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Burdekin Shire Council

Independent Reviewer Report:

Home Hill Fire Station, 83 Tenth Avenue, Home Hill, Queensland

Lot 6 on H616666 and Lot 8 on SP123356

Published on DES Disclosure Log
RTI Act 2009

***Prepared by*: MACH1 ENVIRONMENTAL PTY LTD**

JULY 2020

REPORT NO: 020-002-043 DRAFT

Burdekin Shire Council

Independent Reviewer Report:

Home Hill Fire Station, 83 Tenth Avenue, Home Hill, Queensland

Lot 6 on H616666 and Lot 8 on SP123356

Prepared by: *Robin Wagland*

Role: Independent Reviewer

Signed: sch4p4(6) Personal information

Date: 20 July 2020

Peer/QA Review: Annie Newbery 20/07/2020

Signed: sch4p4(6) Personal information

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1 INTRODUCTION

MACH1 Environmental Pty Ltd (MACH1) was commissioned by Burdekin Shire Council (BSC) (via Michael Lawrence at Bligh Tanner) to undertake the Contaminated Land Independent Reviewer (IR) role for the contaminated land investigation works at Home Hill Fire Station, 83 Tenth Avenue, Home Hill, Queensland, herein called the site.

The review work was undertaken in the capacity of an Independent Reviewer; however, consideration was made to the Queensland Auditor Handbook for Contaminated Land, specifically Module 4 and 6 (effective 23 July 2018). This review was also in general consideration with the provisions of Section 389 1) and 2) of the *Environmental Protection Act 1994* (EP Act). It is noted that while the works were completed as an IR and not under a statutory framework, Robin Wagland has been appointment as a Queensland Contaminated Land Auditor, originally dated 28 November 2013 and most recently renewed on 13 September 2019 (Approval No. CLAD06649219), pursuant to the provisions of Section 573 of the EP Act. A copy of this approval is provided within ***Appendix A*** for your reference/information. The Independent Reviewer has employed evidence-based auditing methods to reach reliable and reproducible conclusions which are consistent with current legislation, policies and guidelines.

It is noted that the site is understood not to be listed on the Department of Environment and Science (DES) Environmental Management Register (EMR), therefore, while the works completed were not designed as statutory outcomes, the consultant's report was reviewed in alignment with the Auditor Guidelines.

The objective of this IR report is to provide a data gap assessment and provide independent conclusions and recommendations relating of the reports prepared for the site by AECOM Australia Pty Ltd (AECOM), who was acting in the role of Contaminated Land Practitioner Group (CLPG) and Suitably Qualified Person (SQP) for the works, and Environmental Earth Sciences (EES), and specifically Mark Stuckey, who were acting in the role of Contaminated Land Auditor (CLA). Again, while acting in the role, a CLA function cannot be enacted for a site not listed on the EMR. The purpose of the CLA function, however, was assumed to provide the site owner/occupier State of Queensland/Queensland Fire and Emergency Services (QFES) with an independent third party review in general alignment with the CLA function. It is further noted that the CLA was stated to be commissioned by QFES in relation the per and poly fluoroalkyl substances (PFAS) assessment project, again noting a CLA review function is general not restricted to a specific contaminant alone.

The IR in alignment with the SQP and CLA has only reviewed the information provided in the reports specific to the site in question and the stated potential contaminants. The IR has in addition undertaken additional desktop research relating to the area in question and has provided interpretation or comment on the site setting, with a particular focus on the potential for off-site contamination to have originated from on site. This objective was specifically not addressed by the SQP or CLA and as such was not fully comprehensive or in full alignment with the requirements of a Contaminated Land Investigation Document (CLID).

The reports reviewed as part of this IR process were as follows:

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- AECOM, *PFAS Detailed Site Investigation, Home Hill Fire Station, 83 Tenth Avenue, Home Hill, , Queensland*, dated 10 February 2020.
- EES, *Auditor Certification Report & Statement of Reasons: Home Hill Fire Station, 83 Tenth Avenue, Home Hill, Qld, Queensland Fire and Emergency Services*, dated 9 March 2020.

The SQP for the investigation of the site under Section 564 of the EP Act was identified by the CLA in his report as James Peachy of AECOM. It is noted that the DES Suitably Qualified Person Declaration (Form ESR/2015/1856) was not included with the documentation provided for review and therefore there has been no review of evidence demonstrating capabilities and satisfying the requirements of the form, however, it is assumed the CLA would have undertaken their own investigation in to the suitability of the SQP. The IR cannot independently verify the SQP suitability without additional knowledge on their qualifications or experience relevant to the site.

The Independent Reviewer can confirm that:

- the Independent Reviewer possesses sufficient expertise and technical expertise for the site in question and is appropriately qualified to complete the review works undertaken;
- the Independent Reviewer has acted independently with integrity, diligence and impartiality and there were no conflicts of interest between the Independent Reviewer and the site operator / owner or the SQP/CLA;
- the review has been completed in an objective and honest manner, to a high professional standard and with all due care and diligence, avoiding misrepresentation and prejudice;
- the Independent Reviewer has not concealed or omitted information so as to mislead opinion about the site;
- the review functions have been completed to achieve the best environmental outcomes and protection of environmental values, including ecological and human health, amenity and safety;
- the Independent Reviewer holds an appropriate level of professional indemnity insurance for the works completed;
- the Independent Reviewer is a member of a Prescribed Organisation, as per Schedule 8 of the Environmental Protection Regulation 2008 (EP Reg), being a member of the Environmental Institute of Australia and New Zealand (EIANZ);
- the Independent Reviewer is certified by one of the recognised bodies in the contaminated land field, being an EIANZ Certified Environmental Practitioner (CEnvP) (No. 12), Contaminated Land Specialist (SC400001);
- the reviewer has made appropriate use of support experts noting in this case Dr John Harbison a Principal Hydrogeologist and Ned Hamer were both engaged to provide expert advice in the areas of hydrogeology;
- the reviewer has had access to sufficient information to enable all pertinent aspects of the site to be evaluated, which includes independent verification of raw data where available and applicable. All reasonable and practicable measures have been taken to verify any opinion of others which have been relied upon, and the data and

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information their opinion is based on, noting the IR has not visited site nor engaged in discussions with either the SQP or CLA; and

- the reviewer has provided a comprehensive and reliable response to the reports provided, which does not exclude any material aspects.

In addition, the Independent Reviewer can confirm an appropriate level of knowledge of the following guidelines which may be relevant to the works completed and the general audit process:

- Environmental Protection (EP) Act 1994.
- Environmental Protection Regulation 2008.
- Queensland Auditor Handbook for Contaminated Land, Module 6: Content requirements for contaminated land investigation documents, certifications and audit reports (July 2018).
- Environmental Protection (Water and Wetland Biodiversity) Policy 2019.
- Environmental Protection (Air) Policy 2008.
- Environmental Protection (Noise) Policy 2008.
- Environmental Protection (Waste Management) Policy 2000.
- DES Guideline, *Assessing a suitably qualified person,* ESR/2016/1938 Version 3.00, July 2018.
- DES Guideline, *Listing and removing land on the land registers,* ESR/2016/2044 Version 1.02, September 2015.
- Australian Standard AS 4482.1-2005, Guide to the Sampling and Investigation of Potentially Contaminated Soil – Part 1: Non-volatile and semi-volatile compounds (Standards Australia, 2005).
- Australian Standard AS 4482.2-1999, Guide to the Sampling and Investigation of Potentially Contaminated Soil – Part 2: Volatile substances (Standards Australia, 1999).
- CRC for Contamination Assessment and Remediation of Remediation of the Environment, *National Remediation Framework Role of Auditing in Remediation*, Draft for Consultation, dated November 2016.
-
- NEPC 2013, *National Environmental Protection (Site Contamination) Measure, National Environment Protection Council. Schedule B9 – Guideline on competencies and acceptance of environmental auditors and related professionals*; Schedule B8 Community Engagement and Risk Communication.
- ISO 9001 (2015) Quality Management System (QMS).

Details relating to the site which was the subject of the Independent Review are provided below in ***Table 1***:

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Table 1 Site Identification Details

Site Name	Home Hill Fire Station
Site Address	83 Tenth Avenue, Home Hill, Queensland
Legal Description (Lot and Plan)	Lot 6 on H616666 and Lot 8 on SP123356
Site Area	1,811m^2
Site Owner/Occupier	State of Queensland/QFES
Land Use	Fire Station
Proposed Land Use	Fire Station
Local Authority Area	Burdekin Shire Council
Site Co-ordinates	-19.66099 / 147.41598
EMR identification	N/A – not listed

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2 INDEPENDENT REVIEWERS SCOPE OF WORK

The scope of work for the Independent Reviewer was as follows:

- Review of the Detailed Site Investigation report by AECOM and the Auditor Certification Report by EES. The scope of this review included but was not limited to the following elements:
    - review the nature and extent of any contamination of the site and the site-specific conceptual site model (CSM). This review comprised:
        - current and proposed use;
        - present and previous owners, occupiers and uses of the site;
        - site history;
        - planning and zoning information;
        - environmental licences, notices, dangerous goods, or trade waste agreements associated with the site;
        - surrounding land use, condition, and history;
        - environmental setting, geology and hydrogeology of the site and surrounding area;
        - potential on- and off-site receptors;
        - quality of water resources, including groundwater and storm-water runoff and any sensitive receiving water environments;
        - chemical and physical characteristics of the soil and groundwater; and
        - contamination identified at the site, including the nature and mobility of contaminants, their depth and spatial distribution.
    - review the completeness and robustness of the investigation of the site and determine any data gaps;
    - determine whether any further investigation of the site is required;
    - determine whether any remediation of the site is required in order that the site can be considered suitable for a specific use or range of uses;
    - assess the suitability of the site for a specific use or range of uses (based on no unacceptable risks to human health or the environment being present), and whether any restrictions on the use of the site are required; and/or
    - assess the requirement for a management plan, and should one be required (to address residual risk remaining at the site), its suitability.
- Production of this Independent Reviewer Report.

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The following should be noted and were taken into consideration in relation to the Independent Reviewer Report:

- This Independent Reviewer Report has been prepared in accordance with general good practise and accepted guidelines for Contaminated Land; noting this is not designed to form part of a statutory submission at this stage nor is it a specific CLA review;
- In preparing the Report, the Independent Reviewer must rely on the experience, expertise and integrity of the consultants undertaking the work leading to the provision of the reports provided. The qualifications and experience of the SQP have not been independently assessed;
- The Independent Reviewer must assume the information presented in the SQP and CLA report is correct and complete, as far as can be reasonably checked, noting publicly available information has been reviewed and verified, where possible;;
- The Independent Reviewer must take reasonable measures to verify the accuracy and completeness of information included in the SQP and CLA report and supporting documents to support the above two points. The measures taken should be guided by the legislation and general good practise and guidelines;
- Contaminated land investigations undertaken in accordance with guidance made and approved by the relevant regulatory authorities contain inherent uncertainties and it is accepted that the reports provided were only a certain stage of investigations and it has been noted that the lateral extent of the groundwater impacted by PFAS is uncertain and potentially extends off-site. It is also noted that further investigation is required to understand the potential risks to off-site receptors; and
- Reports present known information on site conditions at the time the report were published, and conditions may change.

The work was undertaken in accordance with the MACH1 proposal reference 20-002-034 dated 28 May 2020.

