06 was black in colour with a strong hydrocarbon / oil odour, and had increased in thickness by approximately 0.37 m from February 2022.

Cavvanba reported that exceedances of the adopted groundwater assessment criteria (with consideration given to the water hardness adjustment) were limited to the following:

- total chromium in excess of the adopted 95% species protection levels at nine locations, with maximum concentration of 26 µg/L (W2);
- hexavalent chromium in excess of the 95% species protection levels at three locations, with a maximum reported concentration of 30 µg/L (W2);
- copper in excess of the 95% species protection levels at three locations, with a maximum concentration of 4 µg/L (W3);
- PFOS in excess of the adopted human health criteria at two locations, with a maximum concentration of 3.05 µg/L (MW05);
- PFHxS in excess of the adopted human health criteria at two locations, with a maximum concentration of 0.89 µg/L (MW05);
- sum of PFOS & PFHxS in excess of the adopted human health criteria at three locations, with a maximum concentration of 2.16 µg/L (MW05); and
- PFOS in excess of the 99% species protection levels at three locations, with maximum concentration of 2.16 µg/L (MW05).

All groundwater samples collected on-site were reported below the adopted CRC CARE HSLs for vapour intrusion. Cavvanba acknowledged that the LOR for vinyl chloride (VC) is greater than two orders of magnitude than the criterion (i.e. 50 ug/L vs 0.3 ug/L), but highlighted that other VOCs have not been detected, including those known to be precursors to VC such as Trichloroethene at an LOR of 5 ug/L, and therefore it has been treated as a non-detect.

Based on the presence and distribution of petroleum hydrocarbon detections in groundwater through data gathered from this and previous monitoring events, Cavvanba considered there are two known and independent contamination source areas, referred to as the locomotive maintenance bays, and the former diesel refuelling gantry.

Monitoring well MW06 is located adjacent to the locomotive maintenance bays in the Roundhouse building. Cavvanba noted that LNAPL has not been identified in any of the remaining groundwater wells across the site since monitoring in August 2020, and the absence of detectable dissolved phase hydrocarbons within groundwater monitoring wells cross- and down-gradient from this location indicates that the impact is localised and unlikely to be mobile. The increase in LNAPL thickness that has manifested during this monitoring event is likely associated with residual LNAPL saturation rather than an ongoing source. This is evident by water table fluctuations which can result in a dynamic change in the extent of the unsaturated

and saturated zones, causing LNAPL to continuously redistribute vertically. The Auditor agrees this is likely to be the case, however (as recommended by Cavvanba), this should be confirmed with further monitoring and an assessment of the feasibility of LNAPL removal.

Cavvanba stated the results of the hydrocarbon fingerprinting analysis and absence of detectable volatile hydrocarbons such as BTEXN, short chain or chlorinated hydrocarbons indicates that a potential vapour intrusion health risk as a result of the LNAPL presence at MW06 is low. This risk is further reduced due to the absence of routinely occupied buildings within this area, and assumed air exchange capacity of the large and open roundhouse building. The Auditor agrees with this assessment.

Cavvanba noted that dissolved phase petroleum hydrocarbon contamination in groundwater was reported at a maximum concentration of 40,700 µg/L (F2 TRH >C10 – C16) at MW02, located immediately adjacent to the former diesel refuelling gantry during the DSI in 2020. A sudden, two orders of magnitude reduction in TRH concentrations was reported at this location during the subsequent Additional ESA in 2021, which was considered to be associated with a ruptured belowground water pipe and potential potable water influence at this location. TRH (F2 >C10 – C16) concentrations within this monitoring well were reported at 740 µg/L during this groundwater monitoring event. Consistent with recent the most recent groundwater investigations completed in 2021 and 2022 at the site, petroleum hydrocarbon concentrations at this location remain low, and are localised, being delineated by down-gradient monitoring wells, however MW02 has shown a slight increase which may be an indication of a slow rebound.

TCE and DCE were detected in groundwater at monitoring well location MW12, at respective concentrations of 8 µg/L and 5 µg/L during the 2022 monitoring event. VOCs were not detected in groundwater within any of the monitoring wells sampled as part of this monitoring event. Cavvanba considered the isolated detections and low concentrations identified in 2022 (i.e. < 10% criterion DCE) are unlikely to represent an unacceptable risk to human health or the environment on or off-site (delineation achieved and absence of a vapour intrusion pathway at this location), however their previous presence represents an ongoing data gap warranting inclusion in any ongoing monitoring or operational changes.

With regard to heavy metals, Cavvanba reported that consistent with the previous groundwater monitoring events, a limited number of exceedances of the adopted 95% level of species protection criteria were detected in monitoring wells on-site. These reported concentrations are not considered to represent an unacceptable risk to the environment based on the following:

- the reported concentrations are within a similar order of magnitude and/or only marginally in excess of the adopted criteria;
- groundwater beneath the site is not considered to be an ecological receptor of concern in itself; and
- the Mulwaree River is located approximately 570 m from the site boundary, and it is likely that physical and geochemical processes such as dispersion and adsorption would inhibit migration of this distance.

Speciation for chromium [hexavalent CrVI and trivalent CrIII] was conducted at all groundwater monitoring well locations onsite and reported:

- no exceedances of the human health drinking water guideline value of 50 µg/L (CrVI); and
- three locations to exceed the 95% level of species protection criteria, with a maximum reported concentration of 30 µg/L.

The concentrations of CrVI were similar to the total chromium (i.e. CrIII + CrVI) concentration indicating that the detection of total chromium represents a likely CrVI concentration. Cavvanba therefore acknowledged that the resultant laboratory limit of reporting (LOR) for speciated CrVI of 10 µg/L is greater than the 95% level of species protection criterion of 1 µg/L. As a result, the lower concentration total chromium detects which are less than 10 µg/L but more than 1 µg/L may be considered exceedances of the CrVI criterion.

Cavvanba noted that the exact source of chromium in groundwater at the site remains uncertain, it is likely a legacy issue associated with a variety of historical operations completed at the site. Whilst exceedances of the 95% level of species protection criteria for CrVI were identified on the boundary and delineation remains incomplete off-site, Cavvanba did not consider this to represent an unacceptable risk to human health or the environment based on the following:

- groundwater beneath the site is not considered to be an ecological receptor of concern in itself;

- there are no registered groundwater extraction bores down gradient of the site; and
- the Mulwaree River is located approximately 570 m from the site boundary and it is likely that physical and geochemical processes such as dispersion and adsorption would inhibit migration of this distance.

The Auditor agrees this is likely to be the case, however considers a semi-quantitative assessment should be considered as part of the formal groundwater monitoring plan recommended by Cavvanba (eg. attenuation factors based on approved guidelines or reputable reference) to demonstrate sufficient attenuation of contaminant concentrations before ecological receptors are reached.

4.3.4 Natural attenuation

Cavvanba provided an evaluation of natural attenuation based on concentration trends and trends in chemical indicator parameters.

Cavvanba noted the presence of LNAPL or likely presence of LNAPL represents an ongoing source which will prolong any passive option such as MNA, and the feasibility of LNAPL removal should therefore be considered as a remediation action to enhance MNA.

Concentration trends for dissolved phase TRH in MW02 were undertaken, including Mann Kendall analysis which indicated concentrations were stable but did not identify a statistically decreasing trend. Cavvanba noted the significant decrease in concentrations of TRH > C10 – C40 in MW02 from 72,600 ug/L in August 2020 to 2,300 ug/L in April 2023 were most likely associated with a combination of the initial potable water influence, natural attenuation processes, and the primary source of contamination has been removed (i.e. refuelling no longer occurs within this area of the site).

Cavvanba considered it is worthy of note that downgradient monitoring well MW01 has persistently reported low and consistent concentrations of TRH, with a similar concentration also reported at MW103, which is further down gradient. Cavvanba considered it plausible that this represents the migration of contamination from MW02, however the low concentrations and presence of other potential sources along the flow path make this difficult to confirm.

Cavvanba considered spatial trends in natural attenuation indicator parameters for three wells; MW04 considered upgradient, MW02 source zone, and MW10 downgradient, summarised as follows:

- Dissolved oxygen is considered to be low and depleted within the plume, however concentrations of dissolved are relatively consistent across the majority of the site.
- Redox values are generally consistent across the site, ranging from 67.1 mV to 248.1 mV, suggesting oxygen is being depleted by micro-organisms across the majority of the site.
- There is a clear correlation between the centre of the plume and nitrate concentrations [depleted in the source zone], noting that upgradient well MW04 appears to have been slightly influenced by the plume during the February 2022 round.
- There is a clear correlation between the centre of the plume and the increase of manganese and Fe(III) concentrations.
- The reduction of sulfate concentrations appears to be consistent and occurring within the plume, however downgradient wells also appear to be slightly influenced by the plume.
- There is a clear correlation between the centre of the plume and methane concentrations, with methane being generated in the centre of the plume.

Cavvanba reported that overall, it appears that natural attenuation is occurring as strong indicators are present in the hydrocarbon plume based on the Monitored natural attenuation (MNA) data collected during the previous (February 2022) and this monitoring event.

The Auditor agrees, noting that a more comprehensive assessment would include consideration of MW01 and MW103, potentially downgradient of MW02. This should be further assessed in future monitoring.