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3 DATA GAP ASSESSMENT OF THE DETAILED SITE INVESTIGATION REPORT AND AUDITOR CERTIFICATION REPORT

The following sections outline some of the key findings of the review process and outcomes.

3.1 INTRODUCTION, OBJECTIVES AND SCOPE

AECOM was commissioned by Queensland Fire and Emergency Services (QFES) to investigate the concentration and distribution of per- and poly- fluoroalkyl substances (PFAS) at Home Hill Fire Station. EES was commissioned by QFES to undertake the CLA role with relation to the investigation of PFAS at Home Hill Fire Station. The report produced by AECOM and certified by EES was termed a "Contaminated Land Investigation Document (CLID)", suggesting it has been written in accordance with Section 389 of the EP Act and Module 6 of the Queensland Auditor Handbook.

Investigation works referenced the following guidelines:

- DES, Queensland Auditor Handbook for Contaminated Land, Module 6: Content requirements for contaminated land investigation documents, certifications and audit reports (2018);
- Environmental Protection Act, 1994;
- HEPA 2018 PFAS National Environmental Management Plan (NEMP);
- NEPC (1999) National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013) (ASC NEPM 2013):
    - Schedule A Recommended general process for assessment of site contamination
    - Schedule B1 Guideline on Investigation Levels for Soil and Groundwater
    - Schedule B2 Guideline on Site Characterisation
    - Schedule B3 Guideline on Laboratory Analysis of Potentially Contaminated Soils;
- Standards Australia (AS4482.1-2005) Guide to the sampling and investigation of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds; and
- Standards Australia (AS 4482.2-1999) Guide to the sampling and investigation of potentially contaminated soil, Part 2: Volatile Substances.

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The Independent Reviewer comments on the introduction, objectives and scope of works are summarised as follows:
• It is noted that both AECOM and EES were commissioned only to assess PFAS, not all contaminants. While this contaminant is likely most relevant to potential off-site source, it would be standard practise in the development of a CLID to cover a wider spectrum of contaminants in initial investigations. • It is noted that AECOM and EES were commissioned only to assess the Home Hill Fire Station and adjacent to the boundaries of the site, not potential off-site impacts. Potential off-site sources of PFAS are reviewed in brief only, while noting that the SQP acknowledges the potential for off-site impact. • The introduction of AECOM's report, Section 1.1 has noted that "*PFAS are an emerging family of compounds that are highly soluble, persistent and bioaccumulative in the environment. Following release to ground, they can be readily mobilised from soil source zones, and migrate significant distances in surface water and groundwater.*" • AECOM Section 1.2 references the stage of works undertaken is a Stage 3 site investigation report (SIR), with reference made to a preliminary site investigation (PSI) and Sampling, Analysis and Quality Plan (SAQP). Further, in Section 10, a reference is made to the PSI and SAQP document "AECOM, 2019, *Preliminary Site Investigation and Sampling, Analysis and Quality Plan, QFES, April 2019.*" Ideally this document should be included in the appendices to allow review/determination of adherence to the plan. Further, this report should also be reviewed to provide an understanding of the background and determination of the scope of works and why it was of a limited nature. • AECOM Section 1.2 notes the next stage following the now completed review by the CLA (Stage 4), is Stage 5, which is to provide a copy of the SIR to the regulator (DES). It is important to know if this has been undertaken and if not, why not, and when is this planned to occur. Noting also Stage 6 references the need for an off-site investigation plan to meet DES requirements. This is fundamental to the outcome of the works and should ideally be undertaken without delay. Confirmation should be sought if this has been actioned and the outcome of correspondence with DES. This is further crucial to understand if a Duty to Notify has been enacted and if the site has been placed on the DES Environmental Management Register (EMR) based on the findings of the works completed to date. • The EES CLA report notes in Section 1 that EES were engaged to undertake the CLA function in relation to the Home Hill Fire Station. It is noted that it was also stated that the CLA function was necessary to ensure compliance with the *Environmental Protection Act 1994* Subsection 389 (1) and (2), noting this is normally only applicable to sites that are listed on the EMR. This is also applicable to CLA certification which can only be provided for a statutory outcome i.e. certification of the CLID and associated Site Suitability Statement (SSS), noting a SSS form has not been provided. • AECOM Section 1.2, also references a Contaminated Land Investigation Document (CLID). This would suggest the works were being provided to meet the requirements of the *Environmental Protection Act 1994* relating to sites listed on the EMR, yet Section 2.1 notes the site is not listed on the EMR. Without being listed on the EMR a formal CLID cannot be produced nor can a CLA be formally engaged in the review process. This should be clearly stated early in the report, as it is suggested though this review process that this is the case. Further, it should be clarified if a formal notification from the CLA has been provided to DES for appointment as CLA for the site, which again, cannot be

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endorsed without the site being listed on the EMR. A search of the DES EMR database should be undertaken to clarify if the site is, or is not, listed on the EMR. Based on the outcome of the report, legal advice should be sought as to the landowner and CLA's Duty to Notify of hazardous contaminant present on the site. BSC as an Administering Authority with an awareness of the presence of PFAS may also be legally obligated to notify DES. Again, legal advice should be sought in this matter.

- AECOM Section 1.3 notes the objectives of the work was to "*to characterise potential PFAS impacts at Home Hill Fire Station, to assess the potential risks to human health and the environment and to update the PFAS conceptual site model (CSM) for the Site*." To assess the potential risks to human health and the environment, it would follow that off-site impact should be addressed (noting this is suggested to form a future Stage 6 of additional works). The current outcomes/deliverables, however, are restricted to sampling on site. It is further noted that one of the deliverables is sampling of the tap water. This would not normally form a DSI investigation unless there was cause for concern relating to the potable water supply.
- AECOM Section 1.4 references the CLA-endorsed SAQP, however, without a copy of this a full assessment/review of the adequacy of the scope of works cannot be made. It is suggested a copy of this be sought and reviewed.
- The guidelines referenced in the AECOM report Section 1.6 were generally suitable for the works completed, however, it should be noted (and should have been updated), that the NEMP has been revised and updated to Version 2.0 in January 2020. Given the report is dated February 2020, this could have been completed in accordance with the draft version of the new NEMP Version 2.0 agreed by the Heads of EPAs in October 2019, noting the general release of the new version did not occur until May 2020.
- AECOM Section 1.5 references a footnote to an expected update to the NEMP Version 2.0, noting the above comments that this was dated in January 2020, pre-dating the AECOM report. Further, discussions on the PFAS analysis reference the NATA accredited suite, but do not enter into detail on the potential to speciate the type/source of PFAS/AFFF, noting Section 2.4 specifically notes 3M Lightwater being the AFFF utilised on the site. This is relevant for potential off-site studies or to discount potential other sources of PFAS in the area.
- An assessment of the SQP report and CLA Certification Report against the requirements of Section 389 of the EP Act has been completed and is presented in ***Table 4.1*** in ***Section 4*** of this report.

3.2 Site Setting

The AECOM and EES reports describe and summarise the site setting information. All information required by Section 389 of the EP Act and Module 6 of the Auditor Handbook for site setting is noted to be included in the AECOM DSI report. The Auditor Certification Report summarises this this information and does not identify any missing information or errors relating to the information provided by AECOM.

The AECOM report includes a review of potential off-site sources of PFAS within a 4km radius of the site. It is noted that the facilities identified are not specific to PFAS, but are facilities which could be sources of contamination in general (fuel depots, service stations, etc.).

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It is noted that an off-site dry-cleaning facility has been identified by Burdekin Shire Council as a potential source of PFAS, which was not included in the AECOM report.

The Independent Reviewer comments/statement of reasons on the site setting are summarised as follows:
• The information provided regarding the site setting was adequate and accurate, based on available information and checking of secondary sources, with the noted additional identification of a dry cleaning facility within proximity of the site by Burdekin Shire Council. • Reference is made in the AECOM report, Table 2 to the site not being listed on the EMR. This could not be verified without a review of the PSI report and it is suggested this is sought. • Further, it is suggested that a new EMR search is completed to see if the site has been subsequently listed, as the information contained in the AECOM report suggests a hazardous contaminant (in the form of PFAS) is present on site, which could warrant listing on the EMR if notified to DES. It is suggested that legal advice be sought on the requirement for notifying DES. Given DES (as per their website[1]) are currently investigating potential sources of PFAS, and also as a conservative measure, the information in the AECOM report should be shared with DES.

3.3 ENVIRONMENTAL SETTING

The AECOM and EES reports describe and summarise the site setting information. All information required by Section 389 of the EP Act and Module 6 of the Auditor Handbook for environmental setting is noted to be included in the AECOM DSI report. The Auditor Certification Report summarises this information and does not identify any missing information or errors relating to the information provided by AECOM.

The environmental setting information has been reviewed by MACH1 Senior Hydrogeologist, Dr John Harbison, with the review focused on the interpretations and descriptions of local groundwater flow conditions in the CLID and Auditor Report. Information and discussions relating to this review and presented below.

Based on the hydrogeological review of the current information presented within the DSI Report, the groundwater components were found not to be fully comprehensive. While the Queensland groundwater database has been utilised to some extent, there was inadequate inspection and interpretation of the information provided by the database. The bore searches extend to an arbitrary distance of 1 km from the site. Some bores further way from the sites provide useful information and also the information for some bores within the 1 km radius has not been fully utilised. The data quality for bores within this zone has not been fully discussed. These omissions are significant for the prediction of groundwater migration from the sites and the fate and transport of potential contaminants. This is especially

[1] https://www.qld.gov.au/environment/pollution/management/disasters/investigation-pfas/sites/Home Hill

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relevant to the potential contaminant of concern being stated as the PFAS, knowing this can potentially travel many kilometres in groundwater.

Water Management in the Burdekin Delta

The Burdekin delta overlies the largest replenished coastal aquifer in Australia. The Home Hill Fire Station lies within the Lower Burdekin Water Authority Area administered by Lower Burdekin Water (LBW) who distribute water from the Burdekin River via pipelines, channels and lagoons.

The Burdekin River has highly variable flow; therefore, the management of aquifer replenishment is essential for the economic prosperity of the area. Three pumping stations along the southern bank of the Burdekin River have supplied the Southern Division with annual average of 82 GL of river water over 2012-2019. Likewise, three pumping stations along the northern bank have supplied the Northern Division with an annual average of 137 GL over the same period. Approximately half of these amounts are pumped from open channels by customers.

A large proportion of the remainder recharges the underlying shallow aquifers. Water balance estimates for the Burdekin River Delta (McMahon, 2004), give a total groundwater recharge of 430-850 GL/year. Of this, about 100 GL was estimated to be artificial recharge; therefore, this amount is a significant proportion of the total recharge. In conjunction with an estimated groundwater pumping rate of 440-830 GL/year, groundwater flow paths are greatly altered from natural conditions.

Diversion drains, i.e. impounded creeks and channels in the area, are utilised for storing water pumped from the Burdekin River. In the Home Hill CLID, some waterways have been mapped as “drainage lines” (Home Hill Figure 1). However, in view of the information above, the assumption that all local waterways simply act as drainage lines may well beerroneous. Available maps of diversion channels show extensive coverage of both the Northern and Southern Divisions.

In light of the above description of the local water management regime, the assumption that shallow groundwater will generally migrate toward nearby waterways is possibly quite erroneous. While this assumption may be useful in some settings, it is less likely to be applicable in the Burdekin area.