4.3.5 Surface water

Cavvanba included a description of stormwater and drainage investigations completed by Aqua Assets, based on information provided to Cavvanba by ARTC. Cavvanba reported these investigations were

completed in June and August 2023 and included the use of closed-circuit television (CCTV) pipeline inspections, drainage cleaning (combination water jet / vacuum) and pipeline repair. A general description of the drainage system was provided in Section 6.4 of the Supplementary DSI, supported by an updated stormwater drainage plan (Figure B) in Appendix A of the report.

Some components of the drainage system were observed to be blocked during the investigations, and some connections could not be confirmed. The investigations indicated that all stormwater currently discharges from the site through the northern discharge point. The pipework from the southern arrestor pit to the east was observed to be completely blocked with silt at the time of the investigation, and it was understood that stormwater and wastes discharge from the southern arrestor pit, north via the northern arrestor pit. Cavvanba noted that there is potential for integrity issues associated with stormwater pits constructed of bricks and mortar and the pipework in the area of the southern arrestor pit, and a potential that stormwater migration from this location may discharge to soils.

ARTC observed evidence of oil within the base of six stormwater drainage pits within the eastern drainage line at the time of the investigation. Oily sludge water removed from the southern arrestor pit and the API separator. Cavvanba reported that despite the presence of oily sludge within the API separator and arrestor pit, there was no evidence of petroleum hydrocarbon odours or sheens noted by ARTC on water present within the holding tanks (4 x over / under separators) located on the eastern side of Braidwood Road prior to discharge to the open stormwater drainage channel.

Two surface water samples were collected from arrestor pits downgradient of the Roundhouse. Cavvanba reported that surface water appeared stagnant and was not flowing at the time of sampling. A slight sheen was observed on the surface of water in the northern arrestor pit (SW02) during sampling.

Cavvanba reported that exceedances of the adopted assessment criteria were limited to the following:

- cadmium, chromium, copper, lead, nickel and zinc in excess of the 95% species protection levels at SW02;
- zinc in excess of the 95% species protection levels at SW01; and
- PFOS in excess of the 99% species protection levels at SW02.

TRH was reported at a maximum concentration of 1,900 µg/L (F3 >C16 – C34) at SW02 (>C10 – C40 concentration of 2,970 µg/L), which correspond to field observations of a slight sheen at this location.

Cavvanba noted the significance of these, and whether there is a potential unacceptable risk to ecological receptors off-site are to be further evaluated as part of future surface water monitoring.

Cavvanba recommended that:

- The railway maintenance bays within the Roundhouse must not be used for any chemical / oil collection (no products to ground) until such time that the network is deemed fit for purpose.
- Surface water sampling within the holding tanks at the discharge point on the eastern side of Braidwood Road (refer to Figure B of Appendix A).
- Assessment of groundwater conditions within the areas of known integrity issues, being the southern discharge point.

4.3.6 PFAS

PFAS was included within the groundwater analytical suite for all groundwater monitoring wells sampled across the site. Cavvanba described the nature and extent of PFAS impacts within groundwater as follows:

- PFOS, PFHxS and the sum of the two were reported above the human health drinking water guideline value at monitoring well locations MW02, MW05 and MW103 on-site with a maximum reported concentration of 3.05 µg/L (Sum of PFOS and PFHxS at MW05).
- PFOS and Sum of PFHxS and PFOS were reported above the human health recreational water guideline value at monitoring well location MW05 only.
- Exceedances of the adopted 99% level of species protection criteria for PFOS were reported at monitoring well locations MW02, MW05 and MW12, with a maximum reported concentration of 2.15 µg/L (Sum of at MW05). However, Cavvanba acknowledges that the laboratory limit of reporting (LOR)

is greater than the 99% level of species protection criteria, and therefore may be an indication that additional exceedances are apparent in groundwater at other monitoring well locations on-site.

- Exceedances of the 95% level of species protection criteria for PFOS (0.13 µg/L) was reported at one monitoring well location, MW05 only.
- The distribution of PFAS infers that the roundhouse is likely to be the source of contamination, however there is no clearly defined plume and the source is not well understood. It is plausible that the source of contamination is associated with a variety of activities undertaken at the site over many years, and its presence is an artifact of historical operations rather than a particular event (i.e. fire training / fire). This is also supported by the low concentration PFAS in surface water samples collected, which are likely to detect an ongoing surface source such as exposed soil or concrete.
- Delineation has been partly achieved onsite, with the most obvious data gap being MW103, where PFOS is likely to be greater than the 99% species protection level given PFHxS was detected at 0.11 ug/L (the second highest recorded concentration of PFHxS), and its close proximity to the site boundary. Further investigation is required to assess whether an unacceptable risk to human health and the environment is present, and it should consider the distance to the nearest receiving surface water (Mulwaree River ~570 m), availability of municipal potable water and the absence of registered groundwater extraction bores down-gradient of the site.

In the Recommendations section of the Supplementary DSI (Table 12.1), Cavanba considered the site history had been predominantly reconciled, however consideration should be given to obtaining historical information relating to the potential use of PFAS containing products.

The Auditor notes that a former and current fuel depot are located upgradient of the site, and consideration could be given to installing a well upgradient of MW05 to assess whether PFAS detected in groundwater is associated with upgradient, off-site sources. Depending on the outcome of more detailed assessment of potential off-site impacts from the migration of contaminated groundwater (as recommended by Cavanba), consideration should be given to assessment of potential PFAS impacts to soil in the vicinity of MW05, particularly if no upgradient source of PFAS impact to groundwater is identified.

4.3.7 Updated Conceptual Site Model (CSM)

Cavanba updated the CSM based on the information obtained as part of the supplementary DSI. The CSM is summarised below with the Source-Pathway-Receptor (SPR) linkages and Cavanba's discussion of associated risks reproduced in Table 2 below.

Cavanba considered the potential and actual sources of soil and groundwater contamination for the site, and those which are considered to represent a potential environmental liability on-site are as follows:

- Potential sources
 - Current and historical operation of the Roundhouse building resulting in soil and groundwater contamination
 - VOCs in groundwater – should be included in ongoing monitoring but potential inhalation by chlorinated solvents is considered unlikely
 - EIL exceedances of heavy metals - not considered significant enough to define as a source of contamination in the context of the CSM
 - Management limit [exceedances] / aesthetic issues – require appropriate management which should be addressed in the IEMP. Not considered further in the CSM.
- Actual sources
 - Lead and asbestos in site infilling and waste disposal areas – lead is widespread but discontinuous and ACM is widespread within the southern and north-western portions of the site. No distinction has been attempted to separate the presence of ACM on-soil vs in-soil.
 - LNAPL – locomotive maintenance bays - localised and unlikely to be mobile, and likely associated with residual LNAPL saturation rather than an ongoing source.

- TRH [dissolved phase] in groundwater – former diesel ASTs and refuelling gantry - limited in extent and the trend of chemical indicator parameters are adequate to assess the aquifer’s ability to attenuate hydrocarbon contamination.
- PFAS in groundwater - Exceedances of the 99% level of species protection criteria for PFOS were reported in groundwater at the site. Likely associated with a variety of activities, and an artifact of historical operations rather than particular events. Whilst Cavvanba considered an immediate risk to human health and the environment is unlikely, it represents a data gap warranting further consideration.
- Chromium (VI) in groundwater - Exceedances of the 95% level of species protection criteria were reported in groundwater at the site, likely associated with a variety of historical operations. Whilst delineation off-site remains incomplete, Cavvanba did not consider it was likely to represent an unacceptable risk to human health or the environment.
- Stormwater and drainage – whilst gross contamination has not been identified to be mobilising off-site due to the presence of arrestor pits and API separators, there are data gaps.

Cavvanba considered the following potential exposure and migration pathways, with further assessment of the viability of these pathways in Section 10.4 of the Supplementary DSI (summarised in Table 2 below):

Soil

- exposure via dermal contact (incidental) and ingestion (incidental) of lead contaminated soils – Plausible
- exposure via inhalation (dust and airborne asbestos fibres) of contaminated soils – Plausible
- migration and exposure of vapours from contaminated soils / groundwater and/or LNAPL - – Unlikely based on the absence of volatile petroleum hydrocarbons
- generation and pooling of ground gases that may present an explosive hazard – Unlikely
- migration or transport of soil from the site via runoff, relocation or dust migration – Plausible
- exposure to contaminated soils via plant root uptake – Unlikely.

Groundwater

- migration and exposure of vapours from contaminated groundwater and/or LNAPL – Unlikely
- groundwater migration off-site or to an underlying aquifer - Plausible
- direct contact or ingestion of impacted groundwater - Unlikely
- discharge of impacted groundwater to surface water bodies - Unlikely based on distance to the river and discussion in Section 8.2.5 of the Supplementary DSI. The nearby shallow drainage channel identified in Section 2.2 of the Supplementary DSI is unlikely to be in contact with groundwater at 5 m (approx.) below the ground surface.

Surface water

- mixing, erosion and suspension of soil and contaminants in runoff – Unlikely given the presence of arrestor pits and API separator
- off-site migration of dissolved contaminants via surface water such as stormwater – Plausible.

Cavvanba identified the following potential receptors:

- Human receptors
 - on-site occupants in a commercial/industrial scenario on-site;
 - on-site occupants in a recreational scenario on-site (visitors to the site);
 - on-site excavation / intrusive maintenance workers;
 - potential users of groundwater for supply purposes; and
 - private and recreational users of the Mulwaree River (i.e. members of the public and recreational users).

- Ecological receptors
 - on-site terrestrial ecological receptors including soil processes, plant species and organisms that may inhabit or contact soils; and
 - freshwater aquatic organisms off-site within the Mulwaree River.