Available Literature

Due to the importance of groundwater for agriculture and domestic supply, the hydrogeology of the Burdekin Delta has been studied extensively over many decades. It is also recognised that this area is of a highly sensitive nature due to the groundwater being a primary supply of potable water and irrigation. There is a great deal of scientific literature about Burdekin hydrogeology and water management available, particularly via the DES and

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Department of Natural Resources, Mines and Energy (DNRME) Library with many of these publications readily available on-line.

The Queensland groundwater database includes information for a variety of bores including private bores and government monitoring bores; therefore, it is expected that information in the database will be of variable quality and the assessment of the quality of available data should be carried out and documented.

As is typical of other areas in Queensland, there is much less available local groundwater chemistry information than there is geological, well construction and water level information. Nevertheless, the quality of the available chemistry data should also be discussed in the CLID.

Groundwater Levels

The inferred hydraulic gradients are based on limited on-site field measurements of bore water levels (diagrams of on-site groundwater level contours are presented in Figure 3 of the AECOM DSI report); therefore, extrapolation of these findings to potential flow toward nearby receptors has inherent uncertainty. Furthermore, the transient nature of hydraulic gradients must be considered due to the degree of water table fluctuation that is likely. Significant flooding occurs in the Burdekin delta with numerous floods occurring during the modern period of groundwater monitoring; it is a component of aquifer recharge and is related to observed spikes in hydrographs for shallow groundwater.

MACH1 has inspected selected hydrographs for the Home Hill areas. It was not considered the role of an independent peer reviewer to carry out a separate study of a subject site at this stage; therefore, details of these results are not presented here. However, based on this inspection and some preliminary knowledge of the local management regime, the hypotheses that groundwater simply flows from either site toward the Burdekin River or other waterways may be unfounded and requires further investigation. There is a wide range of background research data and information on the local and regional groundwater systems and for development of a comprehensive Conceptual Site Model (CSM), further work would be expected.

Potential Stormwater Transport

Section 2.2 of the AECOM report has noted the presence of both stormwater and sewer lines exiting the site. While it has been noted that the backfill has also been identified as a potential preferential pathway for contaminant migration in the unsaturated zone, the more obvious direct discharge (or historic discharge) of potentially impacted surface waters (say following fire training with the use of AFFF) has not really been highlighted or discussed here. It is noted that the hydrology of the area has been discussed in Section 3.5, but the

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direct connection between the site and potential off-site surface water body receptors has not been studied/researched further.

Section 3.5 and 3.8 reference two drain feature (225m south and 650m north), a reservoir (4km north east) and a pond (850m south west) and while these may not be recorded as a Groundwater Dependent Ecosystem (GDE) they are likely to have local value and additional details of the associated ecology and sensitivity of these should be investigated. They could also potentially act as a local source of recharge to the underlying aquifers.

It was also noted that there was an adjacent SES lot (Lot 7) to the south east of the site which has not been investigated and could potentially be another source of PFAS.

The Independent Reviewer comments/statement of reasons on the environmental setting are summarised as follows:
• The information provided by AECOM regarding the general environmental setting was considered to be adequate and accurate, based on available information and checking of secondary sources, with the exception of the discussions presented above and the items listed below. • The assessment of the quality of available groundwater bore data should be carried out and documented. • The quality of the available groundwater chemistry data should be discussed in the CLID. • Additional information and further detail would be expected relating to both local and regional hydrogeology to further refine the CSM. This is particularly relevant based on the nature of the contaminant of concern (PFAS) and the soluble nature and ability to travel considerable distances within groundwaters (or stormwater releases). • Detail or further discussion on the potential for current (or historical) discharges from the site directly via stormwater or sewer have not been discussed in detail and warrant further research (accepting the PSI has not been provided or reviewed and this may be discussed further in this initial document). • Additional information relating to the historic uses of the adjacent SES site should be sought to discount this as a source of PFAS or otherwise.

3.4 SITE HISTORY

The AECOM and EES reports describe and summarise the site history information. All information required by Section 389 of the EP Act and Module 6 of the Auditor Handbook for site history is noted to be included in the AECOM DSI report, with the exception of historical waste practices and historical earthworks at the site. These items are not included in the AECOM report; however, are noted by the IR to have limited potential to specifically relate to issues affecting PFAS contamination. The EES Auditor Certification Report summarises the site history information and does not identify any missing information or errors relating to the information provided by AECOM.

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The site has been a fire station since at least 1955 (earliest aerial photograph), with PFAS use reported at the site between the 1990s and approximately 2003. There is also potential for PFAS use to have occurred prior to the 1990s as no information was available for this time period. The detailed anecdotal information and sources of this were not provided in the CLID, but were potentially referenced in the PSI. The exact volumes, locations and practises for use of the PFAS are not clear. Given the noted use of PFAS on grassed areas there is the potential for historic impact to underlying groundwaters. Further the exact practises for disposal of waste PFAS and AFFF run-off liquids is unclear. There is the possibility that historically the PFAS could have been released off-site within the stormwater or sewer system and subsequently travelled a considerable distance from the site.

Reference to potential off-site sources of PFAS has named a number of potential locations. The details of these are not known without further research.

The site history assessment was completed as part of the Preliminary Site Investigation report, which has not been provided for review or included as an appendix to the DSI report. No reference to historic title review is included in the site history information within the DSI, suggesting this has not been completed. Details of the aerial photograph review, historical information, anecdotal information, QFES sampling details or other relevant information likely collected as part of the PSI was not presented in the DSI and therefore review of the PSI would be required to verify the suitability of this information. This review would likely provide additional information regarding the development of the site into a fire station; however, this information is unlikely to add significantly to the assessment of contamination at the site, but would further strengthen an understanding of the CSM and verification of the suitability of the works.

It is further noted that the referenced Queensland Government website also notes that "*The Department of Environment and Science is investigating to try to locate the initial source of the PFAS*." It is assumed that the current AECOM and EES reports have been provided to DES, however, if this is not the case, it is suggested this should be encouraged. Further, legal advice should be sought as to the potential Duty to Notify triggered by any of the information provided which may apply to the landowner, CLA or Administering Authority.

In addition, it is assumed that BSC have additional data relating to historic and ongoing groundwater, surface water, sediment or mains/potable water sampling and review of this data in conjunction with the AECOM and EES reports may provide a greater understanding of the site, local or regional distribution of PFAS and help to provided further details on the interpretation of the CSM for the site and surrounding areas. Details of the BSC borehole networks, extraction and water quality would provide useful additional information.

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The Independent Reviewer comments on the site history review are summarised as follows:
• It was concluded that an appropriate level of site history review and previous site investigation has been conducted to provide a sufficient basis for determining the potential for contamination at the site. Without a review of the PSI and sources of the original information relating to activities and use of PFAS on the site, it is hard to determine the suitability of the original works. • A detailed historical review should be completed for the site as part of the preliminary site assessment as a standard practice. It is assumed this is included as part of the PSI and should be reviewed for suitability. Depending on the findings of the PSI, historical details of the use of PFAS on the site and the potential for release to soils, groundwaters, stormwaters or sewer the likelihood of off-site releases of PFAS cannot be definitively proven. Such information may contribute substantially to the understanding of the potential for off-site contamination at the site, if not specifically on-site distribution. • Reference is made to QFES water sampling in 2016. Without the details of this work it is not possible to comment on historic practises/impact, it would however, be useful to seek a copy of this work to undertake an independent review.

3.5 SITE INVESTIGATION WORKS

Soil and groundwater investigation within the site boundary were completed by AECOM and summarised by EES. In addition, a number of sediment samples from drainage channels, one surface water sample from a drainage channel, and one tap water sample were also collected. All samples were analysed for PFAS only, with the main PFAS compounds present being sum of perfluorohexanesulfonic acid (PFHxS) and perfluorooctanesulfonic acid (PFOS).

A total of six (6) investigation points (boreholes) were advanced within the site, which comprises 2,023m^2. This rate of sampling does not quite meet the requirements of AS4482.1, which recommends a minimum of seven (7) investigation points for a site of this area. It is noted that duplicate, triplicate and rinsate quality assurance samples were collected at an appropriate rate to meet the requirements of the standards.

Assessment criteria utilised were the NEMP health guideline values for commercial land use, NEMP drinking water values, and NEMP recreational water values. Two soil samples were found to exceed these guidelines and all four groundwater wells returned results above the nominated guidelines. In addition, the sampled tap water also exceeded the NEMP drinking water value.

The Auditor Certification Report notes that a data gap exists associated with groundwater flow direction and contaminant delineation, particularly to the south-east, this is seen as crucial to an assessment of potential off-site impact.

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The Independent Reviewer comments on the site investigation works are summarised as follows:
• Sampling scope and methodologies reference back to the SAQP. As noted previously, this document has not been made available for review and should therefore be sought to comment on the appropriate works undertaken in accordance with this plan. • The volume of water removed during well development and purging was not equivalent of 6-10 well volumes and should ideally have been greater. • It is noted that the wells were installed below the depth of water strike and also the standing water level, which is not ideal, noting any floating light non-aqueous liquids (LNAPLs) may not be captured (accepting fuels were not analysed for or the main contaminants of concern). Future, seasonal changes in groundwater depths can be considerable and a greater screen length to cover off on groundwater levels variations would be ideal. • Reference is made to AECOM Standard Operating Procedures (SOPs), which were not made available to review. • The investigation sample design and subsequent final coverage of the site was deemed as suitable as an initial investigation stage, noting only PFAS has been investigated at the site. Should a statutory outcome be required for the site, then further investigations would be required to delineate contamination, fully characterise the contamination status of the site, and confirm the direction of groundwater flow. • Methodologies reference specific requirements of NEMP, which is deemed as appropriate. • Soil, sediment, surface water and groundwater sampling methodologies and maintenance of sample integrity were deemed to be in accordance with the guidelines as suitable for the investigations undertaken. • The IR agrees with the conclusions of the Auditor that there is a data gap with relation to groundwater flow direction and delineation, particularly to the south east.

3.6 RESULTS AND DISCUSSIONS

It is noted that the results recorded exceedances of soil guidelines for ecological values and groundwater exceeding both drinking water and recreational values, with recorded but low concentrations in the sediment.

It was further noted that based on limited data the groundwater could potentially flow locally towards local drainage lines, a pond and a reservoir. It is also suggested the primary source of PFAS in the groundwater is located on the northern and eastern portion of the site in the vicinity of or downgradient and cross-gradient of the former foam training exercise areas.

AECOM further note that the extent of PFAS in the groundwater has not been established laterally in any direction, but local flow is towards the north to a drainage feature and subsequently the Burdekin River (3km north).

As per earlier comments, reference is made to ongoing Queensland Government investigations relating to PFAS in groundwater. While again, legal opinion should be sought as to whether a Duty to Notify exists for the site, it would be a helpful exercise to share

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relevant information between government departments i.e. provision of the QFES data to DES.

Surface water sampling was not completed as no water was present, but instead a sediment sample was obtained. Previous water sampling of the Case 4 Pit noted impact in this drainage pit to the east of the former foam training area. Also, reference is made to potential for a drainage line leaving site in the direction of Tenth Avenude and sewer lines leaving the site to both Tenth and Eleventh Avenues. Historical concentrations of PFAS in both the stormwater and sewer may have resulted in off-site releases.