Cavvanba noted source-pathway-receptor (SPR) linkage is considered to be present when a pathway links a source with a receptor. These linkages explain when there may be risks to the receptor, either now or in future. Cavvanba stated that all SPR linkages considered to be potentially complete have been considered in Table 10.1 (reproduced in Table 2 below, with additions by the Auditor from Cavvanba's CSM discussion, where noted).

The Auditor notes that Cavvanba Table 10.1 did not include groundwater sources and pathways, and thus is incomplete, although the CSM as a whole is considered appropriate and has addressed comments from IAA#1. While Cavvanba considered groundwater migration off-site or to an underlying aquifer is plausible, discharge of impacted groundwater to surface water bodies was considered unlikely. However, Cavvanba noted that PFAS in groundwater represented a data gap worthy of further consideration, so the Auditor has included this pathway in Table 2. As noted in Section 4.3.3 above, consideration of attenuation factors should be used to assess the completeness of the exposure pathway to aquatic receptors.

Caution should be used in abbreviating the CSM in future documents. The overall CSM should be considered in the formal groundwater monitoring plan and future remediation documents.

Table 2 CSM Potentially Complete SPR linkages (from Table 10.1, Cavvanba 2023) and associated potential risks (from Section 10.4, Cavvanba 2023)

Source	Pathway	Receptor(s)	Potential Risks (as described by Cavvanba in Section 10.4)
Lead in soil – Fill material	Direct and dermal contact, ingestion and/or dust inhalation	<ul style="list-style-type: none"> on-site occupants in a commercial / industrial land use scenario. visitors in a recreational land use scenario. on-site intrusive maintenance workers. 	The uncovered lead contaminated surface soil provides a direct exposure pathway to site occupants and intrusive maintenance workers via dermal contact, dust inhalation or ingestion of contaminated soil. Elevated concentrations of lead were reported to be widespread but discontinuous in fill material across the southern and north-western portion of the site which represents an unacceptable risk to human health. This potential risk is raised should the site be occupied for recreational / open space purposes which includes the presence of children on-site.
Asbestos in and on soil	Indoor / outdoor dust inhalation (airborne fibres)	<ul style="list-style-type: none"> on-site occupants in a commercial / industrial land use scenario. visitors in a recreational land use scenario. on-site intrusive maintenance workers. 	Non-friable ACM in and on soil provides a direct exposure pathway to on-site occupants and intrusive maintenance workers via airborne fibre inhalation if not appropriately managed. At depth the risk is reduced, however the areas where highly concentrated ACM is buried (i.e. within the vicinity of TP06 as part of the DSI (Cavvanba, 2021a)) at depth poses a high risk if the material is disturbed and should therefore be treated as friable during mechanical disturbance.
TRH, arsenic, copper, lead and zinc in soil – Fill material	Ecological exposure, direct contact, ingestion and/or absorption.	<ul style="list-style-type: none"> on-site terrestrial ecological receptors including on-site soil processes, plant species and organisms that may inhabit or contact soils. 	Copper, arsenic, lead, zinc and / or TRH were reported to exceed the adopted ecological assessment criteria. These criteria are designed for the protection of the upper 0 – 3 m of the soil profile, which corresponds to the root zone and habitation of many species. Given the highly disturbed nature of the site, presence of fill material and lack of vegetation and habitat for potential ecological receptors to exist, it is considered unlikely that a potentially complete SPR linkage exists. However, these exceedances should be considered in conjunction with human health criteria exceedances and assist with decision making regarding the proposed future site management and/or remediation.
Stormwater and drainage – TRH and PFAS in stormwater	Off-site migration of contaminants via surface water such as stormwater	<ul style="list-style-type: none"> flora, fauna (terrestrial and freshwater) and/or aquatic organisms within the Mulwaree River 	The presence of TRH and PFAS in surface water on-site provides a potential exposure pathway to off-site freshwater aquatic organisms through direct contact, ingestion and/or absorption of discharged stormwater. The significance of these exceedances, and whether there is a potential unacceptable risk to ecological receptors off-site are to be further evaluated as part of future surface water monitoring.
PFAS and Chromium VI in groundwater	Groundwater migration off-site or to an underlying aquifer	<ul style="list-style-type: none"> freshwater aquatic organisms off-site within the Mulwaree River 	The presence of chromium (VI) and PFAS in groundwater which has not been delineated beyond the site boundary provides a potential exposure pathway to off-site freshwater aquatic organisms through direct contact, ingestion and/or absorption of contaminated groundwater. Root uptake is not considered a plausible pathway given the depth to groundwater and absence deep rooted vegetation. However, given the absence of sensitive ecological receptors within the immediate vicinity and proximity of the site to the Mulwaree River (570 m), the presence of these contaminants in groundwater on-site are unlikely to represent an unacceptable risk to ecological receptors off-site. There is, however an obvious data gap associated with offsite migration of PFAS. The significance of these exceedances, and whether there is a potential unacceptable risk to ecological receptors off-site are to be further evaluated as part of future groundwater monitoring.
(Shaded cells entries are not in Cavvanba Table 10.1. Added by Auditor based on other sections of the CSM).			

4.3.8 Data gaps update

The Supplementary DSI Section 11 provide the following discussion regarding outstanding data gaps:

Data Gap 1: Groundwater contamination (TRH, PFAS and chromium). The varying magnitude and trends of TRH in groundwater within the vicinity of the former diesel refuelling gantry and the Roundhouse where active maintenance is occurring remains a data gap. Additional uncertainty is introduced through the increase in LNAPL thickness at MW06, and potential for TRH rebound at MW02. These uncertainties make groundwater remediation decision making premature. Additionally, there are uncertainties regarding the source or sources of PFAS and the plume geometry.

Cavvanba considers that these uncertainties can be rectified through future routine and planned groundwater monitoring events, and should be undertaken to assist decision making regarding remediation options. It is possible that for TRH, the outcome will be passive remediation such as monitored natural attenuation. The feasibility of LNAPL removal at this stage is unknown.

Data Gap 2: Site infilling and waste disposal areas. Cavvanba considers that the nature and extent of buried waste material within the eastern and southern portion of the site has been established, sufficient to facilitate future remediation and/or management options for this area.

Data Gap 3: Asbestos in and on soil. There is adequate information to facilitate future remediation and/or management options for ACM on-site.

Data Gap 4: Site history. The site has a long and complicated history with over 100 years of heavy industrial activity, and a change in site operations and management from approximately 1989 when the GLRPS acquired the lease. Whilst it is acknowledged that there are inherent uncertainties in the site history, Cavvanba considers that there is sufficient soil and groundwater data and information to support the development of remediation options for the site. [Cavvanba's Recommendations in Table 12.1 stated site history was predominantly reconciled, however consideration should be given to obtaining historical information relating to the potential use of PFAS containing products].

Data Gap 5: Stormwater and drainage. Cavvanba's understanding of the stormwater and drainage network on-site has been sufficiently established through the data gathered as part of this investigation. However as a result, there are data gaps associated with the integrity of the pipework at the southern discharge point, and whether there are resultant soil and groundwater contamination issues. This also includes the chemical composition of stormwater at the discharge point and is particularly relevant given the presence of TRH, and PFAS in excess of the 99% species protection levels.

The Auditor generally agrees with Cavvanba's assessment of remaining data gaps, noting that a definitive program of investigations or monitoring has not been provided to address these. The Auditor recommends a monitoring program be provided for implementation as part of the IEMP, to address the data gaps noted above.

4.3.9 Conclusion

Numerous investigations have been undertaken at the site, and the Auditor considers the nature and extent of soil and groundwater contamination have been sufficiently defined to provide a basis to determine an appropriate remediation strategy to make the site suitable for continued land use by GLRPS. The Supplementary DSI has largely addressed data gaps identified in IAA#1, although further monitoring and some specific investigations remain necessary as part of management and remediation of the site.

Pending remediation of the site, the IEMP should be implemented to minimise the potential risks of exposure to lead and asbestos contamination of soil at the site. As indicated in IAA#1, removal of hazardous building materials should be prioritised prior to site remediation to prevent re-contamination of the site by ACM in poor condition.

5. Issues to be addressed

The issues listed in IAA#1 are presented below in Table 3, with comment on whether these have been satisfactorily addressed in the Supplementary DSI, where relevant.

Table 3 Summary of issues from IAA#1

Issue	Comment
Likely VMP and consideration of substances indicated by the EPA to be of concern.	A VMP has been issued as described in Section 3. The Supplementary DSI has assessed the substances of concern.
Prioritising removal of hazardous building materials prior to site remediation.	To be addressed in future remediation planning.
Decrepit rail carriages etc which may cause further site contamination.	To be addressed in future remediation planning.
Heritage constraints to remediation, including additional archaeological assessment for ground disturbing activities.	To be addressed in future remediation planning.
Areas where prior investigations by CMPS&F and J&K have identified contamination.	Area of J&K BH5 resampled. The area where CMPS&F identified contamination is within a designated remediation area.
Clarify basis for site-specific assessment criteria (soil and groundwater) where used.	Default conservative criteria used instead of site specific criteria for soil. This is not considered likely to affect remediation requirements. Hardness dependent algorithms used for metals in groundwater.
The need for additional investigations (including underground infrastructure) prior to detailed design and implementation of remediation works.	Investigations completed by others (Aqua Assets). Minimal detail of investigations provided, primarily by way of an updated drainage plan. Some uncertainties remain. Cavvanba has recommended: <ul style="list-style-type: none"> – The railway maintenance bays within the roundhouse must not be used for any chemical / oil collection (no products to ground) until such time that the network is deemed fit for purpose. – Surface water sampling within the holding tanks at the discharge point on the eastern side of Braidwood Road. – Assessment of groundwater conditions within the areas of known integrity issues, being the southern discharge point. The Auditor recommends more detailed documentation of the drainage network be provided, particularly in the area of the southern discharge point.
Areas where contamination has been observed (see Section 7.3.1 of IAA#1) but have not been specifically discussed as part of areas requiring remediation.	Investigations have been undertaken in these areas, and are considered adequate to characterise these areas for remediation planning. The individual areas should be discussed in the ROA, as recommended in IAA#1.
Areas of the site which have not been fully characterised (including, but not limited to areas with access constraints due to existing structures or rail operations).	Additional investigations have been undertaken. Where not fully characterised, conservative assumptions have been made (eg. filled area of roundhouse). Cavvanba concluded that the nature and extent of buried waste material within the eastern and southern portion of the site has been established, sufficient to facilitate future remediation and/or management options for this area.