3.7 CONCEPTUAL SITE MODEL

The following Conceptual Site Model (CSM) was presented by AECOM:

- The potential primary sources of PFAS were described as:
    - Former firefighting training activities using Aqueous Film Forming Foams (AFFF) containing PFAS at the former foam training area.
    - Leaks and spills of AFFF containing PFAS from storage areas, during product transfer and vehicle maintenance.
    - The former SES site located to the south east of the site.
    - An industrial unit located 200m to the north east of the site.
    - Wilmar Sugar Inkerman Mill located 2km north east of the site.
- The potential secondary sources of PFAS were described as:
    - Surface soil where AFFF containing PFAS was historically discharged to surface.
    - Unsaturated zone soil beneath potential source zones.
    - Concrete infrastructure that has been in contact with AFFF (including Case 4 Pit).
    - Sediment and surface water in stormwater drains and sewerage system.
- Potential receptors were identified as:
    - Personnel who work at the fire station (current and future QFES employees). This includes intrusive (i.e. involved in soil excavation) maintenance workers who may conduct infrequent maintenance activities at the site and come into contact with impacted soil, sediment, stormwater and/or groundwater.
    - Persons exposed to groundwater extracted from off-Site bores for industrial activities, recreational activities, irrigation for parks and gardens and domestic activities.
    - Visitors to the site who stay for a short period and are not frequently present at the site who may come into contact with impacted soil and/or stormwater.
    - Recreational users of surface water off-site.
    - The terrestrial ecosystem (flora and fauna) on and off-site.
    - The aquatic ecosystems of nearby waterways.
- Potential migration mechanisms were identified as:
    - Historical discharge of AFFF containing PFAS to ground surface or leakage from storage infrastructure
    - Spilling of AFFF containing PFAS to ground surface during filling and decanting operations
    - Sorption of PFAS to soil in areas where AFFF was historically used, particularly in the unsealed areas such as the foam training area
    - Localised dispersion of firefighting foams with wind during historical application

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  - Surface water run-off containing PFAS flowing into surface water and off-site migration within the drainage system
  - Leaching of PFAS in concrete or soil to surface water run-off and off-Site migration within the drainage system
  - Leaching of PFAS from soil and infiltration to groundwater in areas where AFFF was historically used
  - Leaching of PFAS from concrete pavements or concrete lined drains/pits and infiltration to surface water or groundwater
  - Lateral and vertical migration of PFAS in groundwater under the influence of groundwater flow and PFAS dispersion
  - Migration within backfill to underground services and infrastructure which may act as preferential pathways for PFAS in the unsaturated zone
  - Use of groundwater off-Site for irrigation of parks and gardens or domestic and industrial uses
  - Sorption of PFAS to soil below the groundwater table during migration with groundwater. Sorption to soil slows down the migration of PFAS, but sorbed PFAS may continue to diffuse back into groundwater and act as a secondary source, if conditions are suitable
  - Excavation of soil containing PFAS and relocation to other areas on site.
  - Transport of sediment and surface water along stormwater drains/pits and discharging into waterways.
- Potential receptor and exposure pathways were identified as:
  - Dermal contact and/or incidental ingestion of PFAS impacted soil, including dust inhalation.
  - Persons drinking PFAS impacted groundwater.
  - Dermal contact and/or incidental ingestion of PFAS impacted, groundwater, surface water, and sediment (in drains).
  - Ecological receptors in direct contact with PFAS impacted soil, sediment and surface water.

Review of the CSM by MACH1's Support Team senior hydrogeologist, Dr. John Harbison, identified that the CSM for groundwater occurrence and flow should be expanded upon, primarily due to a demonstrated lack of research covering know local and regional groundwater. No previous research literature of local hydrogeology or water management has been referenced or reviewed in the CLID.

The development of a CSM is described, with the possible migration of potential contaminants in the permeable shallow sand aquifer is acknowledged in both reports. It is noted that the CSM does not specifically reference the sewer lines as a potential migration mechanism, however, the sewer lines are discussed in Section 2.2 of the AECOM report.

The current CSM developed for the site is not considered to generally meet the requirements of the *Australian groundwater modelling guidelines* (Barnett et al., 2012). In particular, according to these guidelines the important components of the hydrogeological domain are:

- hydrostratigraphy;
- aquifer properties;

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- conceptual boundaries; and
- stresses, including the identification of discharge and recharge processes.

Similarly, the ASTM guideline for CSM development (D5979-96) recommends characterisation of the surface, the sub-surface, hydrogeology and groundwater systems in order to develop a CSM. Stresses (including anthropogenic sources) are a component of the groundwater systems characterisation. The ASTM guideline is a more general approach than the Australian guideline and additionally considers groundwater chemistry as an important feature of characterising groundwater flow.

A data gap exists in the development of the CSM through the lack of consideration during the investigation to the high degree of water management that has been occurring in the Burdekin Delta over many decades. Given that the contaminant of concern is PFAS which is highly soluble and can travel considerable distances within both groundwaters, surface waters or even associated with sewers, the detailed understanding of both on-site and off-site hydrogeology and hydrology is crucial to the development of a robust CSM.

The Independent Reviewer comments relating to the Conceptual Site Model are summarised as follows:
• Information on local hydrogeology has not necessarily been fully sourced and interpreted with respect to the land, having regard to the level of risk of groundwater contamination and off-site migration of both groundwaters and surface/sewer waters. • The information provided as part of the CSM development has been checked by the Independent Reviewer and found to represent only a portion of the known data relating to published information on groundwater/surface water in the area. Further, the interpreted CSM for the site was reviewed and deemed to relatively limited in its scope based on the Independent Reviewer's knowledge of the area and interpretation of site data. • It is accepted/noted that the scope of works outlined was limited to the site and site boundaries and it has been acknowledged that off-site investigations are warranted. It would have been useful to provide a more detailed review of the off-site setting to assist in development of the CSM for not just the site but the local area, given the potential local issues associated with known PFAS contamination.

3.8 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the investigation works completed, AECOM made the following final conclusion:

- A number of possibly complete exposure pathways for PFAS sourced from the fire station to impact off-site human and ecological receptors have been identified. The significance of these potentially complete source-pathway- receptor linkages is uncertain and further investigation is required to understand the potential risks to off-site receptors.

Based on the review of the AECOM work, the CLA made the following final conclusions:

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- The CLID findings have determined that while soil contamination in excess of adopted ecological indirect exposure guidelines exists at the site, given the presence of concrete hardstand, the legacy commercial/ industrial use of the site, and the relatively low concentrations identified, this does constitute a significant ecological risk and the site is suitable for on-going commercial/ industrial use.
- However, noting that concentrations of PFOS and PFHxS in groundwater at the site exceed relevant guideline criteria, there is a potential that impacted groundwater has migrated beyond the site boundaries. Accordingly, the CLA considers that further off-site investigation is warranted to comply with legislation and quantify the risk (if any) to off-site human and/ or ecological receptors along a complete exposure pathway and therefore determine what notification, remediation and/ or management measures may be necessary at the site to mitigate these risks.

The Independent Reviewer comments on the conclusions and recommendations are summarised as follows:
• The DSI report does not conclude if the works were completed in accordance with NEPM (or NEMP) guidelines, noting that the Auditor Certification Report does include this conclusion. • The DSI report does not conclude if the site represents prescribed contaminated land or not. The Auditor Certification Report states that '*insufficient data has been collected beyond the site boundary to determine whether the site is prescribed contaminated land*'. If the site is prescribed contaminated land, a Duty to Notify exists under Section 320 of the EP Act. • The Duty to Notify for Contaminated Land Guidelines produced by DES state that the administering authority (DES) should be notified: "*Within 24 hours of becoming aware for the first time of a change in the condition of land, relative to the previous condition (as either known or reasonably inferred) of the land, where the change in condition a) is either known to be or reasonably known to be likely to relate to the nature or extent or impact of contamination, and b) either is causing or is reasonably likely to cause or constitute serious or material environmental harm*". • On the basis of the results of the investigation works completed, it is recommended that legal opinion be sought as to whether the presence of PFAS at the site is reasonably likely to cause or constitute serious or material environmental harm (defined as costing greater than $5,000 to rehabilitate or restore). Given the low financial value, it may be reasonable to conclude that this is likely. • The IR recommends that for the sake of disclosure and to assist DES in their ongoing investigation information provided in the reports should be forwarded to DES (as recommended in the AECOM Stage 5 process). This comment may now be redundant as the Stage 5 process of DES submission may have already been completed.

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4 SECTION 389 OF EP ACT 1994 TABLES

An assessment has been undertaken of the DSI report and Auditor Certification Report against subsections of Section 389 of the Environmental Protection Act 1994. The relevant ***Table 4.1*** is included below.

Table 4.1. Assessment of Report Against Section 389 of the EP Act 1994

Subsections of section 389 of Environmental Protection Act 1994		**Reference to SQP (AECOM) that comply with the corresponding subsection of section 389 of the EP Act**	**Reference to Auditor's (EES) statement of reasons of why each requirement has been deemed compliant**
(1)(a)	The reasons particulars of the land have been recorded in a relevant land register	N/A	N/A
(1)(b)	A description of all surface and subsurface infrastructure on the land, including details of the location, size and type of the infrastructure	Section 2.2	Section 4.2
(1)(c)	A description of the surrounding area of the land, including a description of each of the following in the surrounding area;		
(1)(c)(i)	• All environmentally sensitive areas	Section 3.8	Section 6.1
(1)(c)(ii)	• The location of all water, watercourses and wetlands	Section 3.5	Section 6.1
(1)(c)(iii)	• The location of all stormwater drainage	Section 2.2 and 3.2	Section 6.1
(1)(c)(iv)	• All uses of the land, including uses that may affect the safety of the relevant land or cause environmental harm	Section 2.3	Section 4.2
(1)(c)(v)	• All activities carried out that may affect the safety of the relevant land or cause environmental harm	Section 2.3	Section 4.2
(1)(d) For waste disposed of or stored on the land that contains, or may potentially contain, hazardous contaminants:			
(1)(d)(i)	• Details of the location, volume and type of the waste	Not included	Section 7.1
(1)(d)(ii)	• Details of any potential contamination of the land caused by disposing of or storing the waste on the land	N/A	Section 7.1
(1)(e)	A description of the geology and hydrogeology of the land	Section 3.4 and 3.6	Section 6.2

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Subsections of section 389 of Environmental Protection Act 1994		Reference to SQP (AECOM) that comply with the corresponding subsection of section 389 of the EP Act	Reference to Auditor's (EES) statement of reasons of why each requirement has been deemed compliant
(1)(f)	Details of any environmental relevant activities or notifiable activities carried out on the land, including the materials used and waste produced during the carrying out of the activities	Section 2.1	Section 5
(1)(g)	Details of any earthworks carried out on the land, including the materials used and waste produced during the earthworks	Not included	Not included
(1)(h)	If work has been carried out on the land to remediate the contamination of the land – the contamination levels recorded on the land before and after the work was carried out	N/A	N/A
(1)(i)	For a draft site management plan:		
(1)(i)(i)	• The proposed objectives to be achieved and maintained under the plan	N/A	N/A
(1)(i)(ii)	• The proposed methods for achieving and maintaining the objectives	N/A	N/A
(1)(i)(iii)	The proposed monitoring and reporting compliance measures for the land	N/A	N/A
(2)(a)	A statement (a *site suitability statement*) of the uses or activities for which the land is suitable	N/A	N/A
(2)(b)	A statement of the following matters:		
(2)(b)(i)	• Whether the land is prescribed contaminated land	Not included	Section 11
(2)(b)(ii)	• If the land is contaminated – the extent to which the land is contaminated	N/A	N/A
(2)(b)(iii)	• For a draft site management plan- whether the proposed objectives, methods and measures stated in the plan under subsection (1)(i) are appropriate	N/A	N/A
(2)(b)(iv)	• The extent to which the assessment of the land is in accordance with the contaminated ASC NEPM	Not included	Section 12

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5 INDEPENDENT REVIEWER DATA VERIFICATION

Independent verification of the primary sources of data was undertaken by the Independent Reviewer and comprised of the following:

- Verification of current site status on Google Earth, including a search and review of site layout (and historical layout, as appropriate) and site surrounds.
- Verification of location of Environmental Sensitive Areas and surface water bodies.
- Verification of aerial photograph reviews.
- Verification of historical titles (cross referencing of the documentation provided).
- Verification of DES searches and previous notifications.
- Verification of geology and hydrogeology using QLD Globe, including an independent search of local water bores, checking the geological areas and determining the appropriate assessment of the source-pathway-receptor, with regards to EPP (Water).
- Verification of soil conditions based on the site inspection and also the likelihood of the presence of Acid Sulphate Soils based on the Queensland Acid Sulphate Soil maps accessed through QLD Globe.
- Verification of the site activities and potential for contaminants of concern, noting this has not been based on site inspections and discussions with the SQP, CLA or the client. The Independent Reviewer experience and expertise were also employed to make a learned judgement on the likelihood of the contamination, based on the site history provided, noting additional desktop research has been completed as part of the IR review.
- Verification of the site setting based on the Independent Reviewer's local knowledge and knowledge of other sites in vicinity of the area or sites of a similar nature.
- Data verification included review of: Sample Receipt Notices (SRNs) for holding times and sample integrity; Chain of Custody (COC) documentation; Certificates of Analysis (COA) for both results and laboratory QA/QC procedures; summary tables for transposition and interpretation errors, as well as confirmation of Relative Percent Difference results; results discussion within the text for correct interpretation and appropriate use of criteria; and results within site figures, where relevant.
- Verification of specific support experts as required. Noting, the use of a Hydrogeological Support Expert has been engaged by the Independent Reviewer.
- Verification of any non-conformance with both NEPM and Section 389 (1) and (2).
- Verification that there is no evidence of misrepresentation or omission of material information by the SQP or Independent Reviewer that may compromise the SQP conclusions, noting the CLA undertook an independent and determined their independent conclusions. .

Primary independent sources of data are reproduced in ***Appendix B***.

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6 INDEPENDENT REVIEWER DATA QUALITY REVIEW

Based on the review functions completed for the site, the Independent Reviewer can confirm the following regarding the quality of the data provided by the SQP:

- It is the professional judgement of the Independent Reviewer that sufficient information has been provided by the SQP in order to determine an initial estimation of the nature, extent of and risk associated with contamination at the site, but not to determine potential off-site impacts.
- The Independent Reviewer would recommend additional studies to assess the potential for off-site impact from the identified PFAS present and potentially historically from both groundwater, surface water and sewer.
- The level and type of expertise and qualifications held by the Independent Reviewer, are considered to be suitable to assess a site of this nature, however, given the potential complexity of the groundwater at the site and within the local and regional vicinity, expert advice was sought and provided by a support experts Dr John Harbison and Ned Hamer as part of this review.
- In assessing the data provided by the SQP, the Independent Reviewer has considered the following factors:
    - Core considerations for the site have been identified and evaluated against appropriate assessment criteria for the considered land use, taking into account any relevant factors such as exposure pathways and the conceptual site model, noting the works were limited to PFAS/PFOA contamination only.
    - The adequacy of the available data has been assessed and found to be satisfactory partially meeting with subsection 389 (1) and (2), Module 6, NEMP and the NEPM. It is noted that AECOM do not make a site suitability statement or conclude if the site has prescribed contaminated land, as required under subsection 389 (2).
    - The only hazardous contaminant assessed was PFAS in accordance with the scope. Without review of the PSI, it is not known if there are other potential contaminants known or likely to be present at the site which have not been addressed.
    - The key lines of evidence have been evaluated with regards to the site risks and potential responses, taking into account any relevant factors previously identified and using appropriate assessment criteria, however, potential off-site impact has not been addressed.
    - The data has been assessed in order to identify and evaluate any substantial uncertainties regarding the assessment of the site, noting it is the opinion of the expert support team hydrogeologist that additional data or information related to local and regional groundwater could / should be sought. This is acknowledged by AECOM and the scope was limited to the boundaries of the

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site, however, further off-site information could or should be sought. Again, accepting that both AECOM and the CLA conclude that further investigations are required to understand the potential off-site risks to receptors.

- The Independent Reviewer has given due consideration to Environmental Values associated with the site, specifically as outlined in the EPP Water, noting the Queensland Acts and their subordinate legislation take precedence over the contaminated land NEPM in any difference.

- As part of the review process, the Independent Reviewer can confirm that access has been provided to sufficient information to enable all pertinent aspects of the completed works to be evaluated, with the exception of the PSI and SAQP and a site inspection has not been completed.
- As part of the Quality Assurance / Quality Control components of the Independent Reviewers function, the following review of data has been completed for the site:
  - It is assumed primary sources of information used in the PSI assessment of the site included aerial photographs, historic titles, government search results, but these have not been reviewed. The subsequent site inspection photographs and geological / hydrogeological information provided in the CLID have been reviewed and confirmed by the Independent Reviewer through independent verification (where appropriate/necessary, but noting this has not been done via a site inspection) and found to be suitable, noting additional information should ideally be included relating to off-site hydrogeology and hydrology.
  - The data has been assessed against the Data Quality Indicators (DQI) (precision, accuracy, representativeness, completeness and comparability) and was found to be suitable.
  - The applicability and limitations of field methodologies used are appropriate and have been suitably discussed within the SQP report.
  - Adequate calibration of instruments used and validation of field measurements (e.g. against laboratory results) has been undertaken and found to be suitable. Where non-compatible results were noted, this has been adequately assessed and explained by the SQP.
  - The SQP has suitably assessed the specific analytical methods and QA procedures used by the laboratory and these have been found to be suitable.
  - The precision and accuracy criteria set by the SQP has been suitably applied and assessed as appropriate for the site, with any exceedances described and discussed within Appendix G of the AECOM report.
  - The field considerations for the site such as location and depth of samples, number of samples, experience of the sampling, sample handling procedures and sample documentation including bore logs, test pit logs and / or sample logs has been reviewed and found to be appropriate, noting the limitations of scope.

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- The laboratory considerations for the site such as use of a suitably laboratory, selection of samples for analysis, suitable analysis methodologies, sample documentation completeness, sample holding times and suitable laboratory limits of reporting with consideration to the assessment criteria have been reviewed and found to be appropriate.
- The quality assurance procedures utilised by the SQP such as collection of sample duplicates and triplicates, decontamination procedures, sample collection and preservation methodologies and assessment of laboratory data was reviewed and considered appropriate.
- Results of field accuracy samples such as duplicates (RPD%), rinsate blanks, trip blanks and trip spikes have been reviewed and considered appropriate, noting that one rinsate blank samples returned concentrations of PFAS. This sample was collected from the hydrant which was utilised to clean augers and other drill rig equipment. No PFAS was detected in rinsate samples collected from sampling equipment.
- All primary laboratory data has been reviewed to confirm that appropriate documentation has been provided in the report (including Chain of Custody documentation, laboratory QA/QC data and Sample Receipt Notices) and the data has been assessed against the text, figures and summary tables included in the report in order to ensure the data has been transferred and interpreted correctly.
- All assessment criteria and analysis of data against the selected assessment criteria has been reviewed and considered appropriate.

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7 INDEPENDENT REVIEWER CONCLUSIONS AND RECOMMENDATIONS

7.1 INDEPENDENT REVIEWER SUMMARY OF INTERPRETATIONS AND CONCLUSIONS

The following provides a summary of the interpretations and conclusions drawn during the assessment of the AECOM and EES reports:

- The SAQP document should be included in the appendices of the AECOM report or provided to BSC to allow review/determination of adherence to the plan. Further, this report should also be reviewed to provide an understanding of the background and determination of the scope of works and why it was of a limited nature.
- AECOM Section 1.3 notes the objectives of the work was to "to characterise potential PFAS impacts at Home Hill Fire Station, to assess the potential risks to human health and the environment and to update the PFAS conceptual site model (CSM) for the Site." To assess the potential risks to human health and the environment, it would follow that off-site impact should be addressed (noting this is suggested to form Stage 6 of future works). The outcomes/deliverables, however, are restricted to sampling on site, only.
- Additional information and further detail would be expected relating to both local and regional hydrogeology to further refine the CSM. This is particularly relevant based on the nature of the contaminant of concern (PFAS) and the soluble nature and ability to travel considerable distances within groundwaters (or stormwater releases). While further off-site investigations are recommended, additional research relating to the local and regional hydrogeology and hydrology would be useful.
- A detailed historical review should be completed for the site as part of the preliminary site assessment as a standard practice. It is assumed this is included as part of the PSI and should be reviewed for suitability. Depending on the findings of the PSI, historical details of the use of PFAS on the site and the potential for release to soils, groundwaters, stormwaters or sewer the likelihood of off-site releases of PFAS cannot be definitively proven. Such information may contribute substantially to the understanding of the potential for off-site contamination at the site, if not specifically on-site distribution.
- Reference is made to QFES water sampling in 2016. Without the details of this work it is not possible to comment on historic practises/impact, it would however, be useful to seek a copy of this work to undertake an independent review.
- Discussions on the PFAS analysis reference the NATA accredited suite, but do not enter into detail on the potential to speciate the type/source of PFAS/AFFF, noting Section 2.4 specifically notes 3M Lightwater being the AFFF utilised on the site. This is relevant for potential off-site studies or to discount potential other sources of PFAS in the area.
- The investigation sample design and subsequent final coverage of the site was deemed as suitable as an initial investigation stage, noting only PFAS has been investigated at the site. Should a statutory outcome be required for the site, then further investigations

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would be required to delineate contamination, fully characterise the contamination status of the site, and confirm the direction of groundwater flow.