Issue	Comment
	Cavvanba recommended development of remediation and/or management options to ensure the protection of human and ecological health, focussing on the removal of the potential exposure pathway.
A recommended program for further groundwater monitoring, including contaminants identified by the EPA and by the Auditor (specifically PFAS). Speciation of chromium and hardness-modifying factors should be included, as well as assessment of natural attenuation of hydrocarbons in groundwater (using existing data and in upcoming monitoring events).	<p>Further groundwater monitoring has been undertaken including PFAS, speciated chromium, hardness and assessment of MNA.</p> <p>The Supplementary DSI recommends preparation of a formal groundwater monitoring plan, and continue with routine groundwater monitoring to:</p> <ul style="list-style-type: none"> – ensure that any changes in contaminant concentrations can be detected; – demonstrate plume stability, or otherwise; and – ensure the appropriate protection of groundwater human and ecological health. <p>Cavvanba also recommended assessment of the feasibility of LNAPL removal.</p> <p>Details of proposed monitoring have not been provided.</p> <p>Future assessment of MNA should consider additional wells as discussed in Section 4.3.3.</p>
Survey information for well W1 should be reviewed.	W1 excluded from ongoing groundwater monitoring (off-site and not downgradient).
The subterranean drainage system and waste oil network, and implications to contamination of surface water or perched groundwater.	As noted above, investigations were completed by others. Implications have been drawn based on the investigations, however some uncertainties remain.
Potential vapour risks including from LNAPL and chlorinated hydrocarbons in groundwater.	Further assessed on qualitative basis. Contamination at the site is not considered to present a vapour risk.
Update of the CSM to include potential risks from all potential pathways, findings from recent GME(s) and adequate justification for excluding groundwater contamination (if in fact groundwater contamination is to be excluded from remediation or management requirements).	Updated. There are some inconsistencies within the CSM but the CSM as a whole is considered adequate. Data gaps remain, proposed to be addressed by ongoing monitoring and assessment of feasibility of LNAPL removal.
Consideration of all contaminants and any uncertainties that require management, as well as all areas of the site, as part of the ROA.	To be addressed in an updated ROA.
Consideration of additional factors in the remediation options evaluation process, as outlined in Section 8.4 of IAA#1, particularly including regulatory and heritage issues.	To be addressed in future remediation planning.

6. Auditor’s overall conclusions and recommendations

The following conclusions and recommendations are made on the basis of the documents reviewed as listed in Section 1 of this IAA, and in the context of current guidelines made or approved by the NSW EPA.

6.1 Conclusions

The Supplementary DSI is considered to have been completed in substantial accordance with relevant guidelines, has largely addressed relevant (i.e. investigation) data gaps identified in IAA#1, and is considered to have met the requirements of items T3 and R3 of the Phase 1 VMP. Taken overall, the previous investigations and Supplementary DSI have provided a relatively comprehensive assessment of site conditions, and are considered to have sufficiently characterised the nature and extent of contamination to determine appropriate remediation or management requirements to make the site suitable for continued land use by GLRPS.

The updated CSM provided in the Supplementary DSI (when considered as a whole) has addressed the contaminant sources and exposure routes outlined in the VMP. Based on the investigations, TCE and DCE are no longer considered substances of concern, and hence potential inhalation of vapours from chlorinated solvents is not considered a complete exposure route. However, PFAS have been identified as an additional substance of concern, requiring further monitoring and assessment to confirm whether there is a risk to downgradient receptors.

Remaining data gaps can be addressed by an ongoing groundwater monitoring program as recommended by Cavvanba, and some targeted investigations including around the southern discharge point and potentially a groundwater monitoring well upgradient of MW05 to assess potential upgradient sources of PFAS. An assessment of the feasibility of LNAPL removal should also be undertaken (eg. in conjunction with ongoing groundwater monitoring) to assist in remediation planning.

6.2 Recommendations

The issues outlined in this IAA and in IAA#1 should be addressed in an updated ROA and/or subsequent RAP and final remediation design. It should be noted that a number of the recommendations in IAA#1 are independent of the Supplementary DSI (relating to subsequent stages of work) and still stand. It is expected that these will be addressed in subsequent phases of the VMP described in Section 3.

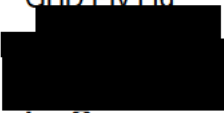
Remediation planning documents should include consideration of all results obtained to date, including statistical assessment where appropriate, and consideration of potential impacts to groundwater quality from soil contamination, if contaminated soils are managed on site.

Pending remediation of the site, the IEMP should be implemented to minimise the potential risks of exposure to lead and asbestos contamination of soil at the site. As indicated in IAA#1, removal of hazardous building materials should be prioritised prior to site remediation to prevent re-contamination of the site by ACM in poor condition.

The IEMP (currently Version 3, 16 May 2023) should be updated in accordance with the VMP, to incorporate the findings of the Supplementary DSI (including Cavvanba's recommendations in relation to the stormwater drainage system, the findings and recommendations of the June 2023 asbestos-picking letter, and the Auditor's recommended documentation of future asbestos-picking events as discussed in Section 4.3.2 of this IAA#2).

A groundwater monitoring plan should be provided to be implemented in conjunction with the IEMP. This should include consideration of additional investigations in the area of the southern discharge point and upgradient of MW05, and assessment of the feasibility of LNAPL removal. Assessment of future groundwater monitoring results should include a semi-quantitative assessment of attenuation before ecological receptors are reached, and consideration of additional wells in assessment of spatial trends in natural attenuation parameters.

Regards
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Attachments:	1	Summaries of investigation scopes
	2	Review comments and responses on Supplementary DSI
	3	Limitations to Interim Audit Advice

Attachment 1

Summary of investigation scopes

Investigation of key site features

Table 4 Summary of investigations and findings in relation to key site features identified by Cavvanba

Site feature (from Cavvanba 2021a DSI)	Investigation locations (prior to Supplementary DSI)	Key contaminant findings	Auditor comments from IAA#1	Update for Supplementary DSI
Roundhouse / Engine Shed	BH08, HA01, TP12, TP13 (DSI) MW13 (downgradient) (ESA) TP44, TP45 (ESA)	DSI - ACM on ground surface concentrated in vicinity of Roundhouse building and southern portion of site.	Limited investigations have been carried out within the Roundhouse. J&K (1997) Boreholes 5, 6 and 7 were within the Roundhouse.	BH108 targeted previous J&K borehole 5. Much lower (1,910 mg/kg) lead concentration found. Area had been repaved with imported roadbase, no prior remediation documented. MW13 groundwater all analytes < LOR except PFHxS = LOR (0.02 µg/L).
Locomotive maintenance pits / subterranean waste oils line (within Roundhouse)	BH07/MW05, BH09/MW06, BH10/MW07 (DSI)	TRH > ML in BH09, lead > HIL D in BH09 and BH10 TRH, PAHs and 1,2,4 trimethyl-benzene in groundwater from MW06 in ESA LNAPL in MW06 in 2022 GME	BH10 is in the vicinity of CMPS&F elevated lead contamination. LNAPL in MW06 considered by Cavvanba (2022) to be due to mobilisation from increased SWLs. Fingerprinting indicated degraded kerosene/diesel or light fuel oil, estimated 29-47 years old.	Increased thickness of LNAPL (0.53 m) encountered in MW06. In groundwater from MW05 and MW07, TRH, BTEX, metals (except 2 µg/L Cr in MW05), PAHs and VOCs <LOR. Low PFAS (0.04 µg/L PFHxS) in MW07, PFAS in MW05 highest in all wells by an order of magnitude (total PFAS 3.5 µg/L). High frequency of ACM on surface soil within Bays 1 to 15 of Roundhouse, Cavvanba assumed the maintenance pits within this area have been filled with uncontrolled fill which was assumed to contain ACM.
Former workshop / machine shop (Wellington Building), abrasives blasting area to north-west and former maintenance pit to south	BH11/MW08, TP09 (DSI)	Lead > HIL D in BH11, TP09	Maximum zinc, copper concentrations also at TP09 and/or BH11 (0-0.05 m, not vertically defined).	No further investigations. MW08 dry. Within area designated as contaminated by lead and ACM.
Lube Oil & Waste Oil Storage Area – northern entrance to Roundhouse	BH06/MW04 (DSI)		Cavvanba (2021a) indicated this was intended to target CMPS&F lead contamination and significant oil leak, but location appears incorrect; and is too far north to target J&K borehole 5 with elevated lead.	BH108 – see above. MW04 groundwater – TRH/BTEX, PAHs, VOCs <LOR. Cr VI 20 µg/L, PFHxS 0.04 µg/L.

Site feature (from Cavvanba 2021a DSI)	Investigation locations (prior to Supplementary DSI)	Key contaminant findings	Auditor comments from IAA#1	Update for Supplementary DSI
Former oil drum compound to north of Roundhouse	BH03 (DSI)	TRH > ML, lead > HIL D in BH03		TP114 to TP116. No significant contamination encountered. Hydrocarbons present but below EILs.
Diesel refuelling gantry	BH04/MW02 (DSI) MW09, MW10, MW11, MW12 (ESA)	TRH > ML in BH04, dissolved phase TRH in MW02 exceed solubility limits in DSI but LNAPL was not observed. In ESA, TRH in MW2 two orders of magnitude lower and PAHs <LOR.	Corresponds with location of TRH in perched groundwater reported by J&K. Only detection of PAHs in groundwater (phenanthrene) in DSI was in MW02. TCE and DCE in groundwater from MW12 in GME (2022), Cavvanba recommended further investigation / groundwater monitoring.	SS144 and SS145. Further groundwater monitoring. TRH F2 and F2 detected in MW02, below LOR in MW09, MW10 and MW12. (MW11 destroyed). BTEX, PAHs, VOCs < LOR in all wells. Cr from 2 to 5 µg/L. Low concentrations of PFAS (0.01 – 0.03 µg/L PFHxS, 0.02 µg/L PFOS in MW12)
Diesel ASTs – near gantry	BH02/MW01 (DSI)			Further groundwater monitoring. Low concentration (340 µg/L) TRH F3 in MW01. Metals < LOR or criteria, BTEX, PAHs and VOCs <LOR, 0.05 µg/L PFHxS.
Diesel ASTs – northern end of site			No investigations in this area, however ASTs are bunded and no apparent signs of significant contamination were observed during the Auditor's site inspection. Investigations would be required if these facilities are removed.	MW103. Low concentration (420 µg/L) TRH F3 in groundwater. Low concentrations of metals (2 – 6 mg/L copper, nickel and zinc), BTEX, PAHs and VOCs <LOR, 0.11 µg/L PFHxS, 0.03 µg/L PFBS. One soil sample analysed (0.2-0.3 mbgl). Low concentrations of metals and TRH. BTEX and PAHs < LOR.
Effluent Treatment Plant / API Separator	BH01 (DSI)			MW101 and MW102.
Former Oil Filter Cleaning Shed (on northern side of Roundhouse)	BH05/MW03 (DSI)	Lead > HIL D in BH05	J&K reported that chlorinated solvents were used in the cleaning process. No VOC scan by Cavvanba 2021a (DSI) in soils or groundwater at this location (only in BH02, BH04/MW02, MW04, MW05, BH09/MW06, MW07 and MW08 – no detects) VOC/SVOC were analysed in groundwater from MW03 in the 2022 GME, results were all < LOR.	Further groundwater monitoring from MW03. TRH, BTEX, VOC and PFAS concentrations < LOR. Low concentration total chromium (3 µg/L), other metals < LOR.
Former 'Pay Bus' Maintenance Pit – near	TP11, TP15 (DSI)			TP109, TP110, TP111, SS128. No significant contamination detected.

Site feature (from Cavvanba 2021a DSI)	Investigation locations (prior to Supplementary DSI)	Key contaminant findings	Auditor comments from IAA#1	Update for Supplementary DSI
south-western boundary of site				
Chemical / Oil Storage Areas – various locations				Not specifically targeted, generally encompassed by sampling in other areas.
Locomotive Sand Hopper		Not considered by Cavvanba to be a source of contamination.	Limited investigations (and only J&K 1997) have been undertaken in the northern portion of the site. Contamination may be unlikely, but absence has not been verified.	TP117, TP118, SS146, SS147, SS148 in northern portion of site. Some copper and zinc >EILs, otherwise no significant contamination detected.
Administration building	TP14 (DSI) TP20 (ESA)		Vicinity (either side of) former separation pit to south of Admin building.	TP112, TP113, BH102, BH103, BH104, SS130 – SS136 in vicinity of Admin building and east of Roundhouse. Asbestos in fill at TP113 and BH104. Some copper >EILs, otherwise no significant contamination detected.
Former meal room, shower room, Chargeman's office, office building and 'Loco Store'			Except for MW10 (well downgradient of diesel refuelling gantry) no investigations have been undertaken in this area.	BH105 – BH107, SS137 – SS143. Asbestos on surface. Some copper >EILs, otherwise no significant contamination detected.
Raised fill area at south-east end of site	TP05 (DSI) TP30, TP35, TP36 (ESA)	Lead > HIL D in TP05 ACM in TP30	TP30 east of perimeter fence line but within filled area.	No further assessment.
Southern portion of site	TP01-TP04, TP06-TP08, TP10 (DSI) TP37 – 43 (ESA)	Buried ACM found in TP06, TP07, TP08. Lead > HIL D in TP04, TP07, TP08		TP101 – TP108, SS101 – SS129, BH101. Isolated lead > HIL, isolated arsenic > EIL, numerous copper and zinc > EIL, some TRH > EILs and management limits, asbestos on surface.
Garden area north of Admin building (not identified in DSI)	TP16 – TP19 (ESA)	Some ash and bricks in fill at TP19.	Site coverage in area without known historical contaminating activities.	BH109 – BH111. No significant contamination detected.
South-eastern portion of site	TP21 – TP29, TP31 - TP34 (ESA)	Lead slightly < HIL D at TP23.	Site coverage in area without known historical contaminating activities, outside filled area and perimeter fence. Ash fill and rubbish in some test pits.	No further assessment.

Summary of scope from recent investigations (updated for IAA#2)

Table 5 Summary of recently completed investigations – analyses of contaminants of potential concern (COPC) (excluding QC samples)

No. locations / COPC	Cavvanba DSI (2021a)	Cavvanba Additional ESA (2021c)	Cavvanba GME (2022)	Supplementary DSI (2023)
Soil	12 boreholes (8 converted to gw wells) by hand auger (HA) or drill rig. 15 test pits	5 additional boreholes converted to groundwater wells 30 test pits	Nil	48 surface locations, 11 boreholes, 18 test pits and one sample from a monitoring well.
TRH / BTEX	37	10		85
PAHs	37	10		85
Phenols	37			-
OCPs	27	10		-
OPPs	27	10		-
Herbicides	8			-
PCBs		10		-
Metals ⁽¹⁾	37	10		85
Lead only		55		-
VOCs	4			-
Asbestos	3 fragments	1 fragment		8 fragments
Groundwater	11 samples (8 new, 3 existing wells)	16 samples – from new and existing wells	13 samples – W1 not sampled (reason not given), W6 not sampled (LNAPL present), W11 destroyed	16 samples from 3 new and remaining existing onsite wells – W6 not sampled (LNAPL present), W11 destroyed.
TRH/BTEX	11	16	13	17
PAHs	11	16	13	17
Phenols	11			-
Dissolved metals ⁽¹⁾⁽²⁾	11	16	13	17 including speciated Cr
OCPs	5			-
VOCs/SVOCs	6	16	13 (VOCs)	17 (VOCs)
PFAS				17
Natural Attenuation Parameters ⁽³⁾			7	13

Notes: (1) Metals typically comprised arsenic, cadmium, chromium (total), copper, mercury, nickel, lead and zinc.

(2) Field records indicate groundwater samples were field filtered.