- The IR agrees with the conclusions of the Auditor that there is a data gap with relation to groundwater flow direction and delineation, particularly to the south east.
- Information on local hydrogeology has not necessarily been fully sourced and interpreted with respect to the land, having regard to the level of risk of groundwater contamination and off-site migration of both groundwaters and surface/sewer waters.
- The information provided as part of the CSM development has been checked by the Independent Reviewer and found to represent only a portion of the known data relating to published information on groundwater/surface water in the area. Further, the interpreted CSM for the site was reviewed and deemed to relatively limited in its scope based on the Independent Reviewer's knowledge of the area and interpretation of site data.
- It is accepted/noted that the scope of works outlined was limited to the site and site boundaries and it has been acknowledged that off-site investigations are recommended and it is agreed that these would be warranted. It would have been useful to provide a more detailed review of the off-site setting to assist in development of the CSM for not just the site, but the local area, given the potential local issues associated with known PFAS contamination.
- The DSI report does not conclude if the site represents prescribed contaminated land or not. The Auditor Certification Report states that 'insufficient data has been collected beyond the site boundary to determine whether the site is prescribed contaminated land'. If the site is prescribed contaminated land, a Duty to Notify likely exists under Section 320 of the EP Act.
- AECOM Section 1.2 notes the next stage following the now completed review by the CLA (Stage 4), is Stage 5, which is to provide a copy of the SIR to the regulator (DES). It is important to know if the DSI report has been provided to the regulator (DES) and if not, why not, and when is this planned to occur. Noting also, Stage 6 references the need for an off-site investigation plan to meet DES requirements. This is fundamental to the outcome of the works and should ideally be undertaken without delay. Confirmation should be sought if this has been actioned and the outcome of correspondence with DES. This is further crucial to understand if a Duty to Notify has been enacted and if the site has been placed on the DES Environmental Management Register (EMR) based on the findings of the works completed to date.
- The EES CLA report notes in Section 1 that EES were engaged to undertake the CLA function in relation to the Home Hill Fire Station. It is noted that it was also stated that the CLA function was necessary to ensure compliance with the Environmental Protection Act 1994 Subsection 389 (1) and (2), noting this is normally only applicable to sites that are listed on the EMR. This is also applicable to CLA certification which can only be provided for a statutory outcome i.e. certification of the CLID and associated Site Suitability Statement (SSS), noting a SSS form has not been provided with the SIR.

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- The Independent Reviewer recommends that for the sake of disclosure and to assist DES in their ongoing investigations in the area, that information provided in the reports should be forwarded to DES (as recommended in the AECOM Stage 5 process). This comment may now be redundant as the Stage 5 process of DES submission may have already been completed.

7.2 INDEPENDENT REVIEWER RECOMMENDATIONS

Based on the Independent Reviewer assessment of the work completed and a review of the AECOM SQP and EES CLA reports, the following recommendations are made by the IR.

- Given the noted presence of PFAS on site in both the soil and groundwater, legal advice should have been sought on the requirement to trigger a Duty to Notify. Given DES are investigating the source of PFAS in the local area, communication with the regulator would be sensible, noting the AECOM stated future Stage 5 of the works is to provide the final SIR to DES.
- It is recommended that further local groundwater information be acquired in order to further develop and updated the CSM for the site, suitable for describing groundwater flow conditions at the site, particularly from the literature below sources:
    - DES and DNRME Library;
    - Queensland groundwater database; and
    - Lower Burdekin Water – publications and/or personal communication.
- As outlined and recommended in both the SIR and CLA report, off-site investigations are recommended to determine if PFAS has migrated off-site and hence the associated risks to potential off-site receptors.

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8 REFERENCES

Australian Standard AS 4482.1-2005, Guide to the Sampling and Investigation of Potentially Contaminated Soil – Part 1: Non-volatile and semi-volatile compounds (Standards Australia, 2005).

Australian Standard AS 4482.2-1999, Guide to the Sampling and Investigation of Potentially Contaminated Soil – Part 2: Volatile substances (Standards Australia, 1999).

Department of Natural Resources and Mines, Queensland Globe mapping tool.

DES Guideline for Assessing qualified persons according to sections 381, 395 and 410 of the *Environmental Protection Act 1994.*

Environmental Protection (EP) Act 1994.

Guideline, Listing and removing land on the last registers (ESR/2016/2044, Version 1.01), DES November 2015.

Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater (CRC CARE Health Screening Levels) (Friebel and Nadebaum 2011).

National Environment Protection (Assessment of Site Contamination) Measure (1999) Schedule B(1) (NEPM, 1999), National Environment Protection Council (Amended May 2013).

Queensland Auditor Handbook for Contaminated Land, Module 6: Content requirements for contaminated land investigation documents, certifications and audit reports (July 2018).

Queensland Department of Mines (1987) 1:2,500,000 Groundwater Resources Map of Queensland.

AECOM, PFAS Detailed Site Investigation, Home Hill Fire Station, 83 Tenth Avenue, Home Hill, Queensland, dated 10February 2020.

EES, Auditor Certification Report & Statement of Reasons: Home Hill Fire Station, 83 Tenth Avenue, Home Hill, Qld, Queensland Fire and Emergency Services, dated 9 March 2020.

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9 LIMITATIONS

This report is produced exclusively for the benefit of Burdekin Shire Council and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise. This report is prepared for the proposed uses stated in the report and the scope outlined and should not be used in whole or part in a different context without reference to MACH1. In time, improved practices or amended legislation may necessitate a re-assessment of the site.

This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the site. The report is limited to those aspects of land contamination specifically reported on and is necessarily restricted to this and no liability is accepted for any other aspect especially concerning gradual or sudden pollution incidents.

The findings of this report are based on the Scope of Work outlined in Section 2. MACH1 performed the services in a manner consistent with the normal level of care and expertise exercised by members of the contaminated land remediation and environmental auditing profession. No warranties, or guarantees, express or implied, are made.

Subject to the Scope of Work, MACH1's assessment is limited strictly to identifying typical environmental conditions associated with the subject property and does not evaluate structural conditions of any buildings on the subject site, nor any other issues. Although normal standards of professional practice have been applied, the absence of any identified hazardous or toxic materials (including soil and groundwater) on the subject property should not be interpreted as a guarantee that such materials do not exist on the site.

This assessment is based on site inspections conducted by MACH1 personnel, sampling and analyses described in the report was conducted by AECOM and EES and information used in the report was provided by AECOM and EES, the property owner or other people with knowledge of the site conditions.

All conclusions and recommendations made in the report are the professional opinions of MACH1 personnel involved with the project and, while normal checking of the accuracy of data has been conducted, some of the opinions are based on unconfirmed data and work conducted by others. MACH1 assumes no responsibility or liability for errors in data obtained from regulatory agencies, AECOM and EES or any other external sources, nor from occurrences outside the scope of this project.

MACH1 is not engaged in environmental auditing or reporting for the purpose of advertising, sales promoting, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes. The report should not be used or reproduced in full or in part for any such promotional purposes, and may not be used or relied upon in any prospectus or offering circular.

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Appendix A

Certificate of Approval - Auditor

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Certificate

Environmental Protection Act 1994

Certificate of Approval - Auditor

Approval No: CLAD06649219

This certificate of approval as an auditor is issued by the chief executive[1] *pursuant to section 573 (2)(a) of the* Environmental Protection Act 1994.

1. Approved person

Mr Robin Mark Wagland

2. Approved auditor functions

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

3. Term of approval

This approval will remain in force until 7 August 2022 unless it is earlier cancelled or suspended.

4. Conditions of approval

The approved person must:

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

sch4p4(6) Personal information

Signature

13 September 2019

Date

James Monkivitch
A/Director, Operational Support
Department of Environment and Science
Delegate of the chief executive
Environmental Protection Act 1994

Enquiries:
Sandra Flanagan
Manager,
Phone: (07) 3330 5713
Email: technicalsupport@des.qld.gov.au

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

Appendix B

Verification Documentation

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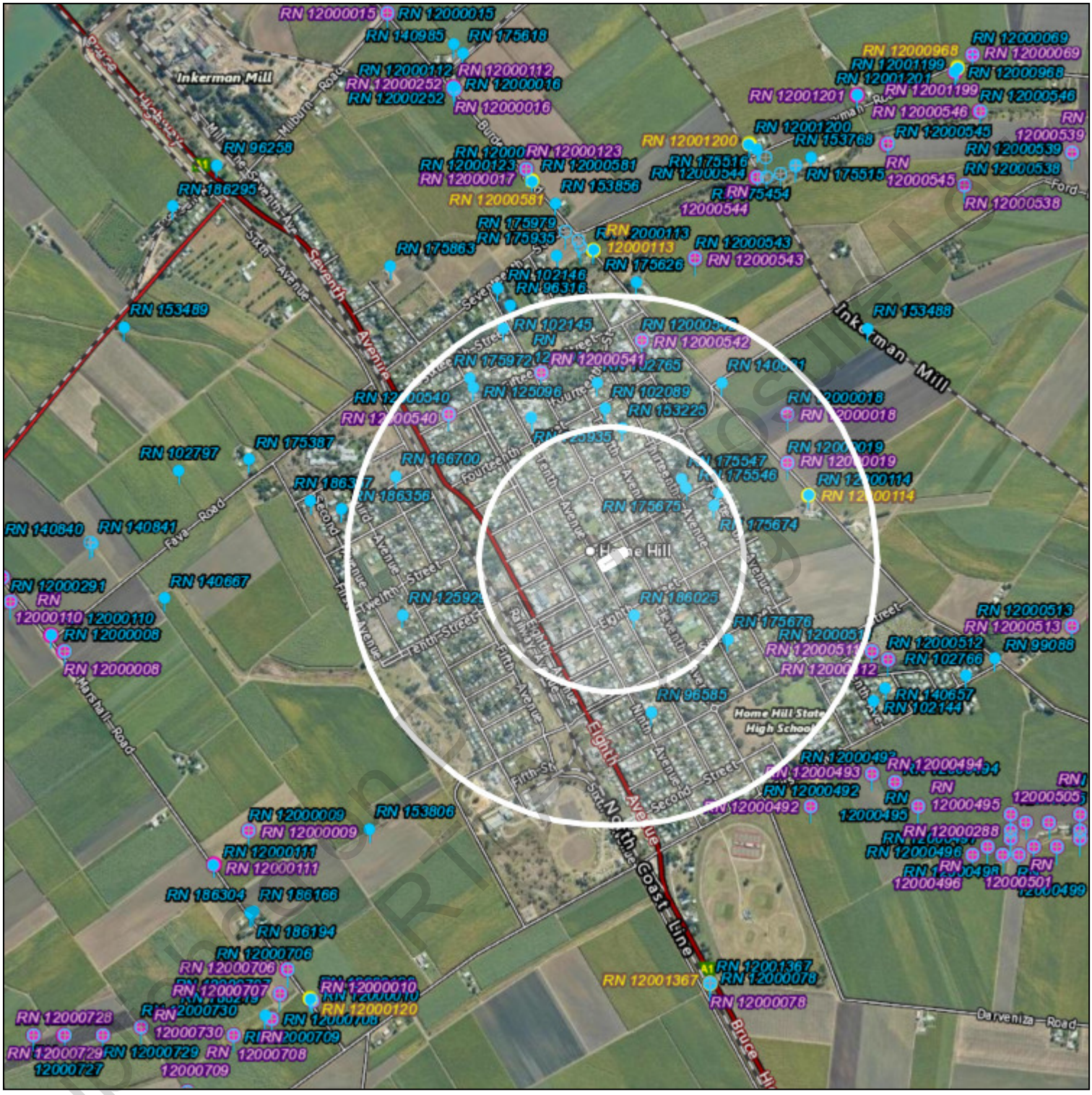
Registered Groundwater Bore Map

Home Hill Fire Station

19°38'31"S 147°23'39"E

19°38'31"S 147°25'60"E



19°40'44"S 147°23'39"E

19°40'44"S 147°25'60"E

A product of Queensland Globe

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Scale: 1:21934

Printed at: A4

Print date: 26/6/2020

Datum: Geocentric Datum of Australia 1994
Projection: Web Mercator EPSG 102100

For more information, visit https://qldglobe.information.qld.gov.au/help-info/Contact-us.html

Queensland Government
Department of Natural Resources, Mines and Energy

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Registered Groundwater Bore Map