(3) Sulfate, Ferrous Iron, Nitrate and Methane

Attachment 2

**Review comments and responses on
Supplementary DSI**



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Section	Item	Auditor comment Sept 2023	Consultant response	Auditor review based on v2 report dated 31/10/2023
General	1	a Update executive summary and conclusions as may be required by other comments.	Updated accordingly	
		b Is there a separate investigation report for the stormwater and drainage investigations completed by ARTC? (s.5.1)	No. The findings were discussed during numerous meetings between ARTC and Cavanba. The figures were received via email and interpreted for inclusion in this report.	Noted. There still seems to be some lack of clarity, particularly in the area of the Southern Arrester Pit and Southern Discharge Point. The Auditor considers these investigations should be more clearly documented as part of ongoing assessment.
		c Please provide survey data for new wells.	Yes. Included as Appendix C.	Addressed.
		d Are Cavanba's fieldwork procedures available? (Particularly groundwater fieldwork procedures for groundwater sampling referenced in s.5.3.2), or are all key aspects of methodology described in the report?	All key aspects are primarily in the report.	Noted. Reviewed further in response to comments below.
		e The Supplementary DSI does not include the results of previous investigations, and discussions are based primarily on the results of the current investigations. The Supplementary DSI does not necessarily need to include all previous results, unless these are required to support discussion; however the RAP will need to include all results, and it is suggested that detailed discussion of each respective site area is included in the RAP, updated to include the results of the Supplementary DSI (see IAA#1).	Addressed in responses below.	Noted. To be addressed further in RAP.
Executive summary	2	a Groundwater - para 1, please clarify whether depths are m bgl, and also provide elevations (m AHD).	The executive summary is purposefully brief. The SWLs are as measured in the field in metres below the top of the casing (mBTOC) (approximately flush to surface). GWE's are provided in Tables 8 and 9.	Noted. Survey data indicates TOC are not flush to surface. Table 9 appears to have an incorrect ground surface elevation for MW101 based on survey data, however this won't affect groundwater SWL calculations.
		b Para 2 states the presence of LNAPL is localised. Please clarify the basis of this statement.	As above. The basis of the statement is explained in Section 8.2.2.	Noted. Reviewed further in response to comments below.
		c Clarify the basis for statements that PFAS and Cr (VI) are unlikely to present unacceptable risks.	As above. The basis of the statement is explained in Section 8.2.4 and 8.2.5.	Noted. Reviewed further in response to comments below.
		d Table 1 - item 5) - where is the "southern discharge point" (identify on a figure). Where are the holding tanks on the eastern side of Braidwood Road? Is the southern discharge point the only area of known integrity issues? Are there any wells in this vicinity?	The southern discharge point is via the "Southern Arrester Pit" on Figure 2. It has been identified as a data gap, and we have recommended monitoring wells to be installed. The Holding tanks are depicted on Figure 2 and Figure B, both of which have been updated.	Locations addressed, although it would be good to expand the area shown on Figure 2 so the location of the inset is evident. Recommendations state "Assessment of groundwater conditions within the areas of known integrity issues, being the southern discharge point". I see no recommendation for monitoring wells. This should be clarified as part of the recommended formal groundwater monitoring plan.
1 - Introduction	3	a s.1.3 - this listed guidelines are not the only ones referred to in the report, relevant to the requirements of the work (e.g. PFAS NEMP?).	Updated accordingly	NEMP 2.0 added.
		b p.6 - clarify whether 10L samples were collected from all test pits, boreholes and/or surface soil samples (or just within areas where asbestos had not been previously identified or observed). Is there a tabulation of 10L sample findings?	The scope list is purposefully brief. Section 5.3.1 describes that all test pits and boreholes were sieved sampled/sieved. Table 5: Asbestos Analytical Summary describes the outcome of sieving where asbestos was observed. The bore logs describe the soil observations. There is no other 10L sample specific sieving tabulation.	Sections 1.3 and 5.3.1 state that a 10 L sample was collected at all test pit and borehole locations, however there is no documentation to substantiate this. Table 5 only presents analysis of asbestos materials. Logs do not record any bulk sampling. The Auditor has reviewed field records for 10 L sampling and sieving (provided separately), which support Cavanba's reporting of the asbestos assessment.
2 - Site setting	4	a s.2.2 - South - add open drainage line (as mentioned in s.2.4.1 p10). Where does it drain from / to?	This drain is located to the Northeast.	s.2.2 remains incomplete in this regard, however as the drain is described in Section 2.4.1, this is not a critical update.
		b s.2.3 Where was the "old depot" (demolished in 1941) located on the site?	The information relating to the 'old depot' was taken from a former State Government Heritage listing which has since been updated. The DSI provides further information relating to the old depot which infers that it was potentially located within an alternate location in Goulburn. There is no further evidence to support the potential for an old depot to be located somewhere on the site.	Addressed.
3 - Previous environmental investigations	5	a s.3.3 - refers to an emu pick in June 2023. Specific reference should be made to the letter report for this activity, including the figures showing the two categories of area. It would be useful to also note that bi-annual emu picks are proposed as part of the IEMP, and summarise conclusions and recommendations of the June 2023 letter (and/or include as an appendix). It should also be clarified whether the most recent emu pick was carried out before or after the investigations described in the Supplementary DSI, and implications to its findings. In regard to the emu pick letter report, what was the approximate grid spacing of the systematic walk-over? And how many EPS personnel were involved in the inspection and removal? If the quantity removed from each respective area is available, this should be stated to further facilitate assessment of risk and progress of management in the respective areas. (This should be documented in any future asbestos removal reports).	The description of the June 2023 emu-picking event is misplaced in this section titled "previous investigations". The event took place following the site investigations, and therefore has been moved into its own section 11.1 where it is briefly summarised. It is also mentioned in the conclusions. The letter is attached as Appendix I.	Noted. Timing is clarified. Section 11.1 is a brief summary. The additional detail (as per Auditor's comment) should be provided in any future asbestos removal reports.
	a	s.5.2 - is the visual appraisal of surface soils captured in Table 1?	Yes, the 0.0-0.1 depth is a description of the surface. Similarly for the bore logs. Refer to comment 3b.	Table 1 indicates ACM was only noted in two out of 148 surface samples, one out of 11 boreholes, and one out of 18 test pits. Section 6.1 states potential ACM was identified to be widespread on soils within areas previously identified during the DSI and Additional ESA, and was also observed to extend into the following areas: - isolated fragments within the four-foot in the southern portion of the site - high frequency of ACM within Bays 1 to 15 which were filled - isolated fragments within the area surrounding and to the east of Building 8 Potential ACM was identified in soils at TP109 0-0.1m, TP113 at 0.4-0.5m and BH104 at 0.4 m. Table 1 does not seem to reflect observations of ACM in the area of sample locations, except where fragments were collected for analysis. As noted in comment 5a, future asbestos removal events should include additional detail to support assessment of asbestos risk.
		b s.5.3.1 - see comment 3b.	As above.	As for 3b and 6a.



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5 - Site investigation	6	c s.5.3.2 p.21 what was methodology for the borehole development?	Updated accordingly. The removal of water was undertaken using a new disposable bailer at each location, as noted on the bore log.	Addressed.
		d s.5.4 p.22 - the list of reference documents doesn't include all those listed in subsequent sections.	Updated to include the PFAS NEMP.	Addressed.
	e	s.5.4.1 p.23 - the assumption that any co-located fines is <10% of ACM is valid for comparison when using HSL A for ACM, but would exceed the HSL for AF/FA when using HSL D. Please consider whether this has any implications to the findings.	Understood. If fines are detected where AF/FA is present, this is recorded as an exceedance.	The point is that sampling for AF is not undertaken, on the assumption that co-located fines is <10% ACM. Where ACM exceeds 0.01% (HIL A), analysis for AF/FA should be considered, as the HSL for AF/FA is 0.001% for any land use.
		s.5.4.2 p.25 - other guideline criteria (e.g. California, Canada) should be considered for ecological risk from TRH in water, given no criteria have been presented in the nominated guidelines.	Cavvanba acknowledges that there are generic Canadian (CCME) and Dutch (RIVM) guidelines for ecotoxicity for TRH as referenced in CRC CARE Technical Report 40. However, there are complexities associated with TRH guidelines for aquatic environments, with different approaches resulting in different guidelines, some of which result in criteria that are below the LOR for TRH. For oils and greases for example, these are generally not soluble at concentrations high enough to have a toxicity. A more appropriate measure of toxicity is the individual constituents. However in the absence of BTEXN / PAHs (i.e. less than the LOR), and specific Australian guidance for TRH in water, aesthetic considerations such as the presence of hydrocarbon sheen / odours (consistent with the CCME Management Limits for soil) are a more appropriate measure for the assessment of ecological risks in waters. The report has been updated accordingly to further consider TRH in surface waters.	Section 5.4.2 has not been updated for TRH. The discussion sections state that the presence of TRH (and other contaminants) are to be further evaluated as part of future groundwater monitoring. The Auditor does not consider aesthetic considerations are "a more appropriate measure for the assessment of ecological risks in waters", and recommends further consideration be given to criteria from other jurisdictions as part of a weight of evidence assessment of ecological risks associated with surface water and groundwater, in future groundwater and surface water monitoring events.
6 - Observations	7	a s.6.1 - clarify in relation to potential ACM on soils, whether these observations were made prior to the June 2023 emu pick.	The observations were before the emu-picking in June. Additional clarifications have been made. Also refer to section 3.3 and 11.1.	Addressed.
		b s.6.2 - either here or s.8.2 should include a hydrograph of groundwater SWLs from current and previous investigations.	Updated accordingly.	Addressed. Presumably "Well Dry" text callout refers to MW08 in April 2023. The Auditor notes a reversal in relative depths between MW05 and MW06 in the last round is likely due to the presence of LNAPLs. There was also a reversal in relative depths between W2 and MW12, but is relatively small and likely insignificant.
		c s.6.4 - Fig 2a shows a 6" pipe in the vicinity of MW06. Is this a water supply pipe and not a drainage pipe?	This is assumed to be a 6" stormwater drainage pipe, however it is not confirmed.	Until confirmed otherwise, this should be considered part of the drainage system.
		d s.6.4, p.30 - where is the northern discharge point? Please label on site plan(s) (e.g. Figure B). The 3rd bullet point under s.6.4 heading states discharge is to the open stormwater drainage channel located on the eastern side of Braidwood Road, however Figure B seems to indicate discharge is after the existing pollution control equipment east of Braidwood Road. Please clarify.	Stormwater discharges via the belowground pipework which exits the site to the north of the former effluent treatment plant and pumping station prior to intersecting Braidwood Road. Figure B and text has been updated to clarify.	The last bullet point in the "Northern discharge point" section seems to provide a clearer explanation than the 3rd bullet point under s.6.4 heading, which has not been changed.
		e s.6.4, p.31 - 3rd bullet point - please label southern and northern arrestor pits (e.g. Figure B) and clarify whether these are both on the Eastern drainage line, and relationship to the southern discharge point.	as per 2d	Arrestor pits labelled on Figure B. The Auditor notes there are contradictions between Figures A and B, particularly in the area of the Southern Arrestor Pit, and pipework is complex in this area. More detailed description should be provided as part of further investigations in this area (as recommended by Cavvanba).
		f s.6.4, p.31 - 6th bullet point - which stormwater pits had evidence of oil?	The two pits with evidence of oil was observed by Cavvanba whilst on-site undertaking the hand-picking exercise. However, upon further discussions and clarification with ARTC, oil was identified in an additional 4 pits. The text and Figure B have been updated accordingly.	Addressed.
		g s.6.4, p.32 - where is the southern discharge point? Please label on site plan(s) (e.g. Figure B)	Updated accordingly	Addressed.
7 - Results	8	a s.7.1 p.34 - were locations SS105, SS106 and SS125 all areas of surficial staining? Given only surface samples were collected, please comment on vertical delineation.	Table 1 describes where surface staining was identified. These stains appeared superficial and did not appear to extend below the immediate ground surface. This is conservatively estimated to be less than 0.2 m depth.	Noted. This is further clarified in Section 8.1.4 of the report.
		b s.7.2 Table 7.2 p.35 - the LOR for vinyl chloride is well above the criterion. Discussion should include the potential for VC to be present, given the other VOC findings.	Updated to describe the lack of other VOCs, including precursors at a LOR of 5 ug/L.	Addressed.
	a	s.8.1.1 second bullet - Cavvanba notes that the area was "repaved with imported material". Please discuss whether there is any indication the area was remediated prior to repaving, given recent results were much lower than J&K 1997; or whether the area should still be managed (eg. due to uncertainty in this regard).	This section has been updated accordingly.	Addressed.



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8 - Discussion	9	b	s.8.1.1 third bullet point - so support this statement, results of previous investigations should be included in the Supplementary DSI (a separate appendix for historical results would be adequate), and discussion should include the 95% UCLav based on all results, how many locations exceed 250% of HIL D, the depth(s) of lead contamination, and whether lead contamination can be managed with ACM (eg. is leachability an issue? Last sub-bullet - what are the circumstances where ash material contains elevated lead? (Are they relevant to this site?))	A historical soil dataset has been included within Appendix G, which includes a 95%UCL calculation for lead for fill material across the entire site. Figures 5a and b have also been updated to incorporate current and historical lead exceedances which are presented graphically. There is no clear correlation with ash fill material and elevated lead concentrations, the text has been update to support this. There is no specific leachability data for the site. Based on Cavvanba's experience on other rail sites (Goulburn Wheat Yards, Junee Roundhouse, Tallawang Ore Spill), particularly the Goulburn Wheat Yard Sidings where it is a similar geology and DTW, extremely high lead concentrations in soil (193,000 mg/kg) with high leachabilities, do not correlate to groundwater impacts. There is however, direct groundwater measurements for the Goulburn Roundhouse which do not indicate that there are leachability issues associated with the lead impacted fill material.	Supporting information has been provided, but is not referenced in the results or discussion sections in relation to lead. The CSM does not include the discussion presented in Cavvanba's response, in relation to potential impacts to groundwater from lead contaminated soil. More detailed discussion should be provided in future documentation.
		c	s.8.1.2 second last para. p.39 - states identification of high frequency ACM on surface soil within Bays 1 - 15 indicates the maintenance pits within this portion have been filled with uncontrolled fill. Are there any boreholes or test pits within this section that substantiate this, or is it a conservative assumption?	It is a conservative assumption. The bays have otherwise not been disturbed.	Noted.
		d	s.8.1.2 last para. p.39 - please include mention of IEMP and June 2023 emu pick as part of management.	Updated accordingly	Addressed.
		e	s.8.1.3 - states "...purposely phytotoxic to presence the integrity..." - should "presence" be "preserve"? Are the arsenic, copper and zinc in the areas of elevated concentrations likely due to historical herbicide or pesticide spraying?	Corrected and updated.	Addressed.
		f	s.8.1.4 - was the vertical extent of TRH at SS105 delineated?	No, as these locations were collected where rolling stock was present. Therefore, proving extremely difficult to collect samples and delineate due accessibility issues. However, based on field observations, the stains appeared to be superficial and did not appear to extend below the immediate ground surface. The text has been updated to support this statement.	Addressed.
		g	s.8.2.1 - para 1 - the SWL at MW12 appears to be low rather than mounded, although SWL at W2 might be mounded. Has the SWL at MW06 been adjusted for the density as well as the thickness of LNAPL?	Cavvanba agrees with the observations at MW12 and W2. No adjustment of the SWL at MW6 has been undertaken, however any adjustment is unlikely to change the overall estimating of flow direction. No changes to the report have been made.	Noted.
		h	s.8.2.2 p.41 Diesel refuelling gantry - was the ruptured water pipe subsequently repaired? Were chloroform and bromodichloromethane detected in any more recent (including current) monitoring?	The pipe was repaired. (Date unknown). Current and latest GME did not detect Chloroform etc. No changes to report.	Noted.
		i	s.8.2.3 last para. p.42 - "...their presence..." should be "...their previous presence..."? Please discuss relative magnitude of previous detection in relation to relevant criteria.	Updated accordingly.	Addressed
		j	s.8.2.4 5th bullet states the distribution of PFAS is consistent with groundwater flow direction - please provide further justification. The distribution seems patchy, except that MW05 has the highest concentration and MW03 (upgradient) is the only well with no PFAS detected	Cavvanba agrees that the text may have over-simplified the distribution. The text has been updated to be more reflective of the observations.	Addressed
		k	s.8.2.4 last bullet indicates delineation was achieved on-site. MW103 is on the site boundary, and as noted, exceeds the 99% criterion for PFAS. Is this actually a data gap? Should PFAS be included in ongoing monitoring? At lower LOR? Is sampling further downgradient (or at the receptor) required to justify the conclusion that PFAS is unlikely to present a risk to the environment?	Cavvanba agrees with the Auditor's observations and a brief re-evaluation of the situation has been included to replace the bullet point text.	Noted. To be further addressed in the formal groundwater monitoring plan.
		l	s.8.2.5 - last line (p.43) states the Mulwaree River is unlikely to be a receiver of contamination. Please justify further on the basis of likely concentrations if it is a receptor (eg. dispersion). (The same applies to PFAS).	Updated accordingly	Noted. Semi-quantitative assessment should be considered as part of the formal groundwater monitoring plan (eg. references for attenuation factors).
		m	s.8.3, last bullet (p.44) - where are the holding tanks on the eastern side of Braidwood Road?	Updated to Refer to Appendix A, Figure B.	Addressed.
		9 - MNA	10	a	s.9.2.1 para 1 states the recorded LNAPL thickness has remained consistent. This doesn't seem to be the case.
b	s.9.2 and 9.3 - please consider trends in MW01 and MW103, as these are potentially indicative of downgradient migration from MW02.			A discussion paragraph has been added to Section 9.2.2	Noted. To be further addressed in the formal groundwater monitoring plan.
		a	s.10.1 - please reconcile "Potential sources" with "Actual sources" based on the outcome of the investigations. Are there data gaps? This section may benefit from putting the "Potential sources" first, and then the "Actual sources". S.8.2.3 indicated VOCs were still a data gap? Arsenic, copper and zinc exceeding EILs hasn't been included in the Actual sources, nor has TRH exceeding Management Limits.	The discussions in previous sections regarding VOCs in groundwater and EIL exceedances in soil are intended to close these particular issues in regard to further consideration in the CSM. Text to this effect has been included. The potential sources has been moved to the top of the section to assist in the presentation of this section.	Noted. The amended sources section is clearer, however there is still some overlap between potential sources and actual sources (possibly a question of semantics between 'sources' and 'identified impacts' resulting from such sources) and some inconsistencies between sections of the CSM (eg. Table 10.1 doesn't include groundwater, "Contaminated groundwater" section following Table 10.1 doesn't mention TRH). The CSM as a whole is considered appropriate, however caution should be used in abbreviating the CSM in future documents. The overall CSM should be considered in the formal groundwater monitoring plan and the RAP.
		b	s.10.1 - lead and asbestos - as noted above, previous data should be considered and further discussion provided to support lead exceeding HIL D being "widespread". (Also relevant to s.10.4 first para following Table 10.1). Is the distribution of ACM widespread on soil, and less so in soil?	Please refer to response provided in 8b. The ACM distribution is described as on soil and in soil. The outcome is that the fill is the most likely source, and therefore ongoing management such as reducing the hazard by hand-picking events has been selected as the most effective control in the short term.	Presumably the reference is meant to be to 9b (section 8). Please see Auditor's response to 9b regarding lead. In regard to ACM, it would seem there is an ongoing potential source from ACM building materials (as noted in previous IAA) to impact surface soils, as well as historical impact to fill material. The Auditor agrees with the ongoing short-term management approach.
		c	s.10.1 - as noted above, conclusions regarding Cr VI require further justification.	Additional discussion included in 8.2.5, and in 10.1	Noted. See Auditor's response to 9l.
		d	s.10.1 - Data gaps in stormwater and drainage haven't been explicitly listed.	referred to section 11.0 - data gaps	Noted. See Auditor's response to 7e and 11a.