Home Hill Fire Station

Legend

Registered water bores [DNRME and private]

- Artesian bore
- Artesian bore (abandoned but useable)
- Artesian bore (abandoned and destroyed)
- Artesian bore, ceased to flow
- Artesian bore, ceased to flow (abandoned but useable
- Artesian bore, ceased to flow (abandoned and destroyed)
- Sub-artesian facility
- Sub-artesian facility (abandoned but useable)
- Sub-artesian facility (abandoned and destroyed)
- Surface water facility
- Surface water facility (abandoned but useable)
- Surface water facility (abandoned and destroyed)

Current water level monitoring bores [DNRME]

Past water monitoring and investigation bores [DNRME]

Water monitoring bores with near real time data [DNRME]

All mine monitoring water bores [DNRME and private]

Mine monitoring water bores with water levels [DNRME and private]

Surat CMA underground water impact reporting monitoring bores [DNRME and private]

CSG online monitoring bores [DNRME and private]

CSG net monitoring bores [Private]

Road

- Highway
- Main
- Local
- Private

Railway

Cities and Towns

Attribution

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Potential Acid Sulphate Soils

Home Hill Fire Station

19°36'37"S 147°21'28"E

19°36'37"S 147°28'25"E

19°43'10"S 147°21'28"E

19°43'10"S 147°28'25"E

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Scale: 1:64947

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Datum: Geocentric Datum of Australia 1994
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Potential Acid Sulphate Soils

Home Hill Fire Station

Legend

Acid sulfate soils - Tweed Heads to Teewah SEA

Acid sulfate soils of Southern Bribie Island CABBI

Acid sulfate soils of the Bajool-Port Alma area CQAB

Acid sulfate soils of the Corio Bay Area CQAC

Acid sulfate soils of Tannum Sands to Gladstone CQAG

Acid sulfate soils of the Narrows area CQAN

Acid Sulfate Soils - Keppel Sands to Yeppoon CQAY

Acid sulfate soils of the Maryborough area MAC

Acid sulfate soils of the Mackay area MWQM

Acid sulfate soils of Cairns NQAS

Acid sulfate soils of the Yeppoon area YAS

Acid sulfate soils of Beachmere CABB

Acid sulfate soils of Donnybrook Meldale and Toorbul CABD

Acid sulfate soils of Halifax IAS

Acid sulfate soils of the Pine Rivers area MAS

Acid sulfate soils of the Airlie Beach area MWQA

Acid sulfate soils of Bowen MWQB

Acid sulfate soils of Proserpine MWQP

Acid sulfate soils of the Sarina area of North Queensland MWQS

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Potential Acid Sulphate Soils

Legend

Acid sulfate soils of the Maroochy-Caloundra area SEAM

Acid sulfate soils - Tweed Heads to Nerang River SEAN

Road

- Highway
- Main
- Local
- Private

Railway

Cities and Towns

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Flood Map

Home Hill Fire Station

19°36'37"S 147°21'28"E

19°36'37"S 147°28'25"E

19°43'10"S 147°21'28"E

19°43'10"S 147°28'25"E

A product of Queensland Globe

Legend located on next page

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Scale: 1:64947

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Flood Map

Home Hill Fire Station

Legend

Railway

Road

- Highway
- Main
- Local
- Private

Cities and Towns

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Detailed Surface geology 1 of 1

QA-QLD

Rock Unit Key (Surface)	2549
Rock Unit Name	Qa-QLD
Map Symbol	Qa
Lithological Summary	Clay, silt, sand and gravel; flood-plain alluvium
Dominant Rock	ALLUVIUM
Rock Type	STRATIFIED UNIT (INCLUDING VOLCANIC AND METAMORPHIC)
Age	QUATERNARY

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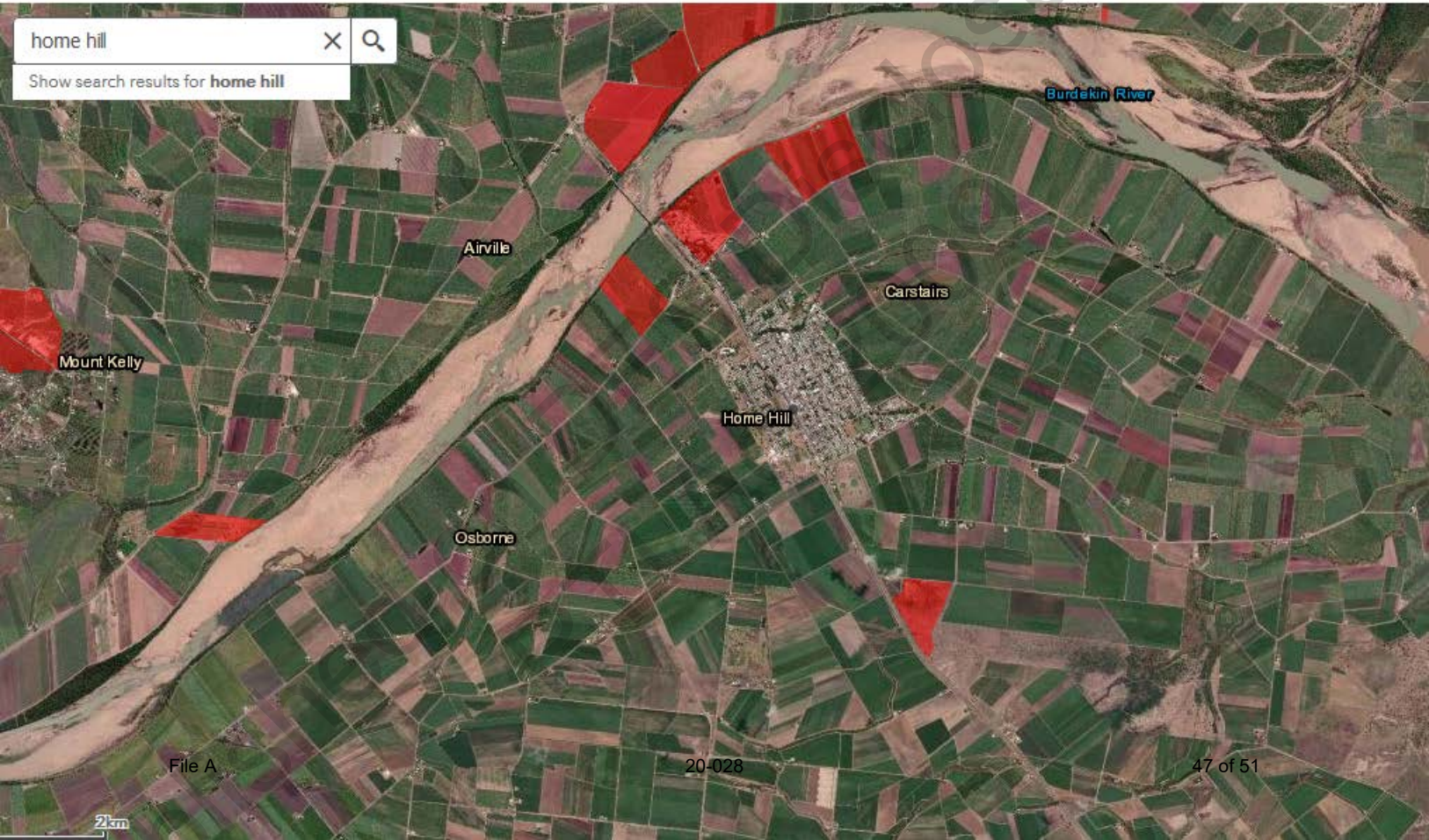
Environmental authority locations



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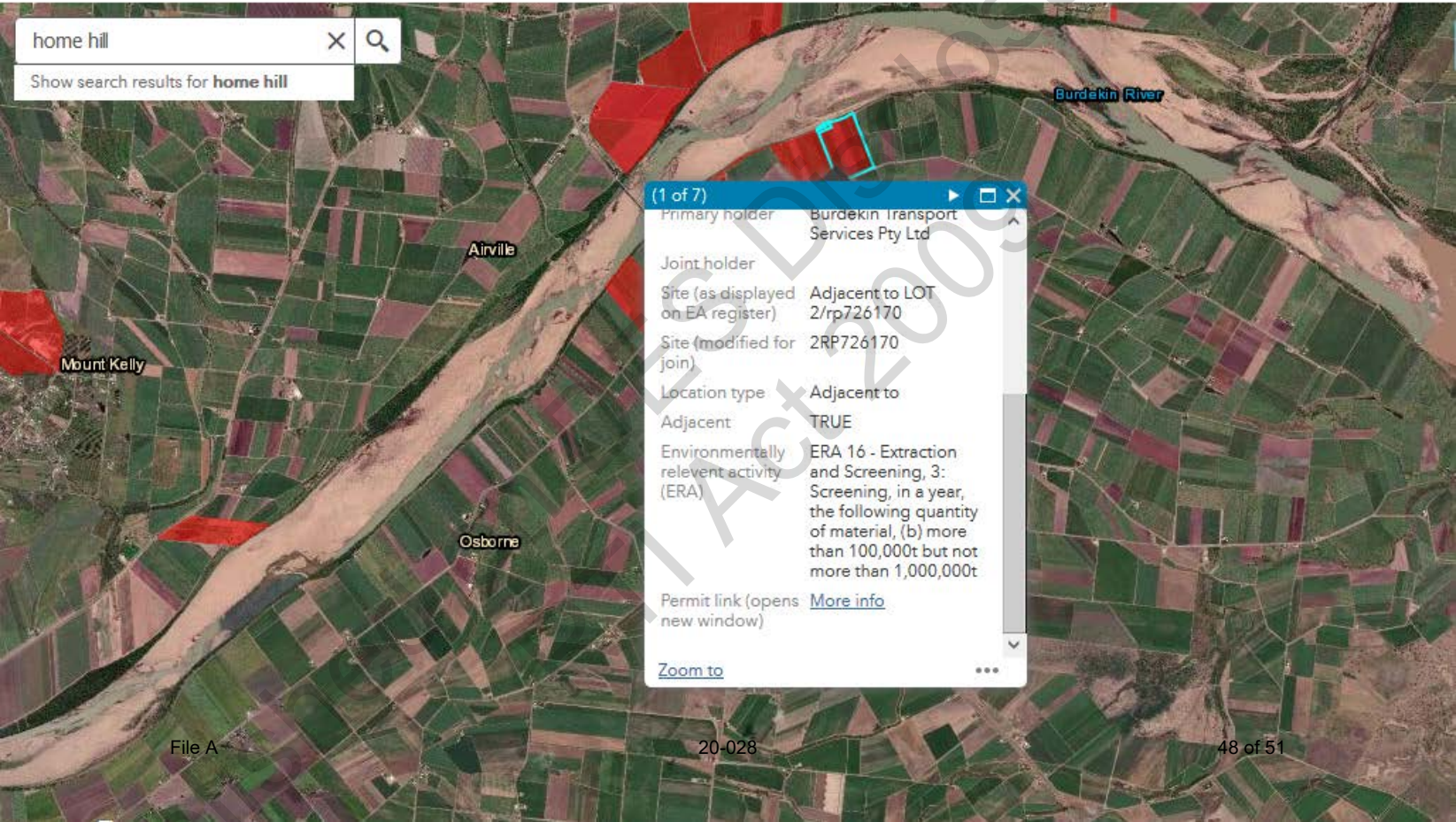

Act 2009

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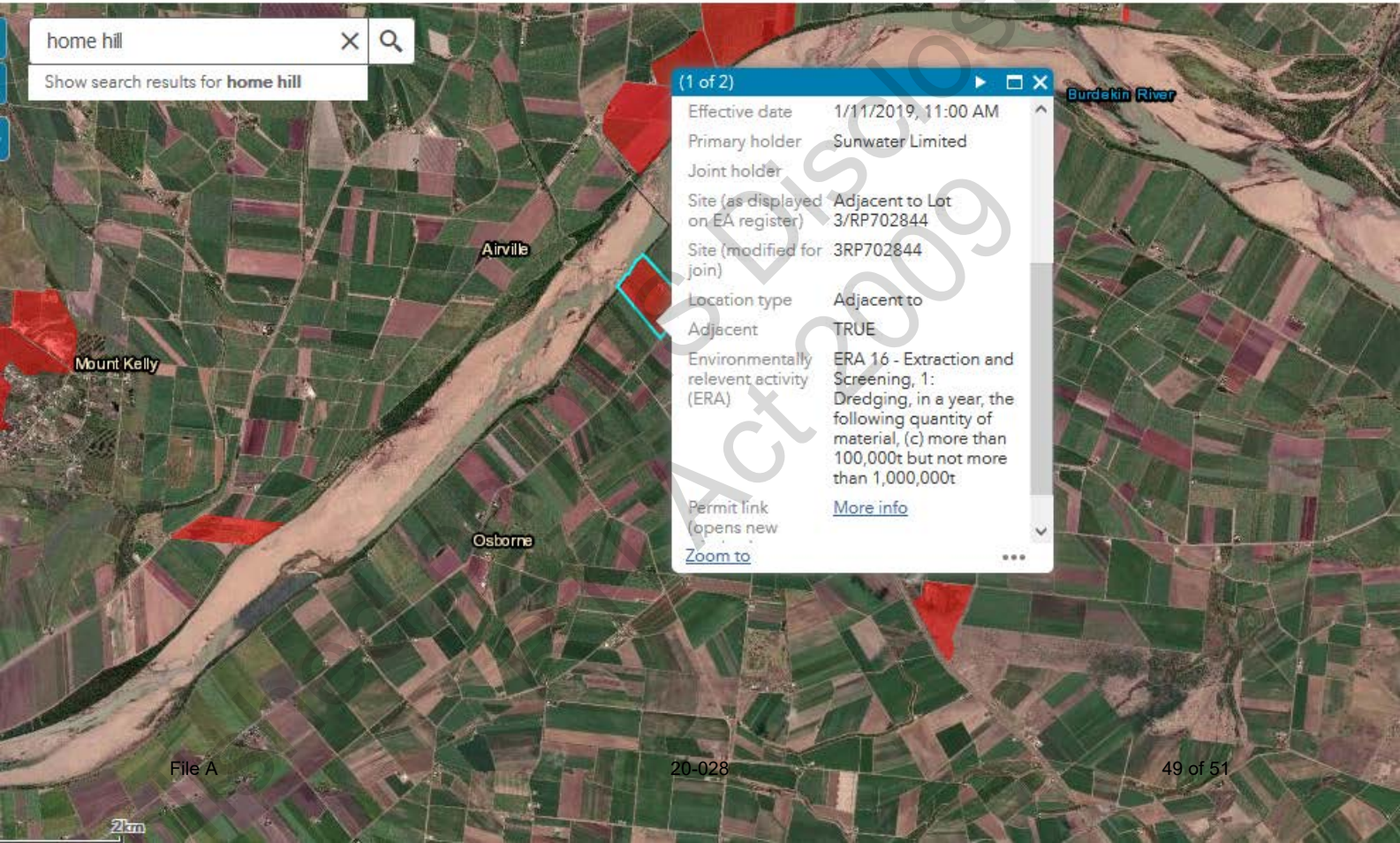

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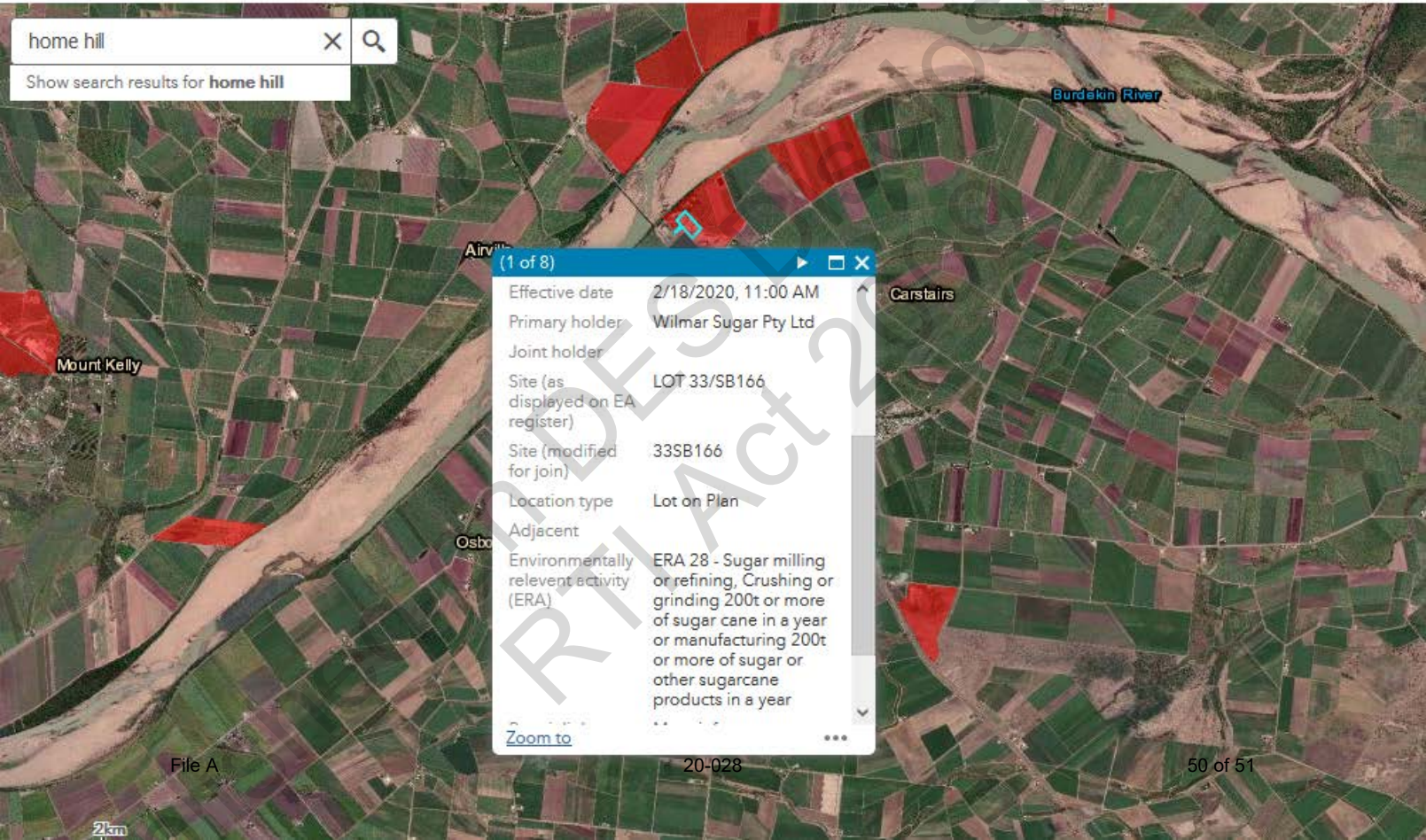

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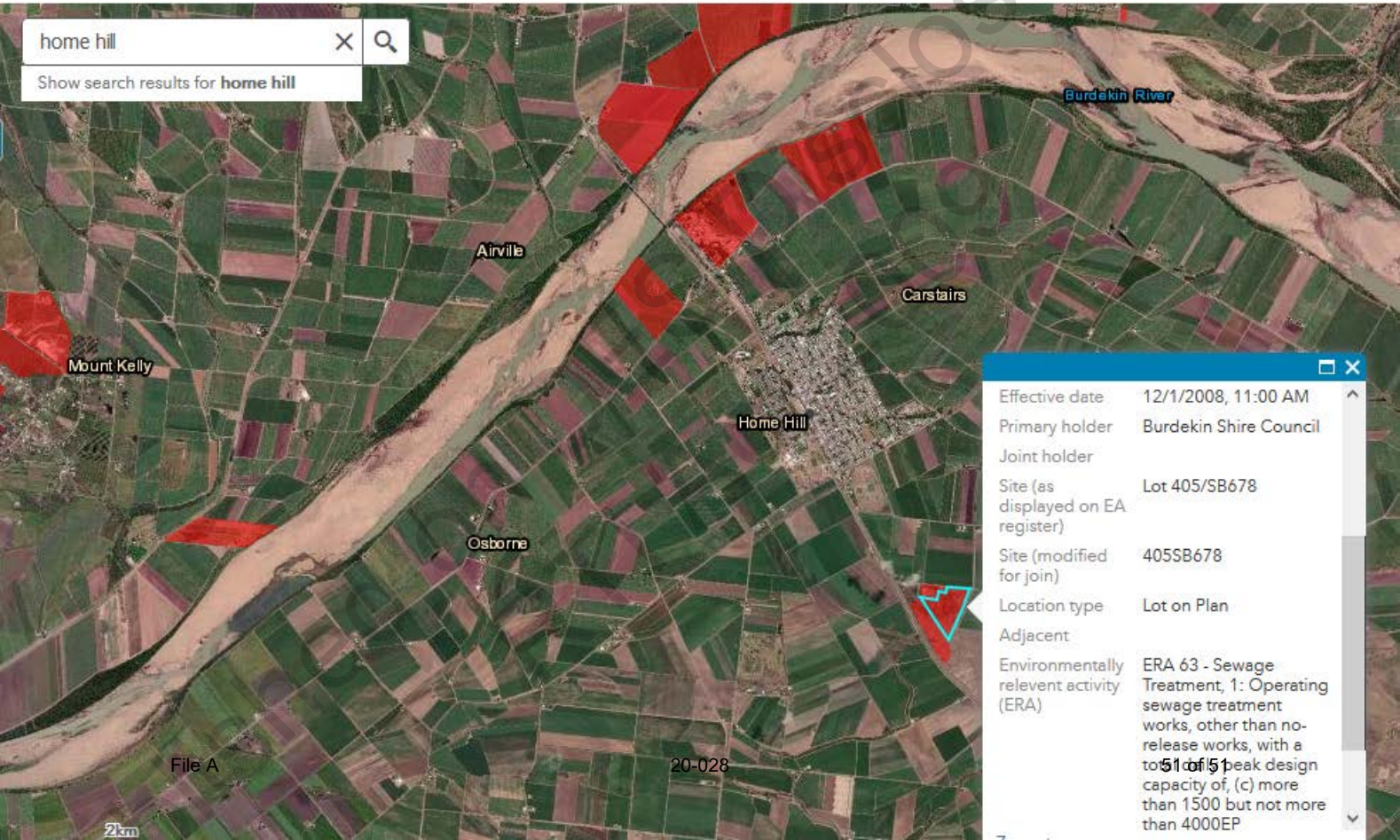
Environmental authority locations