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10 - CSM	11	e s.10.2 - as noted above, discharge of impacted groundwater to surface water bodies needs further discussion to justify it being unlikely. The exposure routes should specifically consider all those noted in the VMP.	This section is purposefully brief and prepared based on the discussions in Sections 8 and 9. The updates to the previous sections have further discussed these aspects. The specific routes described in the VMP have been incorporated more clearly.	Noted. See Auditor's response to 9l and 11a.
		f s.10.4 - Table 10.1 - please re-consider off-site migration of contaminants in groundwater, and contaminants other than PFAS in stormwater, given comments above.	Noted. TRH has also been included.	As noted above, Table 10.1 doesn't include groundwater. See Auditor's response to 11a.
		g s.10.4 - first line on p.59 - why should ACM buried at depth be considered friable? What are the areas where there is high concentrated ACM at depth?	This text has been updated to consider buried asbestos as friable during mechanical disturbance. Areas where highly concentrated ACM included TP06 (DSI) in the southern portion of the site. The text has been updated accordingly.	Addressed
		h s.10.4, p.59 - Contaminated soils - ecological - this discussion should have more focus on where in particular the subject contamination was present - eg. if in the 4 foot; otherwise some areas of the site may be relying on vegetation / grass cover to reduce risk, so phytotoxicity may be more of an issue.	Discussed in Section 8.1.3.	Noted
		i s.10.4, p.59 - Management limits - please clarify whether TRH exceeding management limits was limited to areas of visual staining, and whether there is any health risk associated with the management limit exceedances.	Addressed in 10.1	Noted
		j s.10.4, p.59 - Contaminated groundwater - "distance from" may be better wording than "proximity to" (all instances in the report) in relation of the site to Mulwaree River. As noted above, more justification is provided regarding the conclusion in this paragraph (e.g. semi-quantitative assessment), and it should be noted that there has only been one round of PFAS monitoring, at LORs that exceed some of the criteria	This has been identified as a data gap. Additional discussion has been provided in relevant sections.	Noted. See Auditor's response to 9l.
		k s.10.4, p.59 - the conclusions regarding stormwater (noting data gaps in addition to PFAS were noted in the discussion section) may be appropriate for the preceding groundwater paragraph.	Updated accordingly	Addressed.
11 - Data gaps	12	a p.59 - Data Gap 1 - the future monitoring could also address data gaps other than TRH (as noted above).	Noted, and updated.	Addressed.
		b p.60 - Data Gap 3 - is the distribution of ACM with depth sufficiently understood? (It may be, with assumptions).	Yes, with appropriate conservative assumptions applied	Noted.
		c p.60 - Data Gap 5 - contaminants other than PFAS should be noted, where there are remaining data gaps. What actions are proposed to address the data gaps?	Noted, the text has been updated to include TRH. Actions proposed to address the data gaps will form part of a separate scope of work.	Noted. Specific actions to address remaining uncertainties in the stormwater and drainage system should be provided in a proposed scope of work. See also Auditor's response to 7e.
12 - Conclusions	13	a Please update conclusions and recommendations based on comments above.	Noted, updated.	Noted.
		b Is there a recommended monitoring plan?	Included as a recommendation. The specifics to be addressed as part of a separate scope of work.	Noted. Specifics should be provided in a proposed scope of work.
		c Table 12.1 3) Specific reference to the IEMP management measures / June 2023 emu pick recommendations should be included.	Please refer to Section 11.1.	Noted. Implementation of the IEMP is recommended in Table 12.1. See also Auditor's response to 5a.
		d Table 12.1 4) Is the former depot (demolished) a data gap that needs to be further addressed?	Refer to 2b.	Addressed.
13 - Tables	14	a Table 4 - SS124 phenanthrene result should be 0.9; TP103 PAH results are incorrect.	Noted, updated.	Addressed
		b Table 7 - TP117 TRH F3 and F4 results are incorrect.	This appears to be correct, no changes made.	Acknowledged, appears correct.
		c Table 9 - Depth of Well (mbTOC) values are not the same as in the groundwater sampling field sheets. Please clarify.	Transcription error, updated.	Depth of well values corrected. Table 9 appears to have an incorrect ground surface elevation for MW101 based on survey data, however this won't affect groundwater SWL calculations.
		d Table 11 - SW01 and SW02 TRH F4 and totals are incorrect (also making max in Table 7.3 incorrect)	Noted, updated.	Addressed.

Attachment 3

Limitations to Interim Audit Advice

Attachment 3: Limitations to Interim Audit Advice

This Interim Audit Advice (IAA) has been prepared as part of a site audit undertaken in accordance with relevant provisions of Part 4 of the Contaminated Land Management (CLM) Act 1997.

This IAA:

1. has been prepared by Ian Gregson and members of his support team as indicated in the appropriate sections of this IAA (“GHD”) for Australian Rail Track Corporation Ltd (ARTC);
2. may be used and relied on by ARTC;
3. may be used by and provided to the EPA and the relevant planning authority for the purpose of meeting statutory obligations in accordance with the relevant sections of the CLM Act 1997 or the Environment Planning and Assessment (EP&A) Act 1979;
4. may be provided to other third parties but such third parties’ use of or reliance on the IAA is at their sole risk, as this IAA must not be relied on by any person other than those listed in 1-3 above without the prior written consent of GHD; and
5. may only be used for the purpose as stated in Section 1 of the IAA (and must not be used for any other purpose).

GHD and its servants, employees and officers (including the Auditor) otherwise expressly disclaim responsibility to any person other than ARTC arising from or in connection with this IAA.

Whereas these current opinions and recommendations have been provided as interim guidance to assist in the assessment and management of contamination issues at the site, this guidance should not be regarded as “approval” of any proposed investigations or remedial activities, as such approval is beyond the scope of an independent review. The NSW EPA Guidelines for the NSW Site Auditor Scheme (2017) contains a description of the site assessment and audit process, which includes the following:

- A site audit is the second in two tiers of work in the site assessment and remediation process.
- The **‘first tier’ is the work of a contaminated site consultant**, generally engaged by the site owner or developer. The contaminated site consultant designs and conducts a site assessment and any necessary remediation and validation, and documents the processes and information in reports; and
- The **‘second tier’ is the site audit** which involves a site auditor independently and at arm’s length reviewing, for one of the audit purposes stated in the CLM Act, the consultant’s assessment, remediation and validation plans or reports. The material outcomes of a site audit are a site audit report and site audit statement.

The purpose of the auditor’s review is to assess whether the works undertaken (or proposed to be undertaken) comply with current regulations, standards and guidelines, and that the site has been assessed, remediated and validated to a standard appropriate for the proposed land use. In the first instance, the contaminated land consultant should be satisfied that the work to be conducted conforms to all appropriate regulations, standards and guidelines; and is appropriate, based on the site’s historical land use, physical characteristics and proposed land use.

This interim review and advice do not constitute an audit under the provisions of the Contaminated Land Management (CLM) Act 1997, and do not pre-empt the conclusions which will be drawn at the end of the audit process. A site audit report and site audit statement will be issued when the audit process has been completed.

It is the nature of contaminated site investigations that the degree of variability in site conditions cannot be completely known and no sampling and analysis program can eliminate all uncertainty concerning the condition of the site. Professional judgement must be exercised in the collection and interpretation of the data. In the conduct of this review, in particular, reliance has been placed on data provided in the various site investigation and assessment reports. The Auditor is unable to provide certification outside of areas over which he had some control or is reasonably able to check, and does not accept responsibility for inaccuracies in information provided for review as part of this Audit.

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the IAA are excluded unless they are expressly stated to apply in this IAA.

The services undertaken by the Auditor, his team and GHD in connection with preparing this IAA were undertaken in accordance with current profession practice and by reference to relevant guidelines made or approved by the EPA under Section 105 of the CLM Act 1997.

The opinions, conclusions and any recommendations in this IAA are based on assumptions made by the Auditor, his team and GHD when undertaking services and preparing the IAA ("Assumptions"), as specified throughout this IAA.

GHD and the Auditor expressly disclaim responsibility for any error in, or omission from, this IAA arising from or in connection with any of the Assumptions being incorrect.

Subject to the paragraphs in this section of the IAA, the opinions, conclusions and any recommendations in this IAA are based on conditions encountered and information reviewed at the time of preparation of this IAA and are relevant until such times as the site conditions or relevant legislations changes, at which time, GHD expressly disclaims responsibility for any error in, or omission from, this IAA arising from or in connection with those opinions, conclusions and any recommendations.

The Auditor and GHD have prepared this IAA on the basis of information provided by the client, their consultants and others who provided information to GHD (including Government authorities), which the Auditor and GHD have not independently verified or checked ("Unverified Information") beyond the agreed scope of work. The Auditor and GHD expressly disclaim responsibility in connection with the Unverified Information, including (but not limited to) errors in, or omissions from, the IAA, which were caused or contributed to by errors in, or omissions from, the Unverified Information.

The opinions, conclusions and any recommendations in this IAA are based on information obtained from, and testing undertaken at or in connection with, specific sampling points and may not fully represent the conditions that may be encountered across the site at other than these locations. Site conditions at other parts of the site may be different from the site conditions found at the specific sampling points.

Although reasonable care has been used to assess the extent to which the data collected from site is representative of the overall site condition and its beneficial uses, investigations undertaken in respect of this IAA are constrained by the particular site conditions as discussed in this IAA. As a result, not all relevant site features and conditions may have been identified in this IAA.

Site conditions (including any the presence of hazardous substances and/or site contamination) may change after the date of this IAA. The Auditor and GHD expressly disclaim responsibility:

- Arising from, or in connection with, any change to the site conditions;
- To update this IAA if the site conditions change.

These Disclaimers should be read in conjunction with the entire IAA and no excerpts are taken to be representative of the findings of this IAA. This IAA should not be altered, amended or abbreviated, issued in part or issued incomplete in any way without prior checking and approval by GHD.